

ETSI TS 138 355 V18.2.0 (2024-08)



**5G;
NR;
Sidelink Positioning Protocol (SLPP);
Protocol Specification
(3GPP TS 38.355 version 18.2.0 Release 18)**



Reference

RTS/TSGR-0238355vi20

Keywords

5G

ETSI

650 Route des Lucioles
F-06921 Sophia Antipolis Cedex - FRANCE

Tel.: +33 4 92 94 42 00 Fax: +33 4 93 65 47 16

Siret N° 348 623 562 00017 - APE 7112B
Association à but non lucratif enregistrée à la
Sous-Préfecture de Grasse (06) N° w061004871

Important notice

The present document can be downloaded from the
ETSI [Search & Browse Standards application](#).

The present document may be made available in electronic versions and/or in print. The content of any electronic and/or print versions of the present document shall not be modified without the prior written authorization of ETSI. In case of any existing or perceived difference in contents between such versions and/or in print, the prevailing version of an ETSI deliverable is the one made publicly available in PDF format on [ETSI deliver](#).

Users should be aware that the present document may be revised or have its status changed,
this information is available in the [Milestones listing](#).

If you find errors in the present document, please send your comments to
the relevant service listed under [Committee Support Staff](#).

If you find a security vulnerability in the present document, please report it through our
[Coordinated Vulnerability Disclosure \(CVD\)](#) program.

Notice of disclaimer & limitation of liability

The information provided in the present deliverable is directed solely to professionals who have the appropriate degree of experience to understand and interpret its content in accordance with generally accepted engineering or other professional standard and applicable regulations.

No recommendation as to products and services or vendors is made or should be implied.

No representation or warranty is made that this deliverable is technically accurate or sufficient or conforms to any law and/or governmental rule and/or regulation and further, no representation or warranty is made of merchantability or fitness for any particular purpose or against infringement of intellectual property rights.

In no event shall ETSI be held liable for loss of profits or any other incidental or consequential damages.

Any software contained in this deliverable is provided "AS IS" with no warranties, express or implied, including but not limited to, the warranties of merchantability, fitness for a particular purpose and non-infringement of intellectual property rights and ETSI shall not be held liable in any event for any damages whatsoever (including, without limitation, damages for loss of profits, business interruption, loss of information, or any other pecuniary loss) arising out of or related to the use of or inability to use the software.

Copyright Notification

No part may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying and microfilm except as authorized by written permission of ETSI.

The content of the PDF version shall not be modified without the written authorization of ETSI.

The copyright and the foregoing restriction extend to reproduction in all media.

© ETSI 2024.
All rights reserved.

Intellectual Property Rights

Essential patents

IPRs essential or potentially essential to normative deliverables may have been declared to ETSI. The declarations pertaining to these essential IPRs, if any, are publicly available for **ETSI members and non-members**, and can be found in ETSI SR 000 314: "*Intellectual Property Rights (IPRs); Essential, or potentially Essential, IPRs notified to ETSI in respect of ETSI standards*", which is available from the ETSI Secretariat. Latest updates are available on the ETSI Web server (<https://ipr.etsi.org/>).

Pursuant to the ETSI Directives including the ETSI IPR Policy, no investigation regarding the essentiality of IPRs, including IPR searches, has been carried out by ETSI. No guarantee can be given as to the existence of other IPRs not referenced in ETSI SR 000 314 (or the updates on the ETSI Web server) which are, or may be, or may become, essential to the present document.

Trademarks

The present document may include trademarks and/or tradenames which are asserted and/or registered by their owners. ETSI claims no ownership of these except for any which are indicated as being the property of ETSI, and conveys no right to use or reproduce any trademark and/or tradename. Mention of those trademarks in the present document does not constitute an endorsement by ETSI of products, services or organizations associated with those trademarks.

DECT™, **PLUGTESTS™**, **UMTS™** and the ETSI logo are trademarks of ETSI registered for the benefit of its Members. **3GPP™** and **LTE™** are trademarks of ETSI registered for the benefit of its Members and of the 3GPP Organizational Partners. **oneM2M™** logo is a trademark of ETSI registered for the benefit of its Members and of the oneM2M Partners. **GSM®** and the GSM logo are trademarks registered and owned by the GSM Association.

Legal Notice

This Technical Specification (TS) has been produced by ETSI 3rd Generation Partnership Project (3GPP).

The present document may refer to technical specifications or reports using their 3GPP identities. These shall be interpreted as being references to the corresponding ETSI deliverables.

The cross reference between 3GPP and ETSI identities can be found under <https://webapp.etsi.org/key/queryform.asp>.

Modal verbs terminology

In the present document "**shall**", "**shall not**", "**should**", "**should not**", "**may**", "**need not**", "**will**", "**will not**", "**can**" and "**cannot**" are to be interpreted as described in clause 3.2 of the [ETSI Drafting Rules](#) (Verbal forms for the expression of provisions).

"**must**" and "**must not**" are **NOT** allowed in ETSI deliverables except when used in direct citation.

Contents

Intellectual Property Rights	2
Legal Notice	2
Modal verbs terminology.....	2
Foreword.....	6
1 Scope	7
2 References	7
3 Definitions of terms, symbols and abbreviations	8
3.1 Terms.....	8
3.2 Abbreviations	8
4 Functionality of Protocol.....	9
4.1 General	9
4.1.1 SLPP Configuration.....	9
4.1.2 SLPP Sessions and Transactions	9
4.1.3 SLPP Positioning Methods	9
4.1.4 SLPP Messages.....	9
4.2 Common SLPP Session Procedure.....	10
4.3 SLPP Transport	11
4.3.1 Transport Layer Requirements	11
4.3.2 SLPP Duplicate Detection	11
4.3.3 SLPP Acknowledgement	11
4.3.3.1 General.....	11
4.3.3.2 Procedure related to Acknowledgement.....	11
4.3.4 SLPP Retransmission.....	12
4.3.4.1 General.....	12
4.3.4.2 Procedure related to Retransmission	12
5 SLPP Procedures	13
5.1 Procedures related to capability transfer	13
5.1.1 General.....	13
5.1.2 Capability Transfer procedure	13
5.1.3 Capability Indication procedure.....	14
5.1.4 Transmission of SLPP Request Capabilities.....	14
5.1.5 Reception of SLPP Request Capabilities	14
5.1.6 Transmission of SLPP Provide Capabilities	15
5.2 Procedures related to Assistance Data Transfer	15
5.2.1 General.....	15
5.2.2 Assistance Data Transfer procedure	15
5.2.3 Assistance Data Delivery procedure	16
5.2.4 Transmission of SLPP Request Assistance Data	16
5.2.5 Reception of SLPP Request Assistance Data.....	16
5.2.6 Reception of SLPP Provide Assistance Data.....	16
5.3 Procedures related to Location Information Transfer.....	17
5.3.1 General.....	17
5.3.2 Location Information Transfer procedure.....	17
5.3.3 Location Information Delivery procedure	17
5.3.4 Transmission of Request Location Information.....	18
5.3.5 Reception of Request Location Information	18
5.3.6 Transmission of Provide Location Information	18
5.4 Error Handling Procedures	19
5.4.1 General.....	19
5.4.2 Procedures related to Error Indication	19
5.4.3 SLPP Error Detection	19
5.4.4 Reception of an SLPP Error Message.....	20
5.5 Abort Procedure	20

5.5.1	General.....	20
5.5.2	Procedures related to Abort	20
5.5.3	Reception of an SLPP Abort Message.....	20
6	Protocol data units, formats and parameters (ASN.1).....	21
6.1	General	21
6.2	SLPP messages.....	21
6.2.1	General message structure	21
–	<i>SLPP-PDU-Definitions</i>	21
–	<i>SLPP-Message</i>	23
–	<i>SLPP-MessageBody</i>	24
6.2.2	Message body information elements definitions.....	25
–	<i>RequestCapabilities</i>	25
–	<i>ProvideCapabilities</i>	25
–	<i>RequestAssistanceData</i>	26
–	<i>ProvideAssistanceData</i>	26
–	<i>RequestLocationInformation</i>	27
–	<i>ProvideLocationInformation</i>	28
–	<i>Abort</i>	28
–	<i>Error</i>	29
6.3	SLPP information elements.....	29
6.3.1	Common information elements.....	29
–	<i>ARFCN-ValueNR</i>	29
–	<i>CommonIEsAbort</i>	30
–	<i>CommonIEsError</i>	30
–	<i>GNSS-ID-Bitmap</i>	30
–	<i>LCS-GCS-Translation</i>	31
–	<i>LOS-NLOS-Indicator</i>	31
–	<i>NCGI</i>	32
–	<i>NR-PhysCellID</i>	32
–	<i>PositioningModes</i>	32
–	<i>SL-RTD-Info</i>	33
–	<i>SL-TimeStamp</i>	34
–	<i>SL-TimingQuality</i>	35
6.3.2	UE capability information elements	35
6.3.3	Void	36
6.4	Multiplicity and type constraint values	36
–	<i>Multiplicity and type constraint definitions</i>	36
–	<i>End of SLPP-PDU-Definitions</i>	36
6.5	SLPP PDU Common Contents.....	36
–	<i>SLPP-PDU-CommonContents</i>	36
–	<i>CommonIEsRequestCapabilities</i>	37
–	<i>CommonIEsProvideCapabilities</i>	37
–	<i>CommonIEsRequestAssistanceData</i>	37
–	<i>CommonIEsProvideAssistanceData</i>	38
–	<i>CommonIEsRequestLocationInformation</i>	38
–	<i>CommonIEsProvideLocationInformation</i>	42
–	<i>End of SLPP-PDU-CommonContents</i>	48
6.6	SLPP PDU Common SL-PRS Methods Contents.....	48
–	<i>SLPP-PDU-CommonSL-PRS-MethodsContents</i>	48
–	<i>CommonSL-PRS-MethodsIEsRequestCapabilities</i>	48
–	<i>CommonSL-PRS-MethodsIEsProvideCapabilities</i>	49
–	<i>CommonSL-PRS-MethodsIEsRequestAssistanceData</i>	53
–	<i>CommonSL-PRS-MethodsIEsProvideAssistanceData</i>	53
–	<i>CommonSL-PRS-MethodsIEsRequestLocationInformation</i>	56
–	<i>CommonSL-PRS-MethodsIEsProvideLocationInformation</i>	57
–	<i>End of SLPP-PDU-CommonSL-PRS-MethodsContents</i>	57
6.7	SLPP PDU SL-AoA Contents.....	57
–	<i>SLPP-PDU-SL-AoA-Contents</i>	57
–	<i>SL-AoA-RequestCapabilities</i>	58
–	<i>SL-AoA-ProvideCapabilities</i>	58
–	<i>SL-AoA-RequestAssistanceData</i>	59

- *SL-AoA-ProvideAssistanceData*.....60
- *SL-AoA-RequestLocationInformation*61
- *SL-AoA-ProvideLocationInformation*62
- *End of SLPP-PDU-SL-AoA-Contents*64
- 6.8 SLPP PDU SL-RTT Contents64
 - *SLPP-PDU-SL-RTT-Contents*.....64
 - *SL-RTT-RequestCapabilities*.....65
 - *SL-RTT-ProvideCapabilities*.....65
 - *SL-RTT-RequestAssistanceData*.....67
 - *SL-RTT-ProvideAssistanceData*.....68
 - *SL-RTT-RequestLocationInformation*68
 - *SL-RTT-ProvideLocationInformation*69
 - *End of SLPP-PDU-SL-RTT-Contents*71
- 6.9 SLPP PDU SL-TDOA Contents.....71
 - *SLPP-PDU-SL-TDOA-Contents*71
 - *SL-TDOA-RequestCapabilities*72
 - *SL-TDOA-ProvideCapabilities*72
 - *SL-TDOA-RequestAssistanceData*73
 - *SL-TDOA-ProvideAssistanceData*74
 - *SL-TDOA-RequestLocationInformation*.....74
 - *SL-TDOA-ProvideLocationInformation*.....75
 - *End of SLPP-PDU-SL-TDOA-Contents*.....77
- 6.10 SLPP PDU SL-TOA Contents.....77
 - *SLPP-PDU-SL-TOA-Contents*77
 - *SL-TOA-RequestCapabilities*78
 - *SL-TOA-ProvideCapabilities*78
 - *SL-TOA-RequestAssistanceData*.....79
 - *SL-TOA-ProvideAssistanceData*.....80
 - *SL-TOA-RequestLocationInformation*.....80
 - *SL-TOA-ProvideLocationInformation*.....81
 - *End of SLPP-PDU-SL-TOA-Contents*.....82
- 6.11 Information elements related to Discovery Message.....83
 - *NR-DiscoveryMessageMetaDataContents*83
 - *RSPP-Metadata*.....83
 - *End of NR-DiscoveryMessageMetaDataContents*84
- Annex A (informative): Change history85**
- History86

Foreword

This Technical Specification has been produced by the 3rd Generation Partnership Project (3GPP).

The contents of the present document are subject to continuing work within the TSG and may change following formal TSG approval. Should the TSG modify the contents of the present document, it will be re-released by the TSG with an identifying change of release date and an increase in version number as follows:

Version x.y.z

where:

- x the first digit:
 - 1 presented to TSG for information;
 - 2 presented to TSG for approval;
 - 3 or greater indicates TSG approved document under change control.
- y the second digit is incremented for all changes of substance, i.e. technical enhancements, corrections, updates, etc.
- z the third digit is incremented when editorial only changes have been incorporated in the document.

1 Scope

The present document specifies the Sidelink Positioning Protocol (SLPP) for the interface between UEs and between UE and LMF.

2 References

The following documents contain provisions which, through reference in this text, constitute provisions of the present document.

- References are either specific (identified by date of publication, edition number, version number, etc.) or non-specific.
- For a specific reference, subsequent revisions do not apply.
- For a non-specific reference, the latest version applies. In the case of a reference to a 3GPP document (including a GSM document), a non-specific reference implicitly refers to the latest version of that document *in the same Release as the present document*.

- [1] 3GPP TR 21.905: "Vocabulary for 3GPP Specifications".
- [2] 3GPP TS 38.331: "NR; Radio Resource Control (RRC); Protocol specification".
- [3] 3GPP TS 38.305: "NG Radio Access Network (NG-RAN); Stage 2 functional specification of User Equipment (UE) positioning in NG-RAN".
- [4] ITU-T Recommendation X.691 (07/2002) "Information technology - ASN.1 encoding rules: Specification of Packed Encoding Rules (PER)" (Same as the ISO/IEC International Standard 8825-2).
- [5] 3GPP TS 23.273: "5G System (5GS) Location Services (LCS); Stage 2".
- [6] 3GPP TS 38.211: "3rd Generation Partnership Project; Technical Specification Group Radio Access Network; NR; Physical channels and modulation".
- [7] 3GPP TS 23.032: "Universal Geographical Area Description (GAD)".
- [8] 3GPP TR 38.901: "Technical Specification Group Radio Access Network; Study on channel model for frequencies from 0.5 to 100 GHz".
- [9] 3GPP TS 23.287: "Architecture enhancements for 5G System (5GS) to support Vehicle-to-Everything (V2X) services".
- [10] 3GPP TS 38.101-2: "NR; User Equipment (UE) radio transmission and reception; Part 2: Range 2 Standalone".
- [11] 3GPP TS 38.101-1: "NR; User Equipment (UE) radio transmission and reception; Part 1: Range 1 Standalone".
- [12] 3GPP TS 23.586: "Technical Specification Group Services and System Aspects; Architectural Enhancements to support Ranging based services and Sidelink Positioning".
- [13] 3GPP TS 38.133: "NR; Requirements for support of radio resource management".
- [14] 3GPP TS 23.304: "Technical Specification Group Services and System Aspects; Proximity based Services (ProSe) in the 5G System (5GS)".
- [15] 3GPP TS 38.321: "NR; Medium Access Control (MAC); Protocol specification".

3 Definitions of terms, symbols and abbreviations

3.1 Terms

For the purposes of the present document, the terms given in TR 21.905 [1] and the following apply. A term defined in the present document takes precedence over the definition of the same term, if any, in TR 21.905 [1].

Field: The individual contents of an information element are referred to as fields.

Ranging: Refers to the determination of the distance between two UEs or more UEs and/or the direction of one UE (i.e. Target UE) from another UE via PC5 interface.

Ranging/Sidelink Positioning: AS functionality enabling ranging-based services and sidelink positioning as specified in TS 23.586 [12].

SL Anchor UE: A UE, supporting positioning of target UE, e.g. by transmitting and/or receiving reference signals for positioning, providing positioning-related information, etc. over the Sidelink interface.

SL Server UE: A UE offering position method determination, assistance data distribution and/or location calculation functionalities for sidelink positioning and ranging based services. It interacts with other UEs over PC5 as necessary in order to determine a ranging/SL position method, distribute assistance data and calculate the location of the target UE. A Target UE or SL Anchor UE can act as SL Server UE if any of the functionalities is supported.

SL Target UE: A UE whose distance, direction and/or position is measured with the support from one or multiple SL Anchor UEs using Sidelink in the Ranging based service and Sidelink positioning.

UE-only Operation: Operation of Ranging/Sidelink Positioning in which the service request handling and result calculation are performed by UE.

3.2 Abbreviations

For the purposes of the present document, the abbreviations given in TR 21.905 [1] and the following apply. An abbreviation defined in the present document takes precedence over the definition of the same abbreviation, if any, in TR 21.905 [1].

DFN	Direct Frame Number
LMF	Location Management Function
LOS	Line-of-Sight
NLOS	Non-Line-of-Sight
RTD	Relative Time Difference
SL	Sidelink
SL-AoA	Sidelink Angle-of-Arrival
SLPP	Sidelink Positioning Protocol
SL-PRS	Sidelink Positioning Reference Signals
SL-PRS-RSRP	Sidelink Positioning Reference Signals based Reference Signal Received Power
SL-PRS-RSRPP	Sidelink Positioning Reference Signals based Reference Signal Received Path Power
SL-PRS-RSTD	Sidelink Positioning Reference Signals based Reference Signal Time Difference
SL-PRS-RTOA	Sidelink Positioning Reference Signals based Relative Time of Arrival
SL-RTT	Sidelink Round Trip Time
SL-TDOA	Sidelink Time Difference Of Arrival
SL-TOA	Sidelink Time Of Arrival
UE	User Equipment

4 Functionality of Protocol

4.1 General

4.1.1 SLPP Configuration

SLPP is used point-to-point between Endpoints, e.g. Location Server (SL Server UE or LMF) and target in order to obtain absolute position, relative position, or ranging information of target UE using sidelink measurements obtained by one or more reference sources.

Figure 4.1.1-1: Void

4.1.2 SLPP Sessions and Transactions

An SLPP session is used between UEs or a Location Server and a UE in order to obtain location related measurements based on NR PC5 radio signals, a location estimate or to transfer assistance data. A single SLPP session is used to support a single location request (e.g., for a single SL-MT-LR, or SL-MO-LR). Multiple SLPP sessions can be used between the same endpoints to support multiple location requests (as required by TS 23.273 [5]). For UE-only Operation, the instigator of an SLPP session which is the Endpoint who receives the LCS request, initiates an SLPP session by sending an SLPP message containing an assigned session ID (session identifier) to the other endpoint (s). All constituent messages within a session shall contain the same session ID. For LMF involved Operation, the session ID is assigned by target UE and contained in the SLPP messages used for communication between UEs. The session ID may be included in the SLPP message for the communication between a UE and the LMF.

Each SLPP session comprises one or more SLPP transactions, with each SLPP transaction performing a single operation (capability exchange, assistance data transfer, or location information transfer). The SLPP transactions are realized as SLPP procedures. The instigator of an SLPP session will always instigate the first SLPP transaction, but subsequent transactions may be instigated by either end. SLPP transactions within a session may occur serially or in parallel. SLPP transactions are indicated at the SLPP protocol level with a transaction ID in order to associate messages with one another (e.g., request and response).

Messages within a transaction are linked by a common transaction identifier.

4.1.3 SLPP Positioning Methods

This version of the specification defines SL-TDOA, SL-TOA, SL-AoA and SL-RTT positioning methods based on NR PC5 radio signals.

4.1.4 SLPP Messages

Each SLPP transaction involves the exchange of one or more SLPP messages between Endpoint A and Endpoint B. The general format of an SLPP message consists of a set of common fields followed by a body. The body (which may be empty) contains information specific to a particular message type. Each message type contains information specific to one or more positioning methods and/or information common to all positioning methods.

The common fields are as follows:

Field	Role
<i>sessionID</i>	Identify messages belonging to the same session
<i>transactionID</i>	Identify messages belonging to the same transaction
<i>endTransaction</i>	Indicate when a transaction (e.g. one with periodic responses) has ended
<i>sequenceNumber</i>	Enable detection of a duplicate SLPP message at a receiver
<i>acknowledgement</i>	Enable an acknowledgement to be requested and/or returned for any SLPP message

The following message types are defined:

- Request Capabilities;
- Provide Capabilities;
- Request Assistance Data;
- Provide Assistance Data;
- Request Location Information;
- Provide Location Information;
- Abort;
- Error.

4.2 Common SLPP Session Procedure

The purpose of this procedure is to support an SLPP session comprising a sequence of SLPP transactions. The procedure is described in Figure 4.2-1.

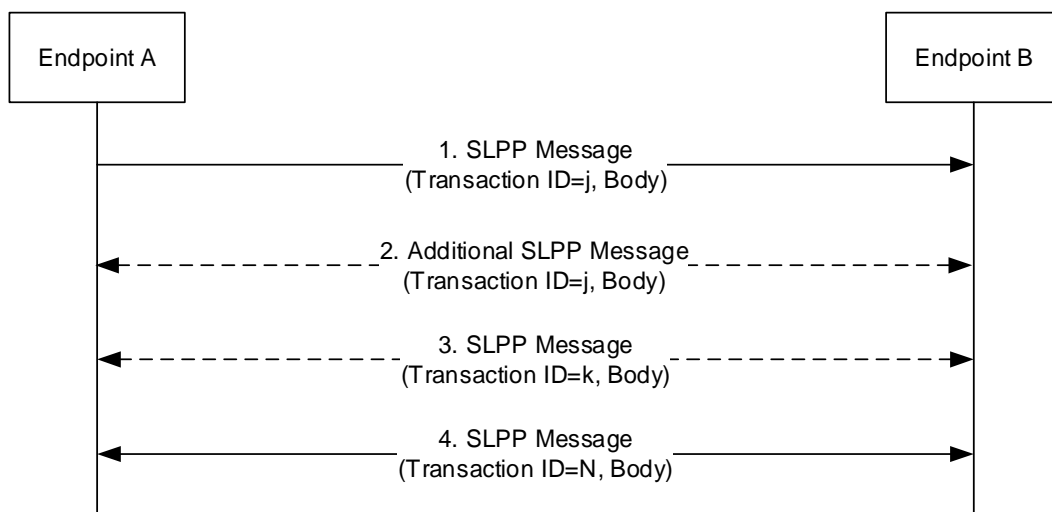


Figure 4.2-1 SLPP Session Procedure

1. Endpoint A, which is the Endpoint who receives the LCS request, initiates an SLPP session by sending an SLPP message containing an assigned session ID for an initial SLPP transaction j to the other endpoint B.
2. Endpoints A and B may exchange further messages to continue the transaction started in step 1.
3. Either endpoint may instigate further transactions by sending additional SLPP messages.
4. A session is terminated by a final transaction N in which SLPP messages will be exchanged between the two endpoints.

Within the same session, all constituent messages shall contain the same session ID and within each transaction, all constituent messages shall contain the same transaction ID. The last message sent in each transaction shall have the field *endTransaction* set to TRUE. Transactions that occur in parallel shall use different transaction IDs; transaction IDs for completed transactions may be reused at any time after the final message of the previous transaction with the same ID is known to have been received.

4.3 SLPP Transport

4.3.1 Transport Layer Requirements

SLPP requires reliable, in-sequence delivery of SLPP messages from the underlying transport layers. This clause describes the transport capabilities that are available within SLPP. A UE implementing SLPP shall support SLPP reliable transport (including all three of duplicate detection, acknowledgement, and retransmission).

4.3.2 SLPP Duplicate Detection

A sender shall include a sequence number in all SLPP messages sent for a particular location session. The sequence number shall be distinct for different SLPP messages sent by the same endpoint for the same endpoint in the same location session (e.g., may start at zero in the first SLPP message and increase monotonically in each succeeding SLPP message). Sequence numbers used in the messages transmitted from different endpoints or for different endpoints are independent (e.g., can be the same).

A receiver shall record the most recent received sequence number for each pair of endpoints of each location session. If a message is received carrying the same sequence number as that last received for the same pair of endpoints and the associated location session, it shall be discarded. Otherwise (i.e., if the sequence number is different or the sequence number is same but for different pair of endpoints), the message shall be processed.

Sending and receiving sequence numbers shall be deleted in a server when the associated location session is terminated and shall be deleted in the UE(s) when there has been no activity for a particular location session for 10 minutes.

4.3.3 SLPP Acknowledgement

4.3.3.1 General

Each SLPP message may carry an acknowledgement request and/or an acknowledgement indicator. A SLPP message including an acknowledgement request (i.e., that include the field *ackRequested* set to TRUE) shall also include a sequence number. Upon reception of an SLPP message which includes the field *ackRequested* set to TRUE, a receiver returns an SLPP message with an acknowledgement response (i.e., that includes the field *ackIndicator* set to the same sequence number of the message being acknowledged). An acknowledgement response may contain no SLPP message body (in which case only the sequence number being acknowledged is significant); alternatively, the acknowledgement may be sent in an SLPP message along with an SLPP message body. An acknowledgement is returned for each received SLPP message that requested an acknowledgement including any duplicate(s). Once a sender receives an acknowledgement for an SLPP message, and provided any included sequence number is matching, it is permitted to send the next SLPP message. No message reordering is needed at the receiver since this stop-and-wait method of sending ensures that messages normally arrive in the correct order.

When an SLPP message is transported via a NAS SL-MO-LR request, the message does not request an acknowledgement.

4.3.3.2 Procedure related to Acknowledgement

Figure 4.3.3.2-1 shows the procedure related to acknowledgement.

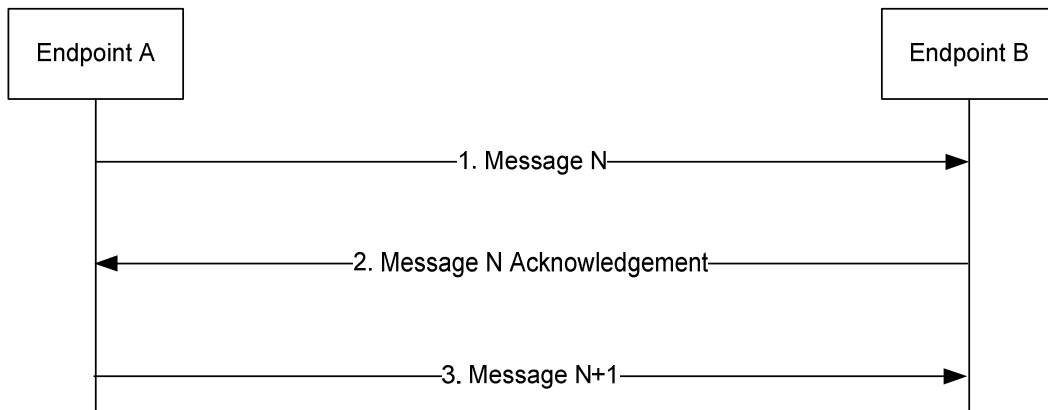


Figure 4.3.3.2-1: SLPP Acknowledgement procedure

1. Endpoint A sends an SLPP message N to Endpoint B which includes the field *ackRequested* set to TRUE and a sequence number.
2. If SLPP message N is received and Endpoint B is able to decode the *ackRequested* value and sequence number, Endpoint B shall return an acknowledgement for message N . The acknowledgement shall contain the field *ackIndicator* set to the same sequence number as that in message N .
3. When the acknowledgement for SLPP message N is received and provided the included the field *ackIndicator* matches the sequence number sent in message N , Endpoint A sends the next SLPP message $N+1$ to Endpoint B when this message is available.

4.3.4 SLPP Retransmission

4.3.4.1 General

This capability builds on the acknowledgement and duplicate detection capabilities. When an SLPP message which requires acknowledgement is sent and not acknowledged, it is resent by the sender following a timeout period up to three times. If still unacknowledged after that, the sender aborts all SLPP activity for this Endpoint. The timeout period is determined by the sender implementation but shall not be less than a minimum value of 250 ms.

4.3.4.2 Procedure related to Retransmission

Figure 4.3.4.2-1 shows the procedure related to retransmission when combined with acknowledgement and duplicate detection.

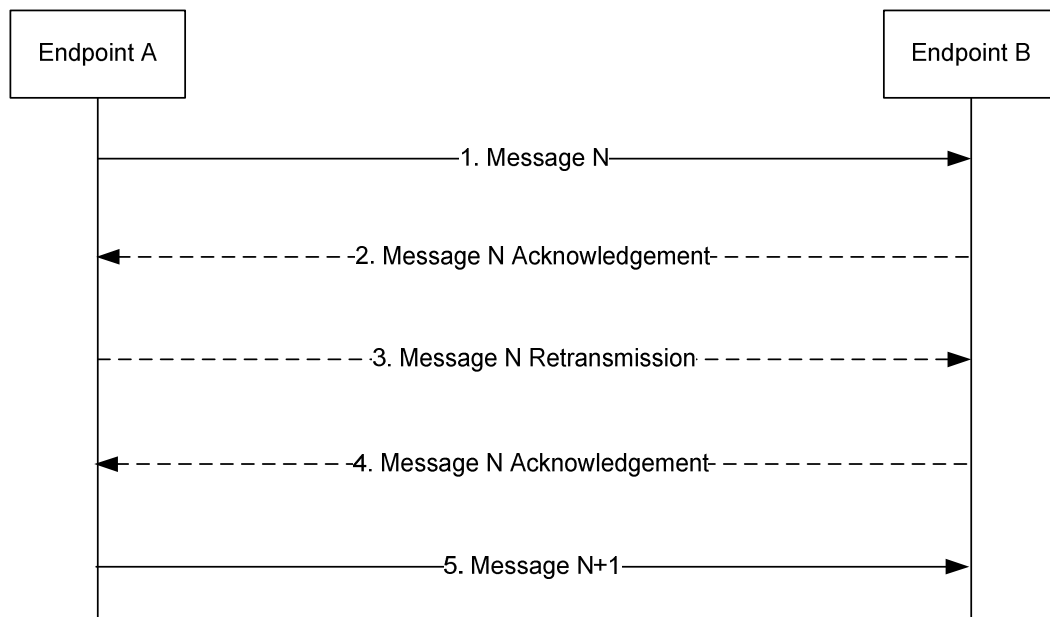


Figure 4.3.4.2-1: SLPP Retransmission procedure

1. Endpoint A sends an SLPP message N to Endpoint B for a particular location session and includes a request for acknowledgement along with a sequence number.
2. If SLPP message N is received and Endpoint B is able to decode the *ackRequested* value and sequence number (regardless of whether the message body can be correctly decoded), Endpoint B shall return an acknowledgement for message N . If the acknowledgement is received by Endpoint A (such that the acknowledged message can be identified and sequence numbers are matching), Endpoint A skips steps 3 and 4.
3. If the acknowledgement in step 2 is not received after a timeout period, Endpoint A shall retransmit SLPP message N and shall include the same sequence number as in step 1.
4. If SLPP message N in step 3 is received and Endpoint B is able to decode the *ackRequested* value and sequence number (regardless of whether the message body can be correctly decoded and whether or not the message is considered a duplicate), Endpoint B shall return an acknowledgement. Steps 3 may be repeated one or more times if the acknowledgement in step 4 is not received after a timeout period by Endpoint A. If the acknowledgement in step 4 is still not received after sending three retransmissions, Endpoint A shall abort all procedures and activity associated with SLPP support for this Endpoint B.
5. Once an acknowledgement in step 2 or step 4 is received, Endpoint A sends the next SLPP message $N+1$ for the location session to Endpoint B when this message is available.

5 SLPP Procedures

5.1 Procedures related to capability transfer

5.1.1 General

The purpose of the procedures that are grouped together in this clause is to enable the transfer of capabilities from Endpoint A to Endpoint B. Capabilities in this context refer to positioning and protocol capabilities related to SLPP and the positioning methods supported by SLPP.

5.1.2 Capability Transfer procedure

The Capability Transfer procedure is shown in Figure 5.1.2-1.

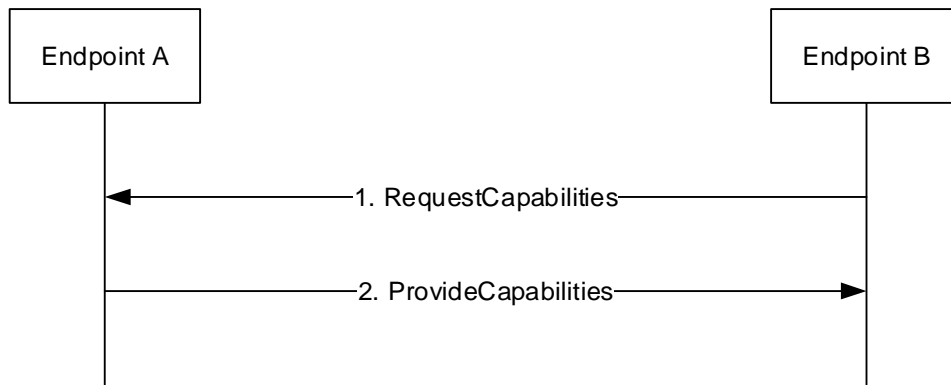


Figure 5.1.2-1: SLPP Capability Transfer procedure

1. Endpoint B sends a *RequestCapabilities* message to Endpoint A. Endpoint B may indicate the types of capability requested.
2. Endpoint A responds with a *ProvideCapabilities* message to Endpoint B. The capabilities shall correspond to the capability types specified in step 1. This message shall include the field *endTransaction* set to TRUE.

5.1.3 Capability Indication procedure

The Capability Indication procedure allows the Endpoint A to provide unsolicited capabilities to the Endpoint B and is shown in Figure 5.1.3-1.

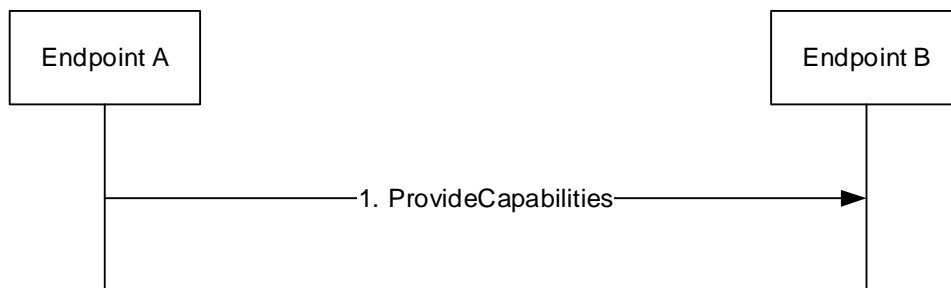


Figure 5.1.3-1: SLPP Capability Indication procedure

1. Endpoint A sends a *ProvideCapabilities* message to Endpoint B. This message shall include the field *endTransaction* set to TRUE.

5.1.4 Transmission of SLPP Request Capabilities

When triggered to transmit a *RequestCapabilities* message, Endpoint B shall:

- 1> set the method specific *RequestCapabilities* PDUs in accordance with the information received from upper layers.
- 1> deliver the message to lower layers for transmission.

5.1.5 Reception of SLPP Request Capabilities

Upon receiving a *RequestCapabilities* message, Endpoint A shall generate a *ProvideCapabilities* message as a response.

Endpoint A shall:

- 1> for each positioning method for which a request for capabilities is included in the message:
 - 2> if Endpoint A supports this positioning method:
 - 3> include the capabilities of Endpoint A for that supported positioning method in the response message;

- 1> set the field *sessionID* in the response message to the same value as the field *sessionID* in the received message if received;
- 1> set the field *transactionID* in the response message to the same value as the field *transactionID* in the received message;
- 1> deliver the response message to lower layers for transmission.

5.1.6 Transmission of SLPP Provide Capabilities

When triggered to transmit a *ProvideCapabilities* message, Endpoint A shall:

- 1> for each positioning method whose capabilities are to be indicated:
 - 2> set the corresponding fields to include Endpoint A's capabilities;
- 1> deliver the response to lower layers for transmission.

5.2 Procedures related to Assistance Data Transfer

5.2.1 General

The purpose of the procedures that are grouped together in this clause is to enable Endpoint A to request assistance data from Endpoint B to assist in positioning, and to enable Endpoint B to transfer assistance data to Endpoint A without a request.

5.2.2 Assistance Data Transfer procedure

The Assistance Data Transfer procedure is shown in Figure 5.2.2-1.

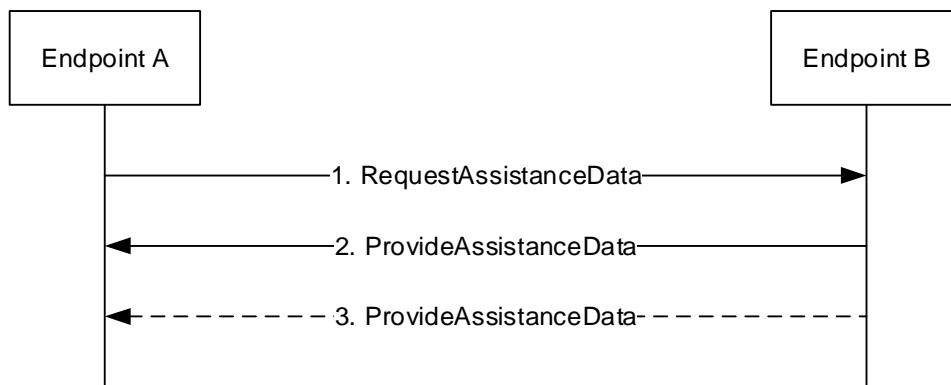


Figure 5.2.2-1: SLPP Assistance data transfer procedure

1. Endpoint A sends a *RequestAssistanceData* message to Endpoint B.
2. Endpoint B responds with a *ProvideAssistanceData* message to Endpoint A containing assistance data. The transferred assistance data should match or be a subset of the assistance data requested in step 1. Endpoint B may also provide any not requested information that it considers useful to Endpoint A. If step 3 is not expected, this message shall set the field *endTransaction* to TRUE.
3. Endpoint B may transmit one or more additional *ProvideAssistanceData* messages to Endpoint A containing further assistance data. The transferred assistance data should match or be a subset of the assistance data requested in step 1. Endpoint B may also provide any not requested information that it considers useful to Endpoint A. The last message shall include the field *endTransaction* set to TRUE.

5.2.3 Assistance Data Delivery procedure

The Assistance Data Delivery procedure allows Endpoint B to provide unsolicited assistance data to Endpoint A and is shown in Figure 5.2.3-1.

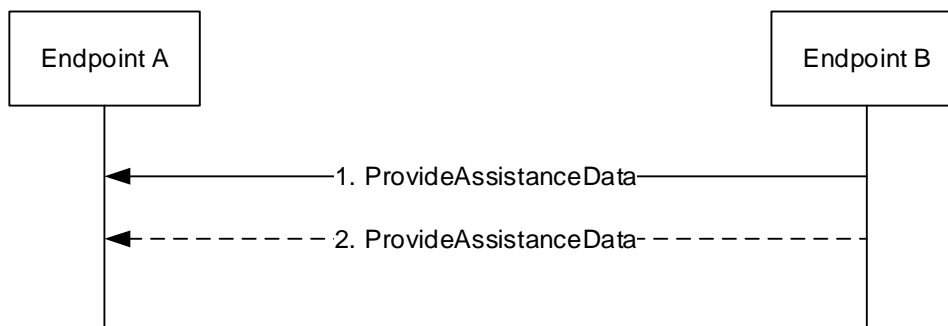


Figure 5.2.3-1: SLPP Assistance data transfer procedure

1. Endpoint B sends a *ProvideAssistanceData* message to Endpoint A containing assistance data. If step 2 is not expected, this message shall set the field *endTransaction* to TRUE.
2. Endpoint B may transmit one or more additional *ProvideAssistanceData* messages to Endpoint A containing additional assistance data. The last message shall include the field *endTransaction* set to TRUE.

5.2.4 Transmission of SLPP Request Assistance Data

When triggered to transmit a *RequestAssistanceData* message, Endpoint A shall:

- 1> set the method specific *RequestAssistanceData* PDUs in accordance with the information received from upper layers.
- 1> deliver the message to lower layers for transmission.

5.2.5 Reception of SLPP Request Assistance Data

Upon receiving a *RequestAssistanceData* message, Endpoint B shall generate a *ProvideAssistanceData* message as a response.

Endpoint B shall:

- 1> for each positioning method for which a request for assistance data is included in the message:
 - 2> if Endpoint B supports this positioning method:
 - 3> include the assistance data for that supported positioning method in the response message;
- 1> set the field *sessionID* in the response message to the same value as the field *sessionID* in the received message if received;
- 1> set the field *transactionID* in the response message to the same value as the field *transactionID* in the received message;
- 1> deliver the response message to lower layers for transmission.

5.2.6 Reception of SLPP Provide Assistance Data

Upon receiving a *ProvideAssistanceData* message, Endpoint A shall:

- 1> for each positioning method contained in the message:

2> deliver the related assistance data to upper layers.

5.3 Procedures related to Location Information Transfer

5.3.1 General

The purpose of the procedures that are grouped together in this clause is to enable Endpoint B to request location measurement data and/or a location estimate from Endpoint A, and to enable Endpoint A to transfer location measurement data and/or a location estimate to Endpoint B without a request.

5.3.2 Location Information Transfer procedure

The Location Information Transfer procedure is shown in Figure 5.3.2-1.

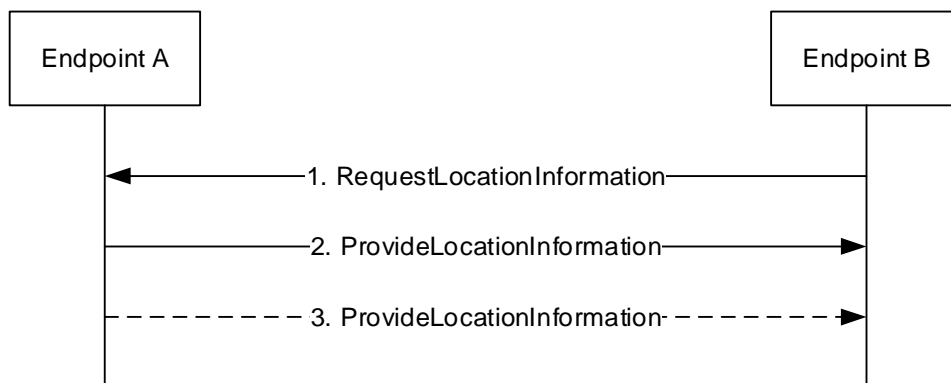


Figure 5.3.2-1: SLPP Location Information transfer procedure

1. Endpoint B sends a *RequestLocationInformation* message to Endpoint A to request location information, indicating the type of location information requested and optionally the associated QoS.
2. Endpoint A sends a *ProvideLocationInformation* message to Endpoint B to transfer location information. The location information transferred should match or be a subset of the location information requested in step 1 unless Endpoint B explicitly allows additional location information. If step 3 is not expected, this message shall set the field *endTransaction* to TRUE.
3. If requested in step 1, Endpoint A sends additional *ProvideLocationInformation* messages to Endpoint B to transfer location information. The location information transferred should match or be a subset of the location information requested in step 1 unless Endpoint B explicitly allows additional location information. The last message shall include the field *endTransaction* set to TRUE.

5.3.3 Location Information Delivery procedure

The Location Information Delivery procedure allows Endpoint A to provide unsolicited location information to Endpoint B. The procedure is shown in Figure 5.3.3-1.

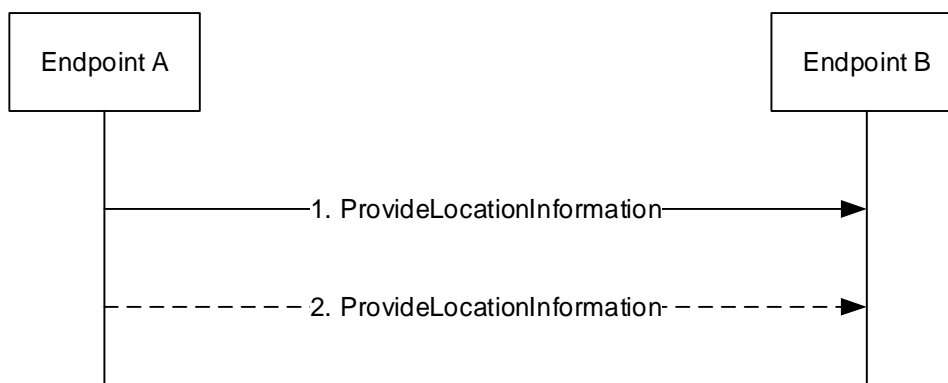


Figure 5.3.3-1: SLPP Location Information Delivery procedure

1. Endpoint A sends a *ProvideLocationInformation* message to Endpoint B to transfer location information. If step 2 is not expected, this message shall set the field *endTransaction* to TRUE.
2. Endpoint A may send one or more additional *ProvideLocationInformation* messages to Endpoint B containing additional location information data. The last message shall include the field *endTransaction* set to TRUE.

5.3.4 Transmission of Request Location Information

When triggered to transmit a *RequestLocationInformation* message, Endpoint B shall:

- 1> set the method specific *RequestLocationInformation* PDUs in accordance with the information received from upper layers.
- 1> deliver the message to lower layers for transmission.

5.3.5 Reception of Request Location Information

Upon receiving a *RequestLocationInformation* message, Endpoint A shall:

- 1> if the requested information is compatible with Endpoint A's capabilities and configuration:
 - 2> include the requested information in a *ProvideLocationInformation* message;
 - 2> set the field *sessionID* in the response message to the same value as the field *sessionID* in the received message if received;
 - 2> set the field *transactionID* in the response to the same value as the field *transactionID* in the received message;
 - 2> deliver the *ProvideLocationInformation* message to lower layers for transmission.
- 1> else if one or more positioning methods are included that Endpoint A does not support:
 - 2> continue to process the message as if it contained only information for the supported positioning methods;
 - 2> handle the signaling content of the unsupported positioning methods by SLPP error detection as in 5.4.3.

5.3.6 Transmission of Provide Location Information

When triggered to transmit *ProvideLocationInformation* message, Endpoint A shall:

- 1> for each positioning method contained in the message:
 - 2> set the corresponding fields to include the available location information;

1> deliver the response to lower layers for transmission.

5.4 Error Handling Procedures

5.4.1 General

This clause describes how a receiving endpoint behaves in cases when it receives erroneous or unexpected data or detects that certain data are missing.

5.4.2 Procedures related to Error Indication

Figure 5.4.2-1 shows the Error indication procedure.

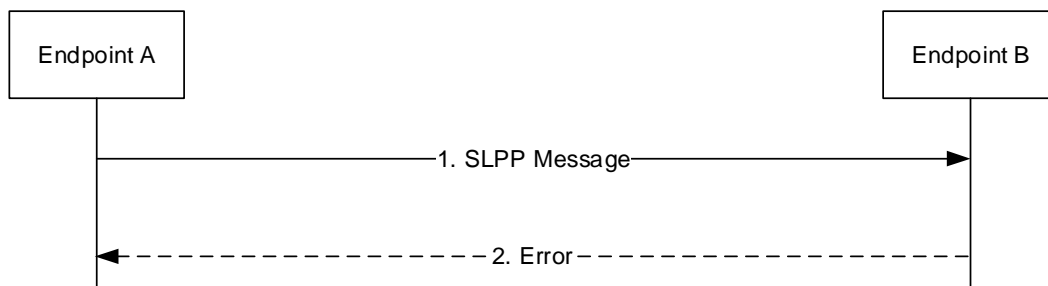


Figure 5.4.2-1: SLPP Error Indication procedure

1. Endpoint A sends an SLPP message to Endpoint B.
2. Endpoint B determines that the SLPP message in step 1 contains an error. Endpoint B returns an *Error* message to Endpoint A indicating the error or errors and discards the message in step 1. If Endpoint B is able to determine that the erroneous SLPP message in step 1 is an SLPP Error or Abort Message, Endpoint B discards the message in step 1 without returning an *Error* message to Endpoint A.

5.4.3 SLPP Error Detection

Upon receiving any SLPP message, the receiving endpoint shall attempt to decode the message and verify the presence of any errors and:

- 1> if decoding errors are encountered:
 - 2> if the receiver cannot determine that the received message is an SLPP *Error* or *Abort* message:
 - 3> return an SLPP *Error* message to the sender and include the field *sessionID* (if PC5-U is used as transport layer) and the received *transactionID*, if they were decoded, and type of error;
 - 3> discard the received message and stop the error detection procedure;
- 1> if the message is a duplicate of a previously received message:
 - 2> discard the message and stop the error detection procedure;
- 1> if the field *transactionID* matches the field *transactionID* for a procedure that is still ongoing for the same session and the message type is invalid for the current state of the procedure:
 - 2> abort the ongoing procedure;
 - 2> return an SLPP *Error* message to the sender and include the field *sessionID* (if PC5-U is used as transport layer), the received field *transactionID* and type of error;
 - 2> discard the message and stop the error detection procedure;

- 1> if the message type is an SLPP *RequestCapabilities* and some of the requested information is not supported:
 - 2> return any information that can be provided in a normal response.
- 1> if the message type is an SLPP *RequestAssistanceData* or *RequestLocationInformation* and some or all of the requested information is not supported:
 - 2> return any information that can be provided in a normal response, which includes indications on other information that is not supported.

5.4.4 Reception of an SLPP Error Message

Upon receiving an *Error* message, Endpoint A shall:

- 1> abort any ongoing procedure associated with the field *sessionID* and the field *transactionID* if included in the received message.

Endpoint A may:

- 1> restart the aborted procedure taking into consideration the returned error information.

5.5 Abort Procedure

5.5.1 General

The purpose of the abort procedure is to allow Endpoints to abort an ongoing procedure due to some unexpected event (e.g., cancellation of a location request by an LCS client). It can also be used to stop an ongoing procedure (e.g., periodic location reporting from an Endpoint).

5.5.2 Procedures related to Abort

Figure 5.5.2-1 shows the Abort procedure.

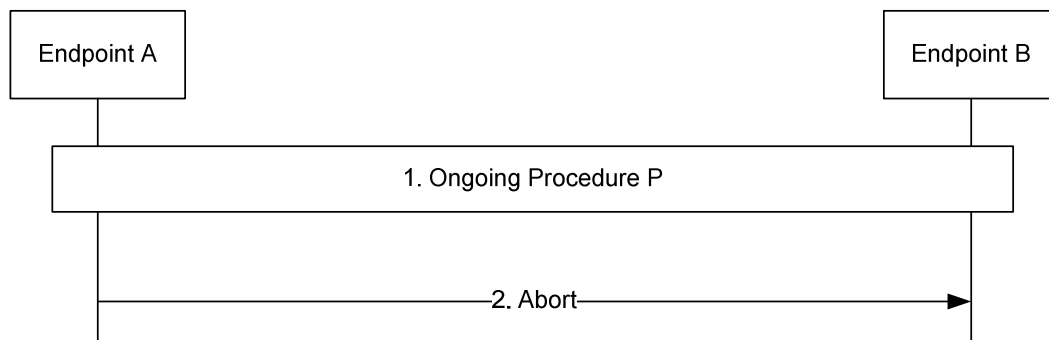


Figure 5.5.2-1: SLPP Abort procedure

1. A procedure P is ongoing between endpoints A and B.
2. Endpoint A determines that the procedure must be aborted and sends an *Abort* message to Endpoint B carrying the field *sessionID* (if PC5-U is used as transport layer) and the field *transactionID* for procedure P. Endpoint B aborts procedure P.

5.5.3 Reception of an SLPP Abort Message

Upon receiving an *Abort* message, Endpoint shall:

- 1> abort any ongoing procedure associated with the field *sessionID* and the field *transactionID* indicated in the message.

6 Protocol data units, formats and parameters (ASN.1)

6.1 General

The contents of each SLPP message is specified in clause 6.2 using ASN.1 to specify the message syntax and using tables when needed to provide further detailed information about the fields specified in the message syntax. The syntax of the information elements that are defined as stand-alone abstract types is further specified in a similar manner in clause 6.3.

The ASN.1 in this clause uses the same format and coding conventions as described in Annex A of TS 38.331 [2].

Transfer syntax for SLPP messages is derived from their ASN.1 definitions by use of Basic Packed Encoding Rules (BASIC-PER), Unaligned Variant, as specified in ITU-T Rec. X.691 [4]. The encoded SLPP message always contains a multiple of 8 bits.

Transfer syntax for SLPP IEs is derived from their ASN.1 definitions by use of Basic Packed Encoding Rules (BASIC-PER), Unaligned Variant, as specified in ITU-T Rec. X.691 [4]. The encoded SLPP IE always contains a multiple of 8 bits. This applies when a single SLPP IE is encoded as the basic production, i.e. for other purposes than encoding the SLPP IE within an SLPP message.

When specifying information elements which are to be represented by BIT STRINGS, if not otherwise specifically stated in the field description of the concerned IE or elsewhere, the following principle applies with regards to the ordering of bits:

- The first bit (leftmost bit) contains the most significant bit (MSB);
- the last bit (rightmost bit) contains the least significant bit (LSB).

6.2 SLPP messages

6.2.1 General message structure

– *SLPP-PDU-Definitions*

This ASN.1 segment is the start of the SLPP PDU definitions.

```
-- ASN1START
-- TAG-SLPP-PDU-DEFINITIONS-START

SLPP-PDU-Definitions DEFINITIONS AUTOMATIC TAGS ::=
BEGIN

IMPORTS
    CommonIEsRequestCapabilities,
```

```
CommonIEsProvideCapabilities,  
CommonIEsRequestAssistanceData,  
CommonIEsProvideAssistanceData,  
CommonIEsRequestLocationInformation,  
CommonIEsProvideLocationInformation
```

FROM

```
SLPP-PDU-CommonContents
```

```
CommonSL-PRS-MethodsIEsRequestCapabilities,  
CommonSL-PRS-MethodsIEsProvideCapabilities,  
CommonSL-PRS-MethodsIEsRequestAssistanceData,  
CommonSL-PRS-MethodsIEsProvideAssistanceData,  
CommonSL-PRS-MethodsIEsRequestLocationInformation,  
CommonSL-PRS-MethodsIEsProvideLocationInformation
```

FROM

```
SLPP-PDU-CommonSL-PRS-MethodsContents
```

```
SL-AoA-RequestCapabilities,  
SL-AoA-ProvideCapabilities,  
SL-AoA-RequestAssistanceData,  
SL-AoA-ProvideAssistanceData,  
SL-AoA-RequestLocationInformation,  
SL-AoA-ProvideLocationInformation
```

FROM

```
SLPP-PDU-SL-AoA-Contents
```

```
SL-RTT-RequestCapabilities,  
SL-RTT-ProvideCapabilities,  
SL-RTT-RequestAssistanceData,  
SL-RTT-ProvideAssistanceData,  
SL-RTT-RequestLocationInformation,  
SL-RTT-ProvideLocationInformation
```

FROM

```
SLPP-PDU-SL-RTT-Contents
```

```
SL-TDOA-RequestCapabilities,  
SL-TDOA-ProvideCapabilities,  
SL-TDOA-RequestAssistanceData,  
SL-TDOA-ProvideAssistanceData,  
SL-TDOA-RequestLocationInformation,  
SL-TDOA-ProvideLocationInformation
```

FROM

```
SLPP-PDU-SL-TDOA-Contents
```

```
SL-TOA-RequestCapabilities,  
SL-TOA-ProvideCapabilities,  
SL-TOA-RequestAssistanceData,  
SL-TOA-ProvideAssistanceData,  
SL-TOA-RequestLocationInformation,
```

```

    SL-TOA-ProvideLocationInformation
FROM
    SLPP-PDU-SL-TOA-Contents;
-- TAG-SLPP-PDU-DEFINITIONS-STOP
-- ASN1STOP

```

NOTE 1: An implementation needs to include only the supported "Method" PDUs. Not supported methods do not need to be included. For example, if SL-RTT is not supported by an implementation, the *SLPP-PDU-SL-RTT-Contents* PDU does not need to be included in the protocol.

NOTE 2: An implementation supporting SL-RTT, SL-AoA, SL-TDOA, or SL-TOA must also support the *SLPP-PDU-CommonSL-PRS-MethodsContents* PDU.

– *SLPP-Message*

The *SLPP-Message* provides the complete set of information for an invocation or response pertaining to an SLPP transaction.

```

-- ASN1START
-- TAG-SLPP-MESSAGE-START

SLPP-Message ::= SEQUENCE {
    applicationLayerID      OCTET STRING      OPTIONAL,
    transactionID           INTEGER (0..255)    OPTIONAL,
    endTransaction          BOOLEAN,
    sequenceNumber          SequenceNumber    OPTIONAL,
    sessionID               SessionID         OPTIONAL,
    acknowledgement         Acknowledgement   OPTIONAL,
    slpp-MessageBody        SLPP-MessageBody  OPTIONAL,
    nonCriticalExtension    SEQUENCE {}        OPTIONAL
}

SequenceNumber ::= INTEGER (0..255)
SessionID ::= OCTET STRING (SIZE (6))

Acknowledgement ::= SEQUENCE {
    ackRequested            BOOLEAN,
    ackIndicator            SequenceNumber     OPTIONAL
}

-- TAG-SLPP-MESSAGE-STOP
-- ASN1STOP

```


<i>SLPP-Message</i> field descriptions
<p>acknowledgement This field is included in an SLPP acknowledgement and in any SLPP message requesting an acknowledgement and is omitted otherwise.</p> <ul style="list-style-type: none"> - ackRequested: This field indicates whether an SLPP acknowledgement is requested (TRUE) or not (FALSE). A value of TRUE may only be included when an <i>s/ipp-MessageBody</i> is included. - ackIndicator: This field indicates the sequence number of the message being acknowledged.
<p>applicationLayerID This field indicates the application layer ID of the UE which is sending the message.</p>
<p>endTransaction This field indicates whether an SLPP message is the last message carrying an <i>s/ipp-MessageBody</i> in a transaction (TRUE) or not last (FALSE).</p>
<p>sequenceNumber This field may be included when an <i>s/ipp-MessageBody</i> is included but shall be omitted otherwise.</p>
<p>sessionID This field indicates the session ID which is used to identify messages belonging to the same session.</p>
<p>s/ipp-MessageBody This field may be omitted in the case the message is sent only to acknowledge a previously received message.</p>
<p>transactionID This field is omitted if an <i>s/ipp-MessageBody</i> is not present (i.e. in an SLPP message sent only to acknowledge a previously received message) or if it is not available to the transmitting endpoint (e.g., in an <i>SLPP-Error</i> message triggered by a message that could not be parsed). If present, this field shall be ignored at a receiver in an SLPP message for which the <i>s/ipp-MessageBody</i> is not present.</p>

– *SLPP-MessageBody*

The *SLPP-MessageBody* identifies the type of an SLPP message and contains all SLPP information specifically associated with that type.

```

-- ASN1START
-- TAG-SLPP-MESSAGEBODY-START

SLPP-MessageBody ::= CHOICE {
    c1
        CHOICE {
            requestCapabilities      RequestCapabilities,
            provideCapabilities       ProvideCapabilities,
            requestAssistanceData    RequestAssistanceData,
            provideAssistanceData    ProvideAssistanceData,
            requestLocationInformation RequestLocationInformation,
            provideLocationInformation ProvideLocationInformation,
            abort                    Abort,
            error                    Error,
            spare8 NULL, spare7 NULL, spare6 NULL, spare5 NULL, spare4 NULL, spare3 NULL, spare2 NULL, spare1 NULL
        },
    messageClassExtension SEQUENCE {}
}

-- TAG-SLPP-MESSAGEBODY-STOP
-- ASN1STOP

```

6.2.2 Message body information elements definitions

– *RequestCapabilities*

The *RequestCapabilities* message body in an SLPP message is used by Endpoint B to request Endpoint A capability information for SLPP and the supported individual positioning methods.

```
-- ASN1START
-- TAG-REQUESTCAPABILITIES-START

RequestCapabilities ::= SEQUENCE {
    criticalExtensions      CHOICE {
        requestCapabilities      RequestCapabilities-IEs,
        criticalExtensionsFuture SEQUENCE {}
    }
}

RequestCapabilities-IEs ::= SEQUENCE {
    commonIEsRequestCapabilities      OCTET STRING  OPTIONAL, -- Containing CommonIEsRequestCapabilities
    commonSL-PRS-MethodsIEsRequestCapabilities  OCTET STRING  OPTIONAL, -- Containing CommonSL-PRS-MethodsIEsRequestCapabilities
    sl-AoA-RequestCapabilities        OCTET STRING  OPTIONAL, -- Containing SL-AoA-RequestCapabilities
    sl-RTT-RequestCapabilities        OCTET STRING  OPTIONAL, -- Containing SL-RTT-RequestCapabilities
    sl-TDOA-RequestCapabilities       OCTET STRING  OPTIONAL, -- Containing SL-TDOA-RequestCapabilities
    sl-TOA-RequestCapabilities        OCTET STRING  OPTIONAL, -- Containing SL-TOA-RequestCapabilities
    lateNonCriticalExtension          OCTET STRING  OPTIONAL,
    nonCriticalExtension              SEQUENCE {}    OPTIONAL
}

-- TAG-REQUESTCAPABILITIES-STOP
-- ASN1STOP
```

– *ProvideCapabilities*

The *ProvideCapabilities* message body in an SLPP message indicates the SLPP capabilities of Endpoint A to Endpoint B.

```
-- ASN1START
-- TAG-PROVIDECAPABILITIES-START

ProvideCapabilities ::= SEQUENCE {
    criticalExtensions      CHOICE {
        provideCapabilities      ProvideCapabilities-IEs,
        criticalExtensionsFuture SEQUENCE {}
    }
}

ProvideCapabilities-IEs ::= SEQUENCE {
    commonIEsProvideCapabilities      OCTET STRING  OPTIONAL, -- Containing CommonIEsProvideCapabilities
    commonSL-PRS-MethodsIEsProvideCapabilities  OCTET STRING  OPTIONAL, -- Containing CommonSL-PRS-MethodsIEsProvideCapabilities
}
```

```

sl-AoA-ProvideCapabilities      OCTET STRING  OPTIONAL, -- Containing SL-AoA-ProvideCapabilities
sl-RTT-ProvideCapabilities      OCTET STRING  OPTIONAL, -- Containing SL-RTT-ProvideCapabilities
sl-TDOA-ProvideCapabilities     OCTET STRING  OPTIONAL, -- Containing SL-TDOA-ProvideCapabilities
sl-TOA-ProvideCapabilities      OCTET STRING  OPTIONAL, -- Containing SL-TOA-ProvideCapabilities
lateNonCriticalExtension        OCTET STRING  OPTIONAL,
nonCriticalExtension            SEQUENCE {}  OPTIONAL
}

-- TAG-PROVIDECAPABILITIES-STOP
-- ASN1STOP

```

– *RequestAssistanceData*

The *RequestAssistanceData* message body in an SLPP message is used by the Endpoint A to request assistance data from Endpoint B.

```

-- ASN1START
-- TAG-REQUESTASSISTANCEDATA-START

RequestAssistanceData ::= SEQUENCE {
    criticalExtensions          CHOICE {
        requestAssistanceData  RequestAssistanceData-IEs,
        criticalExtensionsFuture SEQUENCE {}
    }
}

RequestAssistanceData-IEs ::= SEQUENCE {
    commonIEsRequestAssistanceData      OCTET STRING  OPTIONAL, -- Containing CommonIEsRequestAssistanceData
    commonSL-PRS-MethodsIEsRequestAssistanceData  OCTET STRING  OPTIONAL, -- Containing CommonSL-PRS-MethodsIEsRequestAssistanceData
    sl-AoA-RequestAssistanceData        OCTET STRING  OPTIONAL, -- Containing SL-AOA-RequestAssistanceData
    sl-RTT-RequestAssistanceData        OCTET STRING  OPTIONAL, -- Containing SL-RTT-RequestAssistanceData
    sl-TDOA-RequestAssistanceData       OCTET STRING  OPTIONAL, -- Containing SL-TDOA-RequestAssistanceData
    sl-TOA-RequestAssistanceData        OCTET STRING  OPTIONAL, -- Containing SL-TOA-RequestAssistanceData
    lateNonCriticalExtension            OCTET STRING  OPTIONAL,
    nonCriticalExtension                SEQUENCE {}  OPTIONAL
}

-- TAG-REQUESTASSISTANCEDATA-STOP
-- ASN1STOP

```

– *ProvideAssistanceData*

The *ProvideAssistanceData* message body in an SLPP message is used by Endpoint B to provide assistance data to Endpoint A either in response to a request from Endpoint A or in an unsolicited manner. Upon receiving an SLPP message *ProvideAssistanceData*, the UE releases the value received in previous SLPP message *ProvideAssistanceData* if any.

```

-- ASN1START
-- TAG-PROVIDEASSISTANCEDATA-START

```

```

ProvideAssistanceData ::= SEQUENCE {
    criticalExtensions      CHOICE {
        provideAssistanceData      ProvideAssistanceData-IEs,
        criticalExtensionsFuture    SEQUENCE {}
    }
}

ProvideAssistanceData-IEs ::= SEQUENCE {
    commonIEsProvideAssistanceData      OCTET STRING      OPTIONAL, -- Containing CommonIEsProvideAssistanceData
    commonSL-PRS-MethodsIEsProvideAssistanceData  OCTET STRING      OPTIONAL, -- Containing CommonSL-PRS-MethodsIEsProvideAssistanceData
    sl-AoA-ProvideAssistanceData      OCTET STRING      OPTIONAL, -- Containing SL-AoA-ProvideAssistanceData
    sl-RTT-ProvideAssistanceData      OCTET STRING      OPTIONAL, -- Containing SL-RTT-ProvideAssistanceData
    sl-TDOA-ProvideAssistanceData      OCTET STRING      OPTIONAL, -- Containing SL-TDOA-ProvideAssistanceData
    sl-TOA-ProvideAssistanceData      OCTET STRING      OPTIONAL, -- Containing SL-TOA-ProvideAssistanceData
    lateNonCriticalExtension           OCTET STRING      OPTIONAL,
    nonCriticalExtension               SEQUENCE {}        OPTIONAL
}

-- TAG-PROVIDEASSISTANCEDATA-STOP
-- ASN1STOP

```

– RequestLocationInformation

The *RequestLocationInformation* message body in an SLPP message is used by Endpoint B to request positioning measurements or a position estimate from Endpoint A.

```

-- ASN1START
-- TAG-REQUESTLOCATIONINFORMATION-START

RequestLocationInformation ::= SEQUENCE {
    criticalExtensions      CHOICE {
        requestLocationInformation      RequestLocationInformation-IEs,
        criticalExtensionsFuture        SEQUENCE {}
    }
}

RequestLocationInformation-IEs ::= SEQUENCE {
    commonIEsRequestLocationInformation      OCTET STRING      OPTIONAL, -- Containing CommonIEsRequestLocationInformation
    commonSL-PRS-MethodsIEsRequestLocationInformation  OCTET STRING      OPTIONAL, -- Containing CommonSL-PRS-MethodsIEsRequestLocationInformation
    sl-AoA-RequestLocationInformation      OCTET STRING      OPTIONAL, -- Containing SL-AoA-RequestLocationInformation
    sl-RTT-RequestLocationInformation      OCTET STRING      OPTIONAL, -- Containing SL-RTT-RequestLocationInformation
    sl-TDOA-RequestLocationInformation      OCTET STRING      OPTIONAL, -- Containing SL-TDOA-RequestLocationInformation
    sl-TOA-RequestLocationInformation      OCTET STRING      OPTIONAL, -- Containing SL-TOA-RequestLocationInformation
    lateNonCriticalExtension           OCTET STRING      OPTIONAL,
    nonCriticalExtension               SEQUENCE {}        OPTIONAL
}

-- TAG-REQUESTLOCATIONINFORMATION-STOP
-- ASN1STOP

```

– *ProvideLocationInformation*

The *ProvideLocationInformation* message body in an SLPP message is used by Endpoint A to provide positioning measurements or position estimates to Endpoint B.

```
-- ASN1START
-- TAG-PROVIDELOCATIONINFORMATION-START

ProvideLocationInformation ::= SEQUENCE {
    criticalExtensions          CHOICE {
        provideLocationInformation    ProvideLocationInformation-IEs,
        criticalExtensionsFuture      SEQUENCE {}
    }
}

ProvideLocationInformation-IEs ::= SEQUENCE {
    commonIEsProvideLocationInformation    OCTET STRING    OPTIONAL, -- Containing CommonIEsProvideLocationInformation
    commonSL-PRS-MethodsIEsProvideLocationInformation    OCTET STRING    OPTIONAL, -- Containing CommonSL-PRS-MethodsIEsProvideLocationInformation
    sl-AoA-ProvideLocationInformation      OCTET STRING    OPTIONAL, -- Containing SL-AoA-ProvideLocationInformation
    sl-RTT-ProvideLocationInformation      OCTET STRING    OPTIONAL, -- Containing SL-RTT-ProvideLocationInformation
    sl-TDOA-ProvideLocationInformation     OCTET STRING    OPTIONAL, -- Containing SL-TDOA-ProvideLocationInformation
    sl-TOA-ProvideLocationInformation     OCTET STRING    OPTIONAL, -- Containing SL-TOA-ProvideLocationInformation
    lateNonCriticalExtension              OCTET STRING    OPTIONAL,
    nonCriticalExtension                   SEQUENCE {}    OPTIONAL
}

-- TAG-PROVIDELOCATIONINFORMATION-STOP
-- ASN1STOP
```

– *Abort*

The *Abort* message body in an SLPP message carries a request to abort an ongoing SLPP procedure.

```
-- ASN1START
-- TAG-ABORT-START

Abort ::= SEQUENCE {
    criticalExtensions          CHOICE {
        abort                    Abort-IEs,
        criticalExtensionsFuture  SEQUENCE {}
    }
}

Abort-IEs ::= SEQUENCE {
    commonIEsAbort              CommonIEsAbort    OPTIONAL,
    lateNonCriticalExtension     OCTET STRING    OPTIONAL,
    nonCriticalExtension         SEQUENCE {}      OPTIONAL
}

-- TAG-ABORT-STOP
-- ASN1STOP
```

– *Error*

The *Error* message body in an SLPP message carries information concerning an SLPP message that was received with errors.

```
-- ASN1START
-- TAG-ERROR-START

Error ::= CHOICE {
    criticalExtensions    CHOICE {
        error              Error-IEs,
        criticalExtensionsFuture SEQUENCE {}
    }
}

Error-IEs ::= SEQUENCE {
    commonIEsError          CommonIEsError OPTIONAL,
    lateNonCriticalExtension OCTET STRING   OPTIONAL,
    nonCriticalExtension    SEQUENCE {}     OPTIONAL
}
-- TAG-ERROR-STOP
-- ASN1STOP
```

6.3 SLPP information elements

6.3.1 Common information elements

– *ARFCN-ValueNR*

The *ARFCN-ValueNR* is used to indicate the ARFCN applicable for a downlink, uplink or bi-directional (TDD) NR global frequency raster, as defined in TS 38.101-2 [10] and TS 38.101-1 [11].

```
-- ASN1START
-- TAG-ARFCN-VALUENR-START

ARFCN-ValueNR ::= INTEGER (0..3279165)

-- TAG-ARFCN-VALUENR-STOP
-- ASN1STOP
```

– CommonIEsAbort

The *CommonIEsAbort* carries common IEs for an Abort SLPP message Type.

```
-- ASN1START
-- TAG-COMMONIESABORT-START

CommonIEsAbort ::= SEQUENCE {
    abortCause      ENUMERATED { undefined, stopPeriodicReporting }
}

-- TAG-COMMONIESABORT-STOP
-- ASN1STOP
```

CommonIEsAbort field descriptions

abortCause

This field defines the request to abort an ongoing procedure. The abort cause '*stopPeriodicReporting*' is used by an endpoint to stop any ongoing location reporting configured as *periodicalReporting* in the *CommonIEsRequestLocationInformation*.

– CommonIEsError

The *CommonIEsError* carries common IEs for an Error SLPP message Type.

```
-- ASN1START
-- TAG-COMMONIESERROR-START

CommonIEsError ::= SEQUENCE {
    errorCause      ENUMERATED { undefined, slppMessageHeaderError, slppMessageBodyError, incorrectDataValue }
}

-- TAG-COMMONIESERROR-STOP
-- ASN1STOP
```

CommonIEsError field descriptions

errorCause

This field defines the cause for an error. '*slppMessageHeaderError*' and '*slppMessageBodyError*' are used if a receiver is able to detect a coding error in the SLPP header (i.e., in the common fields) or SLPP message body respectively. '*incorrectDataValue*' is used if a receiver receives an incorrect data value.

– GNSS-ID-Bitmap

The IE *GNSS-ID-Bitmap* is used to indicate several GNSSs using a bit map.

```
-- ASN1START
-- TAG-GNSS-ID-BITMAP-START
```

```
GNSS-ID-Bitmap ::= BIT STRING { gps (0), sbas (1), qzss (2), galileo (3), glonass (4), bds (5), navic (6) } (SIZE (1..16))
-- TAG-GNSS-ID-BITMAP-STOP
-- ASN1STOP
```

– *LCS-GCS-Translation*

The IE *LCS-GCS-Translation* provides the angles α (bearing angle), β (downtilt angle) and γ (slant angle) for the translation of a Local Coordinate System (LCS) to a Global Coordinate System (GCS) as defined in TR 38.901 [8].

```
-- ASN1START
-- TAG-LCS-GCS-TRANSLATION-START

LCS-GCS-Translation ::= SEQUENCE {
    alpha          INTEGER (0..3599),
    beta           INTEGER (0..3599),
    gamma          INTEGER (0..3599)
}
-- TAG-LCS-GCS-TRANSLATION-STOP
-- ASN1STOP
```

<i>LCS-GCS-Translation</i> field descriptions
<i>alpha</i> This field specifies the bearing angle α for the translation of the LCS to a GCS as defined in TR 38.901 [8]. Scale factor 0.1 degree; range 0 to 359.9 degrees.
<i>beta</i> This field specifies the downtilt angle β for the translation of the LCS to a GCS as defined in TR 38.901 [8]. Scale factor 0.1 degrees; range 0 to 359.9 degrees.
<i>gamma</i> This field specifies the slant angle γ for the translation of the LCS to a GCS as defined in TR 38.901 [8]. Scale factor 0.1 degree; range 0 to 359.9 degrees.

– *LOS-NLOS-Indicator*

The IE *LOS-NLOS-Indicator* provides information on the likelihood of a Line-of-Sight (LOS) propagation path from the source to the receiver.

```
-- ASN1START
-- TAG-LOS-NLOS-INDICATOR-START

LOS-NLOS-Indicator ::= SEQUENCE {
    indicator      CHOICE {
        soft        INTEGER (0..10),
        hard        BOOLEAN
    }
}
-- TAG-LOS-NLOS-INDICATOR-STOP
-- ASN1STOP
```


LOS-NLOS-Indicator field descriptions**indicator**

This field provides information on the likelihood of a Line-of-Sight propagation path from the source to the receiver with a value of 1 corresponding to LoS and a value of 0 corresponding to NLoS.

- **soft:** Integer value '0' indicates likelihood 0, integer value '10' indicates likelihood 1. Scale factor 0.1; range 0 to 1.
- **hard:** FALSE indicates likelihood '0', TRUE indicates likelihood '1'.

– **NCGI**

The *NCGI* specifies the NR Cell Global Identifier (NCGI) which is used to identify NR cells globally (TS 38.331 [2]).

```
-- ASN1START
-- TAG-NCGI-START

NCGI ::= SEQUENCE {
    mcc          SEQUENCE (SIZE (3))    OF INTEGER (0..9),
    mnc          SEQUENCE (SIZE (2..3)) OF INTEGER (0..9),
    nr-CellIdentity BIT STRING (SIZE (36))
}

-- TAG-NCGI-STOP
-- ASN1STOP
```

– **NR-PhysCellID**

The *NR-PhysCellID* specifies the NR physical cell identifier (TS 38.331 [2]).

```
-- ASN1START
-- TAG-NR-PHYSCELLID-START

NR-PhysCellID ::= INTEGER (0..1007)

-- TAG-NR-PHYSCELLID-STOP
-- ASN1STOP
```

– **PositioningModes**

The IE *PositioningModes* is used to indicate several positioning modes using a bit map. This is represented by a bit string, with a one value at the bit position means the particular positioning mode is addressed; a zero value means not addressed.

```
-- ASN1START
-- TAG-POSITIONINGMODES-START
```

```
PositioningModes ::= BIT STRING { sl-TargetUE-Based (0), sl-TargetUE-Assisted (1) } (SIZE (1..8))
-- TAG-POSITIONINGMODES-STOP
-- ASN1STOP
```

– *SL-RTD-Info*

The IE *SL-RTD-Info* provides time synchronization information of SL Anchor UEs.

```
-- ASN1START
-- TAG-SL-RTD-INFO-START

SL-RTD-Info ::= SEQUENCE ( SIZE (1.. maxNrOfUEs)) OF RTD-InfoListPerAnchorUE

RTD-InfoListPerAnchorUE ::= SEQUENCE {
  applicationLayerID      OCTET STRING,
  referenceRTD-Info       ReferenceRTD-Info          OPTIONAL,
  rtd-BetweenAnchorUEs   CHOICE {
    subframeOffset        INTEGER (0..1966079),
    sl-OffsetDFN           INTEGER (0..1000)
  }
  rtd-Quality              SL-TimingQuality          OPTIONAL,
  syncSourceType           ENUMERATED { gnss, gNB-eNB, ue}  OPTIONAL
}

ReferenceRTD-Info ::= SEQUENCE {
  syncSourceType           ENUMERATED { gnss, gNB-eNB, ue},
  applicationLayerID      OCTET STRING              OPTIONAL,
  nrCell-Identify         SEQUENCE {
    nr-PhysCellID          NR-PhysCellID            OPTIONAL,
    nr-ARFCN                ARFCN-ValueNR           OPTIONAL,
    nr-CellGlobalID        NCGI                     OPTIONAL
  }
}

-- TAG-SL-RTD-INFO-STOP
-- ASN1STOP
```

<i>SL-RTD-Info</i> field descriptions
<p><i>nrCell-Identify</i> This field provides NR cell identity information. The field is present only if the synchronization source of a SL Anchor UE is gNB/eNB.</p>
<p><i>referenceRTD-Info</i> This field defines the reference RTD and comprises the following sub-fields:</p> <ul style="list-style-type: none"> - <i>syncSourceType</i>: This field specifies the synchronization source type. - <i>applicationLayerID</i>: This field provides the application layer ID of the reference UE if the <i>syncSourceType</i> is set to UE.
<p><i>rtdBetweenAnchorUEs</i> This field specifies the RTD between SL Anchor UEs:</p> <ul style="list-style-type: none"> - <i>subframeOffset</i>: This field specifies the subframe boundary offset at the TRP antenna location between the reference UE and this neighbour UE in time units $T_c = 1/(\Delta f_{\max} \cdot N_f)$ where $\Delta f_{\max} = 480 \cdot 10^3$ Hz and $N_f = 4096$ (TS 38.211 [6]). The offset is counted from the beginning of a subframe #0 of the reference UE to the beginning of the closest subsequent subframe of this neighbour UE. Scale factor 1 Tc. - <i>sl-OffsetDFN</i>: This field indicates the timing offset for the UE to determine DFN timing when GNSS is used for timing reference. Value 1 corresponds to 0.001 milliseconds, value 2 corresponds to 0.002 milliseconds, and so on.
<p><i>rtd-Quality</i> This field specifies the quality of the RTD.</p>

– *SL-TimeStamp*

The IE *SL-TimeStamp* defines the UE measurement associated time stamp.

```

-- ASN1START
-- TAG-SL-TIMESTAMP-START

SL-TimeStamp ::= CHOICE {
    dfn-Time          SEQUENCE {
        syncSourceType    ENUMERATED { gnss, ue}    OPTIONAL,
        applicationLayerID OCTET STRING            OPTIONAL,
        dfn               INTEGER (0.. 1023),
        nr-Slot           CHOICE {
            scs15          INTEGER (0..9),
            scs30          INTEGER (0..19),
            scs60          INTEGER (0..39),
            scs120         INTEGER (0..79)
        }
    },
    sfn-Time          SEQUENCE {
        nr-PhysCellID     NR-PhysCellID            OPTIONAL,
        nr-ARFCN           ARFCN-ValueNR           OPTIONAL,
        nr-CellGlobalID   NCGI                     OPTIONAL,
        nr-SFN             INTEGER (0..1023),
        nr-Slot           CHOICE {
            scs15          INTEGER (0..9),
            scs30          INTEGER (0..19),
            scs60          INTEGER (0..39),
            scs120         INTEGER (0..79)
        }
    }
}

```

```

}
-- TAG-SL-TIMESTAMP-STOP
-- ASN1STOP

```

***SL-TimeStamp* field descriptions**

dfn-Time

This field provides the DFN based time stamp.

sfn-Time

This field provides the SFN based time stamp. If this field is present, at least one of *nr-PhysCellID*, *nr-ARFCN*, or *nr-CellGlobalID* shall be present.

– *SL-TimingQuality*

The IE *SL-TimingQuality* defines the quality of a timing value (e.g., of a TOA measurement).

```

-- ASN1START
-- TAG-SL-TIMINGQUALITY-START

SL-TimingQuality ::= SEQUENCE {
    timingQualityValue      INTEGER (0..31),
    timingQualityResolution ENUMERATED {mdot1, m1, m10, m30}
}
-- TAG-SL-TIMINGQUALITY-STOP
-- ASN1STOP

```

***SL-TimingQuality* field descriptions**

timingQualityValue

This field provides an estimate of uncertainty of the timing value for which the IE *SL-TimingQuality* is provided in units of metres.

timingQualityResolution

This field provides the resolution used in the *timingQualityValue* field. Enumerated values *mdot1*, *m1*, *m10*, *m30* correspond to 0.1, 1, 10, 30 metres, respectively.

6.3.2 UE capability information elements

– *ScheduledLocationTimeSupportPerMode*

The IE *ScheduledLocationTimeSupportPerMode* is used by the endpoint to indicate the time bases supported for scheduled location requests for each positioning mode indicated by *PositioningModes*.

```

-- ASN1START
-- TAG-SCHEDULEDLOCATIONTIMESUPPORTPERMODE-START

ScheduledLocationTimeSupportPerMode ::= SEQUENCE {
    utcTime                PositioningModes                OPTIONAL,

```

```

    gnssTime          SEQUENCE {
      posModes        PositioningModes,
      gnss-TimeIDs    GNSS-ID-Bitmap
    }
    nrTime            PositioningModes
    relativeTime      PositioningModes
  }
-- TAG-SCHEDULEDLOCATIONTIMESUPPORTPERMODE-STOP
-- ASN1STOP

```

6.3.3 Void

6.4 Multiplicity and type constraint values

– *Multiplicity and type constraint definitions*

```

-- ASN1START
-- TAG-MULTIPLICITY-AND-TYPE-CONSTRAINT-DEFINITIONS-START

maxNrOfUEs          INTEGER ::= 256      -- Max number of Tx UEs or Rx UEs
nrMaxBands           INTEGER ::= 1024    -- Maximum number of supported bands in UE capability

-- TAG-MULTIPLICITY-AND-TYPE-CONSTRAINT-DEFINITIONS-STOP
-- ASN1STOP

```

– *End of SLPP-PDU-Definitions*

```

-- ASN1START

END

-- ASN1STOP

```

6.5 SLPP PDU Common Contents

– *SLPP-PDU-CommonContents*

This ASN.1 segment is the start of the SLPP PDU Common Contents definitions.

```

-- ASN1START
-- TAG-SLPP-PDU-COMMONCONTENTS-START

```

```
SLPP-PDU-CommonContents DEFINITIONS AUTOMATIC TAGS ::=
BEGIN
IMPORTS
    ARFCN-ValueNR,
    NCGI,
    NR-PhysCellID
FROM
    SLPP-PDU-Definitions;

-- TAG-SLPP-PDU-COMMON-CONTENTS-STOP
-- ASN1STOP
```

– *CommonIEsRequestCapabilities*

```
-- ASN1START
-- TAG-COMMONIESREQUESTCAPABILITIES-START

CommonIEsRequestCapabilities ::= SEQUENCE {
    ...
}

-- TAG-COMMONIESREQUESTCAPABILITIES-STOP
-- ASN1STOP
```

– *CommonIEsProvideCapabilities*

```
-- ASN1START
-- TAG-COMMONIESPROVIDECAPABILITIES-START

CommonIEsProvideCapabilities ::= SEQUENCE {
    ...
}

-- TAG-COMMONIESPROVIDECAPABILITIES-STOP
-- ASN1STOP
```

– *CommonIEsRequestAssistanceData*

```
-- ASN1START
-- TAG-COMMONIESREQUESTASSISTANCEDATA-START

CommonIEsRequestAssistanceData ::= SEQUENCE {
    ...
}

-- TAG-COMMONIESREQUESTASSISTANCEDATA-STOP
-- ASN1STOP
```

– *CommonIesProvideAssistanceData*

```
-- ASN1START
-- TAG-COMMONIESPROVIDEASSISTANCEDATA-START

CommonIesProvideAssistanceData ::= SEQUENCE {
    ...
}

-- TAG-COMMONIESPROVIDEASSISTANCEDATA-STOP
-- ASN1STOP
```

– *CommonIesRequestLocationInformation*

The *CommonIesRequestLocationInformation* carries common IEs for a Request Location Information SLPP message Type.

```
-- ASN1START
-- TAG-COMMONIESREQUESTLOCATIONINFORMATION-START

CommonIesRequestLocationInformation ::= SEQUENCE {
    locationInformationType      LocationInformationType,
    periodicalReporting           PeriodicalReportingCriteria OPTIONAL,
    additionalInformation         AdditionalInformation OPTIONAL,
    qos                          QoS OPTIONAL,
    environment                   Environment OPTIONAL,
    scheduledLocationTime        ScheduledLocationTime OPTIONAL,
    ...
}

LocationInformationType ::= ENUMERATED { locationEstimateRequired, locationMeasurementsRequired, locationEstimatePreferred,
locationMeasurementsPreferred, rangeEstimateRequired, rangeMeasurementsRequired,
rangeEstimatePreferred, rangeMeasurementsPreferred, directionEstimateRequired,
directionMeasurementsRequired, directionEstimatePreferred, directionMeasurementsPreferred,
rangeDirectionEstimateRequired, rangeDirectionMeasurementsRequired,
rangeDirectionEstimatePreferred, rangeDirectionMeasurementsPreferred,
relativeLocationEstimateRequired, relativeLocationMeasurementsRequired,
relativeLocationEstimatePreferred, relativeLocationMeasurementsPreferred, spare12, spare11,
spare10, spare9, spare8, spare7, spare6, spare5, spare4, spare3, spare2, spare1 }

PeriodicalReportingCriteria ::= SEQUENCE {
    reportingAmount              ENUMERATED { ra2, ra4, ra8, ra16, ra32, ra64, ra-Infinity },
    reportingInterval            ENUMERATED { ri1, ri2, ri4, ri8, ri10, ri16, ri20, ri32, ri64 }
}

AdditionalInformation ::= ENUMERATED { onlyReturnInformationRequested, mayReturnAdditionalInformation }

QoS ::= SEQUENCE {
```

```

horizontalAccuracy      HorizontalAccuracy  OPTIONAL,
verticalCoordinateRequest  BOOLEAN,
verticalAccuracy        VerticalAccuracy    OPTIONAL,
rangeAccuracy           RangeAccuracy      OPTIONAL,
azimuthAccuracy         AzimuthAccuracy   OPTIONAL,
elevationAccuracy       ElevationAccuracy  OPTIONAL,
responseTime            ResponseTime       OPTIONAL,
velocityRequest         BOOLEAN
}

HorizontalAccuracy ::= SEQUENCE {
    accuracy          INTEGER(0..255),
    confidence        INTEGER(0..100)
}

VerticalAccuracy ::= SEQUENCE {
    accuracy          INTEGER(0..255),
    confidence        INTEGER(0..100)
}

RangeAccuracy ::= SEQUENCE {
    accuracy          INTEGER(0..127),
    confidence        INTEGER(0..100)
}

AzimuthAccuracy ::= SEQUENCE {
    accuracy          INTEGER(0..127),
    confidence        INTEGER(0..100)
}

ElevationAccuracy ::= SEQUENCE {
    accuracy          INTEGER(0..127),
    confidence        INTEGER(0..100)
}

ResponseTime ::= SEQUENCE {
    time              INTEGER (1..128),
    tenMilliseconds  ENUMERATED { true}   OPTIONAL
}

Environment ::= ENUMERATED { badArea, notBadArea, mixedArea}

ScheduledLocationTime ::= SEQUENCE {
    utc-Time          UTCTime              OPTIONAL,
    gnss-Time         SEQUENCE {
        gnss-TOD-Msec  INTEGER (0..3599999),
        gnss-TimeID    GNSS-ID
    }
    nr-Time           SEQUENCE {
        nr-PhysCellID  NR-PhysCellID,
        nr-ARFCN        ARFCN-ValueNR,
        nr-CellGlobalID NCGI              OPTIONAL,
        nr-SFN          INTEGER (0..1023),
        nr-Slot         CHOICE {
            scs15      INTEGER (0..9),

```



```
        scs30                INTEGER (0..19),
        scs60                INTEGER (0..39),
        scs120               INTEGER (0..79)
    }
}
relativeTime                INTEGER (1..1024)
}
GNSS-ID ::= ENUMERATED{ gps, sbas, qzss, galileo, glonass, bds, navic, spare1}
-- TAG-COMMONIESREQUESTLOCATIONINFORMATION-STOP
-- ASN1STOP
```

CommonEsRequestLocationInformation field descriptions
<p>additionalInformation</p> <p>This field indicates whether the UE is allowed to return additional information to that requested. If this field indicates '<i>onlyReturnInformationRequested</i>' then the UE shall not return any additional information. If this field indicates '<i>mayReturnAdditionalInformation</i>' then the UE may return additional information. If a location estimate is returned, any additional information is restricted to that associated with a location estimate (e.g. might include velocity if velocity was not requested but cannot include measurements). If measurements are returned, any additional information is restricted to additional measurements (e.g. might include SL-AoA measurements if SL-TDOA measurements were requested but not SL-AoA measurements).</p>
<p>environment</p> <p>This field provides the UE with information about expected multipath and non line of sight (NLOS) in the current area. The following values are defined:</p> <ul style="list-style-type: none"> - badArea: possibly heavy multipath and NLOS conditions (e.g. bad urban or urban). - notBadArea: no or light multipath and usually LOS conditions (e.g. suburban or rural). - mixedArea: environment that is mixed or not defined. <p>If this field is absent, a default value of 'mixedArea' applies.</p>
<p>locationInformationType</p> <p>This field indicates whether an endpoint requires a location estimate or measurements. For '<i>locationEstimateRequired</i>', '<i>rangeEstimateRequired</i>' or '<i>relativeLocationEstimateRequired</i>', the UE shall return a location or range estimate if possible, or indicate a location error if not possible. For '<i>locationMeasurementsRequired</i>', '<i>rangeMeasurementsRequired</i>' or '<i>relativeLocationMeasurementsRequired</i>', the UE shall return measurements if possible, or indicate a location error if not possible. For '<i>locationEstimatePreferred</i>', '<i>rangeEstimatePreferred</i>' or '<i>relativeLocationEstimatePreferred</i>', the UE shall return a location or range estimate if possible, but may also or instead return measurements for any requested position methods for which a location estimate is not possible. For '<i>locationMeasurementsPreferred</i>', '<i>rangeMeasurementsPreferred</i>' or '<i>relativeLocationMeasurementsPreferred</i>', the UE shall return location or range measurements if possible, but may also or instead return a location estimate for any requested position methods for which return of location measurements is not possible.</p>
<p>periodicalReporting</p> <p>This field indicates that periodic reporting is requested and comprises the following subfields:</p> <ul style="list-style-type: none"> - reportingAmount indicates the number of periodic location information reports requested. Enumerated values correspond to 2, 4, 8, 16, 32, 64, or infinite/indefinite number of reports. If the <i>reportingAmount</i> is '<i>infinite/indefinite</i>', the UE should continue periodic reporting until an SLPP <i>Abort</i> message is received. - reportingInterval indicates the interval between location information reports and the response time requirement for the first location information report. Enumerated values correspond to reporting intervals of 1, 2, 4, 8, 10, 16, 20, 32, and 64 seconds, respectively. Measurement reports containing no measurements or no location estimate are required when a <i>reportingInterval</i> expires before a UE is able to obtain new measurements or obtain a new location estimate.
<p>qos</p> <p>This field indicates the quality of service and comprises a number of sub-fields. In the case of measurements, some of the sub-fields apply to the location estimate that could be obtained by the endpoint from the measurements provided by the UE assuming that the measurements are the only sources of error. This field comprises the following subfields:</p> <ul style="list-style-type: none"> - horizontalAccuracy indicates the maximum horizontal error in the location estimate at an indicated confidence level. The '<i>accuracy</i>' corresponds to the encoded uncertainty as defined in TS 23.032 [7] and '<i>confidence</i>' corresponds to confidence as defined in TS 23.032 [7]. - verticalCoordinateRequest indicates whether a vertical coordinate is required (TRUE) or not (FALSE) - verticalAccuracy indicates the maximum vertical error in the location estimate at an indicated confidence level and is only applicable when a vertical coordinate is requested. The '<i>accuracy</i>' corresponds to the encoded uncertainty altitude as defined in TS 23.032 [7] and '<i>confidence</i>' corresponds to confidence as defined in TS 23.032 [7]. - responseTime <ul style="list-style-type: none"> - time indicates the maximum response time as measured between receipt of the <i>RequestLocationInformation</i> and transmission of a <i>ProvideLocationInformation</i>. - tenMilliSeconds indicates the unit of the <i>time</i> field corresponds to a resolution of 0.01 seconds. If this field is absent, the unit/resolution is 1 second. - velocityRequest indicates whether velocity (or measurements related to velocity) is requested (TRUE) or not (FALSE). <p>All QoS requirements shall be obtained by the UE to the degree possible but it is permitted to return a response that does not fulfill all QoS requirements if some were not attainable.</p>

scheduledLocationTime

This field indicates that the UE is requested to obtain location measurements or location estimate valid at the *scheduledLocationTime* *T* and comprises the following subfields:

- **utc-Time** provides *T* in UTC in the form of YYMMDDhhmmssZ.
- **gnss-Time** provides *T* in GNSS system time of the GNSS indicated by *gnss-TimeID*.
 - **gnss-TOD-msec** specifies the GNSS TOD in 1-milli-second resolution rounded down to the nearest millisecond unit.
- **nr-Time** provides *T* in NR network time.
 - **nr-PhysCellID**, **nr-ARFCN**, **nr-CellGlobalID** identifies the reference cell (NR) that is used for the network time.
 - **nr-SFN** specifies the system frame number in NR.
 - **nr-Slot** specifies the slot number in NR for the indicated subcarrier spacing (SCS). The total NR network time is given by *nr-SFN* + *nr-Slot*.
- **relativeTime** provides *T* in seconds from current time, where current time is defined as the time the *CommonIEsRequestLocationInformation* was received.

NOTE 1: A location estimate returned to an LCS Client, AF or UE for a scheduled location time can be treated by the LCS Client, AF or UE as an estimate of the location of the UE at the scheduled location time (see TS 23.273 [5]).

NOTE 2: If this field is present, at least one of *utc-Time*, *gnss-Time*, *nr-Time*, or *relativeTime* shall be present.

– CommonIEsProvideLocationInformation

The *CommonIEsProvideLocationInformation* carries common IEs for a Provide Location Information SLPP message Type.

```
-- ASN1START
-- TAG-COMMONIESPROVIDELOCAIONINFORMATION-START

CommonIEsProvideLocationInformation ::= SEQUENCE {
    locationEstimate                LocationCoordinates                OPTIONAL, -- locationTargetUe-sl-pos
    rangeAndOrDirection              RangeAndOrDirection                OPTIONAL,
    velocityEstimate                 Velocity                            OPTIONAL,
    relativeLocationEstimate          RelativeLocationCoordinates         OPTIONAL,
    locationError                     LocationError                        OPTIONAL,
    ...
}

LocationCoordinates ::= CHOICE {
    ellipsoidPoint                    EllipsoidPoint,
    ellipsoidPointWithUncertaintyCircle EllipsoidPointWithUncertaintyCircle,
    ellipsoidPointWithUncertaintyEllipse EllipsoidPointWithUncertaintyEllipse,
    polygon                            Polygon,
    ellipsoidPointWithAltitude         EllipsoidPointWithAltitude,
    ellipsoidPointWithAltitudeAndUncertaintyEllipsoid EllipsoidPointWithAltitudeAndUncertaintyEllipsoid,
    ellipsoidArc                       EllipsoidArc
}

RelativeLocationCoordinates ::= CHOICE {
    relative2D-LocationWithUncertaintyEllipse Relative2D-LocationWithUncertaintyEllipse,
    relative3D-LocationWithUncertaintyEllipsoid Relative3D-LocationWithUncertaintyEllipsoid,
    ...
}

Relative2D-LocationWithUncertaintyEllipse ::= SEQUENCE {
    x                                INTEGER (-134217728..134217727), -- 28 bit field
    y                                INTEGER (-134217728..134217727), -- 28 bit field
    uncertaintySemiMajor              INTEGER (0..127),
    uncertaintySemiMinor              INTEGER (0..127),

```

```

orientationMajorAxis      INTEGER (0..179),
confidence                 INTEGER (0..100)
}
Relative3D-LocationWithUncertaintyEllipsoid ::= SEQUENCE {
  x                        INTEGER (-134217728..134217727),      -- 28 bit field
  y                        INTEGER (-134217728..134217727),      -- 28 bit field
  z                        INTEGER (-16777216..16777215),        -- 25 bit field
  uncertaintySemiMajor    INTEGER (0..255),
  uncertaintySemiMinor    INTEGER (0..255),
  orientationMajorAxis    INTEGER (0..179),
  uncertaintyAltitude     INTEGER (0..255),
  confidence              INTEGER (0..100)
}

Velocity ::= CHOICE {
  horizontalVelocity      HorizontalVelocity,
  horizontalWithVerticalVelocity HorizontalWithVerticalVelocity,
  horizontalVelocityWithUncertainty HorizontalVelocityWithUncertainty,
  horizontalWithVerticalVelocityAndUncertainty HorizontalWithVerticalVelocityAndUncertainty,
  relativeVelocityWithUncertainty RelativeVelocityWithUncertainty
}

LocationError ::= SEQUENCE {
  locationfailurecause    LocationFailureCause
}

LocationFailureCause ::= ENUMERATED { undefined, requestedMethodNotSupported, positionMethodFailure, periodicLocationMeasurementsNotAvailable}

EllipsoidPoint ::= SEQUENCE {
  latitudeSign            ENUMERATED {north, south},
  degreesLatitude        INTEGER (0..8388607),      -- 23 bit field
  degreesLongitude       INTEGER (-8388608..8388607) -- 24 bit field
}

EllipsoidPointWithUncertaintyCircle ::= SEQUENCE {
  latitudeSign            ENUMERATED {north, south},
  degreesLatitude        INTEGER (0..8388607),      -- 23 bit field
  degreesLongitude       INTEGER (-8388608..8388607), -- 24 bit field
  uncertainty            INTEGER (0..127)
}

EllipsoidPointWithUncertaintyEllipse ::= SEQUENCE {
  latitudeSign            ENUMERATED {north, south},
  degreesLatitude        INTEGER (0..8388607),      -- 23 bit field
  degreesLongitude       INTEGER (-8388608..8388607), -- 24 bit field
  uncertaintySemiMajor    INTEGER (0..127),
  uncertaintySemiMinor    INTEGER (0..127),
  orientationMajorAxis    INTEGER (0..179),
  confidence              INTEGER (0..100)
}

EllipsoidPointWithAltitude ::= SEQUENCE {

```

```

latitudeSign          ENUMERATED {north, south},
degreesLatitude       INTEGER (0..8388607),      -- 23 bit field
degreesLongitude      INTEGER (-8388608..8388607), -- 24 bit field
altitudeDirection     ENUMERATED {height, depth},
altitude              INTEGER (0..32767)        -- 15 bit field
}

EllipsoidPointWithAltitudeAndUncertaintyEllipsoid ::= SEQUENCE {
latitudeSign          ENUMERATED {north, south},
degreesLatitude       INTEGER (0..8388607),      -- 23 bit field
degreesLongitude      INTEGER (-8388608..8388607), -- 24 bit field
altitudeDirection     ENUMERATED {height, depth},
altitude              INTEGER (0..32767),        -- 15 bit field
uncertaintySemiMajor  INTEGER (0..127),
uncertaintySemiMinor  INTEGER (0..127),
orientationMajorAxis  INTEGER (0..179),
uncertaintyAltitude   INTEGER (0..127),
confidence             INTEGER (0..100)
}

EllipsoidArc ::= SEQUENCE {
latitudeSign          ENUMERATED {north, south},
degreesLatitude       INTEGER (0..8388607),      -- 23 bit field
degreesLongitude      INTEGER (-8388608..8388607), -- 24 bit field
innerRadius           INTEGER (0..65535),        -- 16 bit field,
uncertaintyRadius     INTEGER (0..127),
offsetAngle           INTEGER (0..179),
includedAngle         INTEGER (0..179),
confidence             INTEGER (0..100)
}

RangeAndOrDirection ::= SEQUENCE {
range                 Range      OPTIONAL,
azimuth               Azimuth    OPTIONAL,
elevation              Elevation  OPTIONAL
}

Range ::= SEQUENCE {
rangeResult           INTEGER (0..134217727),
uncertainty           INTEGER (0..255),
confidence             INTEGER (0..100)          OPTIONAL
}

Azimuth ::= SEQUENCE {
azimuthResult         INTEGER (0..3599),
uncertainty           INTEGER (0..127),
confidence             INTEGER (0..100)          OPTIONAL
}

Elevation ::= SEQUENCE {
elevationResult       INTEGER (0..1800),
uncertainty           INTEGER (0..63),
confidence             INTEGER (0..100)          OPTIONAL
}

```

```

}
HorizontalVelocity ::= SEQUENCE {
    bearing          INTEGER(0..359),
    horizontalSpeed  INTEGER(0..2047)
}
HorizontalWithVerticalVelocity ::= SEQUENCE {
    bearing          INTEGER(0..359),
    horizontalSpeed  INTEGER(0..2047),
    verticalDirection ENUMERATED{upward, downward},
    verticalSpeed    INTEGER(0..255)
}
HorizontalVelocityWithUncertainty ::= SEQUENCE {
    bearing          INTEGER(0..359),
    horizontalSpeed  INTEGER(0..2047),
    uncertaintySpeed INTEGER(0..255)
}
HorizontalWithVerticalVelocityAndUncertainty ::= SEQUENCE {
    bearing          INTEGER(0..359),
    horizontalSpeed  INTEGER(0..2047),
    verticalDirection ENUMERATED{upward, downward},
    verticalSpeed    INTEGER(0..255),
    horizontalUncertaintySpeed INTEGER(0..255),
    verticalUncertaintySpeed  INTEGER(0..255)
}
Polygon ::= SEQUENCE (SIZE (3..15)) OF PolygonPoints
PolygonPoints ::= SEQUENCE {
    latitudeSign    ENUMERATED {north, south},
    degreesLatitude INTEGER (0..8388607),      -- 23 bit field
    degreesLongitude INTEGER (-8388608..8388607) -- 24 bit field
}
RelativeVelocityWithUncertainty ::= SEQUENCE {
    radialVelocityComponent SEQUENCE {
        unitsRadialVelocity    ENUMERATED { mPerS, cmPerS, ... },
        radialVelocity         INTEGER (-2048..2047),
        uncertaintyRadialVelocity INTEGER (0..255),
        confidenceUncertaintyRadialVelocity INTEGER (0..100)
    } OPTIONAL,
    transverseVelocityComponent SEQUENCE {
        unitsTransverseVelocity ENUMERATED { degPerSec1, degPerSec0-1, ... },
        azimuth                 SEQUENCE {
            azimuthRateOfChange    INTEGER (0..1023),
            uncertaintyAzimuthRateOfChange INTEGER (0..255),
            confidenceUncertaintyAzimuthRateOfChange INTEGER (0..100)
        } OPTIONAL,
        elevation                SEQUENCE {
            elevationRateOfChange    INTEGER (0..1023),
            uncertaintyElevationRateOfChange INTEGER (0..255),
        }
    }
}

```

```
confidenceUncertaintyElevationRateOfChange INTEGER (0..100)
    }
}
...
}
-- TAG-COMMONIESPROVIDELOCAATIONINFORMATION-STOP
-- ASN1STOP
```

CommonEsProvideLocationInformation field descriptions
<p>azimuthResult This field provides an azimuth result which provides a direction to point B from point A in a horizontal plane through point A and as measured clockwise from North. Scale factor 0.1 degree; range 0 to 359.9 degrees.</p>
<p>elevationResult This field provides an elevation angle which is measured relative to zenith (elevation 0 deg points to Zenith, 90 deg to the Horizontal Plane and 180 deg to the Nadir. Scale factor 0.1 degree; range 0 to 180 degrees).</p>
<p>locationError This field shall be included if and only if a location estimate and measurements are not included in the SLPP PDU. The field includes information concerning the reason for the lack of location information. The <i>LocationFailureCause</i> 'periodicLocationMeasurementsNotAvailable' shall be used by the UE if periodic location reporting was requested, but no measurements or location estimate are available when <i>the reportingInterval</i> expired.</p>
<p>locationEstimate This field provides a location estimate using one of the geographic shapes defined in TS 23.032 [7]. Coding of the values of the various fields internal to each geographic shape follow the rules in TS 23.032 [7]. The conditions for including this field are defined for the <i>locationInformationType</i> field in a Request Location Information message.</p>
<p>radialVelocityComponent This field provides the radial velocity component characterised by a rate of change of range between the device A and device B:</p> <ul style="list-style-type: none"> - unitsRadialVelocity provides the unit for the <i>radialVelocity</i>. Enumerated values 'mPerS' and 'cmPerS' indicate units m/s and cm/s, respectively. - radialVelocity provides the radial velocity as defined in TS 23.032 [7] in units given in the <i>unitsRadialVelocity</i> field. Positive values indicate increasing range between device A and B; negative values indicate decreasing range between device A and B. - uncertaintyRadialVelocity provides the (single-sided) uncertainty of the <i>radialVelocity</i> in increments of 1 the unit given in the <i>unitsRadialVelocity</i> field. - confidenceUncertaintyRadialVelocity provides the confidence of the <i>uncertaintyRadialVelocity</i>, as defined in TS 23.032 [7] for the "Confidence".
<p>rangeResult This field provides the range result between two points in units of mill-meters, as defined in TS 23.032 [7] for the "Range and Direction".</p>
<p>transverseVelocityComponent This field provides the transverse velocity component characterised by a rate of change of direction to the device B from the device A:</p> <ul style="list-style-type: none"> - unitsTransverseVelocity provides the unit for the <i>azimuth</i> and <i>elevation</i> components. Enumerated values 'degPerSec1' and 'degPerSec0-1' indicate units 1-degree per second and 0.1 degree per second, respectively. - azimuthRateOfChange provides the rate of change of azimuth measured clockwise from North in a horizontal plane through the device A as defined in TS 23.032 [7] in units given in the <i>unitsTransverseVelocity</i> field. - uncertaintyAzimuthRateOfChange provides the (single-sided) uncertainty of the <i>azimuthRateOfChange</i> in increments of 1 units given in the <i>unitsTransverseVelocity</i> field. - confidenceUncertaintyAzimuthRateOfChange provides the confidence of the <i>uncertaintyAzimuthRateOfChange</i>, as defined in TS 23.032 [7] for the "Confidence". - elevationRateOfChange provides the rate of change of elevation measured from Zenith in a vertical plane through the devices A and B, as defined in TS 23.032 [7] in units given in the <i>unitsTransverseVelocity</i> field. - uncertaintyElevationRateOfChange provides the (single-sided) uncertainty of the <i>elevationRateOfChange</i> in increments of 1 in units given in the <i>unitsTransverseVelocity</i> field. - confidenceUncertaintyElevationRateOfChange provides the confidence of the <i>uncertaintyElevationRateOfChange</i>, as defined in TS 23.032 [7] for the "Confidence".
<p>velocityEstimate This field provides a velocity estimate using one of the velocity shapes defined in TS 23.032 [7]. Coding of the values of the various fields internal to each velocity shape follow the rules in TS 23.032 [7].</p>
<p>x, y, z This field provides the value (in the unit of mill-meters) on x-axis, y-axis and z-axis of the relative location in the local cartesian system, as defined in TS 23.032 [7]. The origin of the cartesian system is the reference location of the relative positioning.</p>

– *End of SLPP-PDU-CommonContents*

```
-- ASN1START
END
-- ASN1STOP
```

6.6 SLPP PDU Common SL-PRS Methods Contents

– *SLPP-PDU-CommonSL-PRS-MethodsContents*

This ASN.1 segment is the start of the SLPP PDU Common SL-PRS Methods Contents definitions.

```
-- ASN1START
-- TAG-SLPP-PDU-COMMONSL-PRS-METHODSCONTENTIS-START

SLPP-PDU-CommonSL-PRS-MethodsContents DEFINITIONS AUTOMATIC TAGS ::=
BEGIN

IMPORTS
    EllipsoidPoint,
    EllipsoidPointWithUncertaintyEllipse,
    EllipsoidPointWithAltitude,
    EllipsoidPointWithAltitudeAndUncertaintyEllipsoid
FROM
    SLPP-PDU-CommonContents

    SL-TimeStamp,
    maxNrOfUEs,
    nrMaxBands
FROM
    SLPP-PDU-Definitions;

-- TAG-SLPP-PDU-COMMONSL-PRS-METHODSCONTENTIS-STOP
-- ASN1STOP
```

– *CommonSL-PRS-MethodsIEsRequestCapabilities*

```
-- ASN1START
-- TAG-COMMONSL-PRS-METHODSIESREQUESTCAPABILITIES-START

CommonSL-PRS-MethodsIEsRequestCapabilities ::= SEQUENCE {
    ...
```

```

}
-- TAG-COMMONSL-PRS-METHODSIESREQUESTCAPABILITIES-STOP
-- ASN1STOP

```

CommonSL-PRS-MethodsIesProvideCapabilities

```

-- ASN1START
-- TAG-COMMONSL-PRS-METHODSIESPROVIDECAPABILITIES-START

CommonSL-PRS-MethodsIesProvideCapabilities ::= SEQUENCE {
  --R1 41-1-1a Common SL-PRS processing capability per UE
  sl-PRS-CommonProcCapabilityPerUE          SL-PRS-CommonProcCapabilityPerUE          OPTIONAL,
  sl-PRS-CapabilityBandList                 SEQUENCE (SIZE (1..nrMaxBands)) OF SL-PRS-CapabilityPerBand,
  ...
}

SL-PRS-CapabilityPerBand ::= SEQUENCE {
  freqBandIndicatorNR                      INTEGER (1..1024),
  --R1 41-1-1 Common SL-PRS processing capability in a SL BWP
  sl-PRS-CommonProcCapabilityPerBand       SL-PRS-CommonProcCapabilityPerBand          OPTIONAL,
  --R1 41-1-19 ARP location provision for sidelink as assistance data
  sl-PositioningARP-LocationProvision      ENUMERATED {supported}                     OPTIONAL,
  --R1 41-1-19a Report of Rx ARP-ID with SL positioning measurements
  sl-PositioningMeasReportWithRxARP-ID     ENUMERATED {supported}                     OPTIONAL,
  --R1 41-1-19b Report of Tx ARP-ID to LMF or another UE for the transmitted SL PRS
  sl-PRS-ReportTxARP-ID                   ENUMERATED {supported}                     OPTIONAL,
  --R1 41-1-2 Receiving SL-PRS in a shared resource pool
  sl-PRS-RxInSharedResourcePool           ENUMERATED {supported}                     OPTIONAL,
  --R1 41-1-3 Receiving SL-PRS in a dedicated resource pool
  sl-PRS-RxInDedicatedResourcePool        SL-PRS-RxInDedicatedResourcePool          OPTIONAL,
  --R1 41-1-4a Transmitting SL-PRS in a shared resource pool
  sl-PRS-TxInSharedResourcePool           ENUMERATED {supported}                     OPTIONAL,
  --R1 41-1-4b Transmitting SL-PRS mode 1 in a dedicated resource pool
  sl-PRS-TxScheme1InDedicatedResourcePool ENUMERATED {supported}                     OPTIONAL,
  --R1 41-1-4c Transmitting SL-PRS mode 2 in a dedicated resource pool
  sl-PRS-TxScheme2InDedicatedResourcePool ENUMERATED {supported}                     OPTIONAL,
  --R1 41-1-7e SL PRS measurement for SL PRS-RSRP
  sl-PRS-RSRP-Meas                         ENUMERATED {supported}                     OPTIONAL,
  --R1 41-1-7f SL PRS measurement for SL PRS-RSRPP
  sl-PRS-RSRPP-Meas                       ENUMERATED {supported}                     OPTIONAL,
  --R1 41-1-11 TDM-based multiplexing of SL-PRS reception from different UEs in the same slot in dedicated resource pool
  sl-PRS-TDM-Multiplexing                  ENUMERATED {supported}                     OPTIONAL,
  --R1 41-1-12 Comb-based multiplexing for SL-PRS reception from different UEs in the same slot in dedicated resource pool
  sl-PRS-RxCombMultiplexing               ENUMERATED {supported}                     OPTIONAL,
  --R1 41-1-13 Reporting the additional paths for SL positioning
  sl-PRS-AdditionalPathsReport             ENUMERATED {n1,n2,n4,n6,n8}                OPTIONAL,
  --R1 41-1-14 LoS/NLoS indicator for SL positioning per measurement
  sl-PRS-LOS-NLOS-Indication              ENUMERATED {hard, hard-soft}               OPTIONAL,
  -- R1 41-1-20: Supports SL PRS Rx for a band configured with SL CA
  sl-PRS-RxForBandWithSL-CA               ENUMERATED {supported}                     OPTIONAL,
  -- R1 41-1-21: Supports SL PRS Tx for a band configured with SL CA

```

```

sl-PRS-TxForBandWithSL-CA          ENUMERATED {supported}          OPTIONAL,
...
}

SL-PRS-CommonProcCapabilityPerUE ::= SEQUENCE {
--R1 41-1-1a Common SL-PRS processing capability
maxNumOfActiveSL-PRS-Resources     SEQUENCE {
    fr1          ENUMERATED {n1, n2, n4, n6, n8, n12, n16, n24}      OPTIONAL,
    fr2          ENUMERATED {n1, n2, n4, n6, n8, n12, n16, n24, n32, n48, n64, n128}  OPTIONAL
},
maxNumOfSlotsWithActiveSL-PRS-Resources SEQUENCE {
    fr1          ENUMERATED {n1, n2, n3, n4, n6, n8}                OPTIONAL,
    fr2          ENUMERATED {n1, n2, n4, n8, n12, n16, n24, n32, n48, n64}  OPTIONAL
}
}

SL-PRS-CommonProcCapabilityPerBand ::= SEQUENCE {
maxSL-PRS-Bandwidth                CHOICE {
    fr1          ENUMERATED {mhz5, mhz10, mhz20, mhz40, mhz50, mhz80, mhz100},
    fr2          ENUMERATED {mhz50, mhz100, mhz200, mhz400}
},
maxNumOfActiveSL-PRS-ResourcesInOneSlot CHOICE {
    fr1          ENUMERATED {n1, n2, n4, n6, n8, n12, n16, n24},
    fr2          ENUMERATED {n1, n2, n4, n6, n8, n12, n16, n24, n32, n48, n64, n128}
},
maxNumOfSlotsWithActiveSL-PRS-Resources CHOICE {
    fr1          ENUMERATED {n1, n2, n3, n4, n6, n8},
    fr2          ENUMERATED {n1, n2, n4, n8, n12, n16, n24, n32, n48, n64}
},
minTimeAfterEndofSlotCarryActiveSL-PRS-Resources     ENUMERATED {ms20, ms30, ms40, ms50, ms80, ms100, ms160}
}

SL-PRS-RxInDedicatedResourcePool ::= SEQUENCE {
    numSupportedRxPSCCH-PerSlot     ENUMERATED {value1, value2},
    supportedCP-TypeFor60kHzSCS     ENUMERATED {ncp, ncpAndECP}
}

-- TAG-COMMONSL-PRS-METHODSIESPROVIDECAPABILITIES-STOP
-- ASN1STOP

```

CommonSL-PRS-MethodsIEsProvideCapabilities field descriptions
<p>sl-PositioningARP-LocationProvision Indicates whether UE supports provisioning of ARP location for sidelink as assistance data.</p>
<p>sl-PositioningMeasReportWithARP-ID Indicates whether UE supports providing Rx ARP-ID with SL positioning measurements.</p>
<p>sl-PRS-AdditionalPathsReport Indicates whether UE supports RSRPP reporting for additional paths. The value indicates the maximum number of additional detected path timing reporting for K additional paths for SL positioning. UE supporting this feature shall also support at least one of <i>sl-PRS-RSTD-Meas</i>, <i>sl-RTOA-Meas</i>, <i>sl-PRS-RxTxTimeDiffWithoutTxTimeStamp</i>, <i>sl-PRS-RxTxTimeDiffWithTxTimeStamp</i>, <i>sl-PRS-RSRPP-Meas</i>, or <i>sl-AoA-Meas</i>.</p>
<p>sl-PRS-CommonProcCapabilityPerBand Indicates the common SL-PRS processing capability per band, and comprises the following sub-fields:</p> <ul style="list-style-type: none"> - <i>maxSL-PRS-Bandwidth</i>: Maximum SL PRS bandwidth in MHz in a resource pool for positioning, which is supported and reported by UE for SL-PRS measurement; - <i>maxNumOfActiveSL-PRS-ResourcesInOneSlot</i>: Maximum number of active SL PRS resources across all configured RPs in a slot assuming maximum SL PRS bandwidth in MHz, which is supported and reported by UE; - <i>maxNumOfSlotsWithActiveSL-PRS-Resources</i>: Maximum number of slots with active SL PRS resources across all configured RPs assuming maximum SL PRS bandwidth in MHz, which is supported and reported by UE; - <i>minTimeAfterEndofSlotCarryActiveSL-PRS-Resources</i>: Minimum time after the end of a slot carrying the active SL-PRS resource(s) assuming maximum number of symbols and maximum bandwidth for a UE to finish the SL-PRS resource and the associated PSCCH processing which is supported and reported by UE; <p>NOTE 1: A SL PRS resource is considered as active starting at the end of the last symbol of the PSCCH carrying the SCI trigger and the occupancy is released at the end of timeline indicated in <i>minTimeAfterEndofSlotCarryActiveSL-PRS-Resources</i>.</p>
<p>sl-PRS-CommonProcCapabilityPerUE Indicates the common SL-PRS processing capability, and comprises the following sub-fields:</p> <ul style="list-style-type: none"> - <i>maxNumOfActiveSL-PRS-Resources</i>: Maximum number of active SL PRS resources across all configured RPs across all bands in a slot assuming maximum SL PRS bandwidth in MHz, which is supported and reported by UE; - <i>maxNumOfSlotswithActiveSL-PRS-Resources</i>: Maximum number of slots with active SL PRS resources across all configured RPs across all bands assuming maximum SL PRS bandwidth in MHz, which is supported and reported by UE. <p>UE supporting this feature shall also support <i>sl-PRS-CommonProcCapabilityPerBand</i>.</p>
<p>sl-PRS-LOS-NLOS-Indication Indicates whether UE supports LoS/NLoS indicator for SL positioning per measurement. The value indicates whether the indicator is hard value or hard+soft value. UE supporting this feature shall also support at least one of <i>sl-PRS-RSTD-Meas</i>, <i>sl-RTOA-Meas</i>, <i>sl-PRS-RxTxTimeDiffWithoutTxTimeStamp</i>, <i>sl-PRS-RxTxTimeDiffWithTxTimeStamp</i>, or <i>sl-AoA-Meas</i>.</p>
<p>sl-PRS-ReportTxARP-ID Indicates whether UE supports providing Tx ARP-ID for the transmitted SL PRS.</p>
<p>sl-PRS-RSRP-Meas Indicates whether UE supports SL PRS measurement for SL PRS-RSRP, and is comprised of the following functional components:</p> <ul style="list-style-type: none"> - Support SL PRS-RSRP measurement based on SL-PRS; - Support SL PRS-RSRP measurement reporting. <p>UE supporting this feature shall also support <i>sl-PRS-CommonProcCapabilityPerBand</i>.</p>
<p>sl-PRS-RSRPP-Meas Indicates whether UE supports SL PRS measurement for SL PRS-RSRPP, and is comprised of the following functional components:</p> <ul style="list-style-type: none"> - Support SL PRS-RSRPP measurement based on SL-PRS; - Support SL PRS-RSRPP measurement reporting. <p>UE supporting this feature shall also support <i>sl-PRS-CommonProcCapabilityPerBand</i>.</p>

<p><i>sl-PRS-RxCombMultiplexing</i> Indicates whether UE supports comb-based multiplexing for SL-PRS reception from different UEs in the same slot in dedicated resource pool. UE supporting this feature shall also support <i>sl-PRS-RxInDedicatedResourcePool</i>.</p>
<p><i>sl-PRS-RxForBandWithSL-CA</i> Indicates whether UE supports SL PRS reception in a single carrier for a shared SL PRS resource pool and/or a dedicated SL PRS resource pool for a band configured with SL CA. A UE that supports this feature shall also support <i>sl-CA-Communication-r18</i>, defined in TS 38.331 [2] and one of <i>sl-PRS-RxInSharedResourcePool</i> or <i>sl-PRS-RxInDedicatedResourcePool</i>. NOTE 1: In a shared SL PRS resource pool in a single SL carrier: Tx power control follows the rule defined for SL CA in NR Rel-18. NOTE 2: In a dedicated SL PRS resource pool in a single SL carrier when the slots (pre)configured for the dedicated SL PRS resource pool do not collide with the slots (pre)configured for any other resource pool or S-SSB resource(s) in other carriers.</p>
<p><i>sl-PRS-RxInDedicatedResourcePool</i> Indicates whether UE supports receiving SL-PRS in dedicated resource pool and receiving SCI format 1B. This field comprises the following sub-fields: - <i>numOfSupportedRxPSCCH-PerSlot</i>: Indicates the number of PSCCH UE can receive in a slot. value1 corresponds to floor ($N_{RB} / 10$ RBs), value2 corresponds to $2 \cdot \text{floor}(N_{RB} / 10)$ RBs). N_{RB} is the number of RBs defined per channel bandwidth in TS 38.101-1 [11] Table 5.3.2-1 for FR1 and TS 38.101-2 [10] Table 5.3.2-1 for FR2. - <i>supportedCP-TypeFor60kHzSCS</i>: Supported CP type for 60 kHz SCS. UE supporting this feature shall also support <i>sl-PRS-CommonProcCapabilityPerBand</i>.</p>
<p><i>sl-PRS-RxInSharedResourcePool</i> Indicates whether UE supports receiving SL-PRS in shared resource pool and receiving SCI format 2D. UE supporting this feature shall also support <i>sl-PRS-CommonProcCapabilityPerBand</i> and <i>sl-Reception-r16</i> defined in TS 38.331 [2].</p>
<p><i>sl-PRS-TDM-Multiplexing</i> Indicates whether UE supports TDM-based multiplexing of SL-PRS reception from different UEs in the same slot in dedicated resource pool. UE supporting this feature shall also support <i>sl-PRS-RxInDedicatedResourcePool</i>.</p>
<p><i>sl-PRS-TxForBandWithSL-CA</i> Indicates whether UE supports SL PRS transmission in a single carrier for a shared SL PRS resource pool and/or a dedicated SL PRS resource pool for a band configured with SL CA. A UE that supports this feature shall also support <i>sl-CA-Communication-r18</i>, defined in TS 38.331 [2] and one of <i>sl-PRS-TxInSharedResourcePool</i>, <i>sl-PRS-TxScheme1InDedicatedResourcePool</i>, or <i>sl-PRS-TxScheme2InDedicatedResourcePool</i>. NOTE 1: In a shared SL PRS resource pool in a single SL carrier: Tx power control follows the rule defined for SL CA in NR Rel-18. NOTE 2: In a dedicated SL PRS resource pool in a single SL carrier when the slots (pre)configured for the dedicated SL PRS resource pool do not collide with the slots (pre)configured for any other resource pool or S-SSB resource(s) in other carriers.</p>
<p><i>sl-PRS-TxInSharedResourcePool</i> Indicates whether UE supports transmitting SL-PRS in a shared resource pool, and is comprised of the following functional components: - Support transmitting SL-PRS in shared resource pool; - Support transmitting SCI format 2D; - Support downlink pathloss based open loop power control. The supported resource allocation modes are the same as for communication and signaled in <i>sl-TransmissionMode1-r16</i> and <i>sl-TransmissionMode2-r16</i> defined in TS 38.331 [2]. UE supporting this feature shall also support <i>sl-TransmissionMode1-r16</i> or <i>sl-TransmissionMode2-r16</i>, and <i>sl-PRS-RxInSharedResourcePool</i> defined in TS 38.331 [2].</p>

sl-PRS-TxScheme1InDedicatedResourcePool

Indicates whether UE supports transmitting SL-PRS scheme 1 in a dedicated resource pool, and is comprised of the following functional components:

- Support transmitting SL-PRS and PSCCH within a slot without PSSCH in dedicated resource pool;
- Support transmitting SL-PRS according to the mapping rule between PSCCH and SL-PRS;
- Support transmitting SCI format 1B;
- Support receiving DCI format 3_2;
- Support downlink pathloss based open loop power control of SL-PRS (NOTE 1).

UE supporting this feature shall also support *sl-PRS-RxInDedicatedResourcePool*.

NOTE 1: It is not required to be supported in a band indicated with only the PC5 interface in TS 38.101-1 [11] Table 5.2E.1-1.

sl-PRS-TxScheme2InDedicatedResourcePool

Indicates whether UE supports transmitting SL-PRS scheme 2 in a dedicated resource pool, and is comprised of the following functional components:

- Support transmitting SL-PRS and PSCCH within a slot without PSSCH in dedicated resource pool;
- Support transmitting SL-PRS according to the mapping rule between PSCCH and SL-PRS;
- Support transmitting SCI format 1B.

UE supporting this feature shall also support at least one of *sl-PRS-TxRandomSelection* or *sl-PRS-TxUsingFullSensing-r18* defined in TS 38.331 [2].

– ***CommonSL-PRS-MethodsIEsRequestAssistanceData***

```
-- ASN1START
-- TAG-COMMONSL-PRS-METHODSIESREQUESTASSISTANCEDATA-START

CommonSL-PRS-MethodsIEsRequestAssistanceData ::= SEQUENCE {
    sl-PRS-AssistanceDataInfoReq          BIT STRING { sl-PRS-SequenceID-Req      (0),
                                                         anchorUE-LocationInfoReq (1),
                                                         arp-LocationInfoReq     (2),
                                                         sl-POS-ARP-ID-Tx-Req    (3)
                                                         OPTIONAL,
    } (SIZE (1..8))
    ...
}
-- TAG-COMMONSL-PRS-METHODSIESREQUESTASSISTANCEDATA-STOP
-- ASN1STOP
```

***CommonSL-PRS-MethodsIEsRequestAssistanceData* field descriptions**

sl-PRS-AssistanceDataInfoReq

This field indicates the SL PRS Assistance Data requested.

- bit 0 indicates whether the field *sl-PRS-SequenceID* in *CommonSL-PRS-MethodsIEsProvideAssistanceData* is requested or not;
- bit 1 indicates whether the field *anchorUE-LocationInformation* in *CommonSL-PRS-MethodsIEsProvideAssistanceData* is requested or not;
- bit 2 indicates whether the field *arp-LocationInfo* in *CommonSL-PRS-MethodsIEsProvideAssistanceData* is requested or not;
- bit 3 indicates whether the field *sl-POS-ARP-ID-Tx* in *CommonSL-PRS-MethodsIEsProvideAssistanceData* is requested or not.

– ***CommonSL-PRS-MethodsIEsProvideAssistanceData***

```
-- ASN1START
-- TAG-COMMONSL-PRS-METHODSIESPROVIDEASSISTANCEDATA-START
```

```

CommonSL-PRS-MethodsIEsProvideAssistanceData ::= SEQUENCE {
    sl-PRS-AssistanceDataInfo      SEQUENCE (SIZE (1..maxNrOfUEs)) OF SL-PRS-AssistanceData      OPTIONAL,
    sl-PRS-Error                    SL-PRS-AssistanceDataError                                OPTIONAL,
    ...
}

SL-PRS-AssistanceData ::= SEQUENCE {
    applicationLayerID              OCTET STRING,
    sl-PRS-SequenceID               INTEGER(0..4095)                                OPTIONAL, -- SL PRS sequence ID for transmitting SL-PRS
    anchorUE-LocationInformation    AnchorLocationCoordinates                    OPTIONAL,
    arp-LocationInfo                ARP-LocationInfo                            OPTIONAL,
    sl-PRS-TxInfo                   SL-PRS-TxInfo                            OPTIONAL,
    sl-POS-ARP-ID-Tx                SL-POS-ARP-ID-Tx-InfoList                OPTIONAL,
    ...
}

AnchorLocationCoordinates ::= CHOICE {
    ellipsoidPoint                  EllipsoidPoint,
    ellipsoidPointWithUncertaintyEllipse EllipsoidPointWithUncertaintyEllipse,
    ellipsoidPointWithAltitude      EllipsoidPointWithAltitude,
    ellipsoidPointWithAltitudeAndUncertaintyEllipsoid EllipsoidPointWithAltitudeAndUncertaintyEllipsoid
}

ARP-LocationInfo ::= SEQUENCE {
    referencePoint                  ReferencePoint                                OPTIONAL,
    arp-LocationInfoList            SEQUENCE (SIZE (1..4)) OF ARP-LocationInfoElement
}

ReferencePoint ::= CHOICE {
    location2D                      EllipsoidPointWithUncertaintyEllipse,
    location3D                      EllipsoidPointWithAltitudeAndUncertaintyEllipsoid
}

ARP-LocationInfoElement ::= SEQUENCE {
    sl-PRS-ARP-ID                   INTEGER (1..4),
    arp-LocationInfo                RelativeLocation
}

RelativeLocation ::= SEQUENCE {
    milliArcSecondUnits             ENUMERATED { mas0-03, mas0-3, mas3, mas30},
    heightUnits                     ENUMERATED { mm, cm, m, spare1},
    deltaLatitude                   DeltaLatitude,
    deltaLongitude                  DeltaLongitude,
    deltaHeight                     DeltaHeight,
    locationUNC                     LocationUncertainty                                OPTIONAL
}

DeltaLatitude ::= SEQUENCE {
    deltaLatitude                   INTEGER (-1024..1023),
    coarseDeltaLatitude             INTEGER (0..4095)                                OPTIONAL
}

DeltaLongitude ::= SEQUENCE {

```

```
    deltaLongitude      INTEGER (-1024..1023),
    coarseDeltaLongitude INTEGER (0..4095)          OPTIONAL
}

DeltaHeight ::= SEQUENCE {
    deltaHeight      INTEGER (-1024..1023),
    coarseDeltaHeight INTEGER (0..4095)          OPTIONAL
}

LocationUncertainty ::= SEQUENCE {
    horizontalUncertainty  INTEGER (0..255),
    horizontalConfidence  INTEGER (0..100),
    verticalUncertainty    INTEGER (0..255),
    verticalConfidence    INTEGER (0..100)
}

SL-PRS-AssistanceDataError ::= ENUMERATED { undefined, assistanceDataNotAvailable, ... }

SL-PRS-TxInfo ::=
    SEQUENCE {
        sl-PRS-Priority      INTEGER (1..8)                                OPTIONAL,
        sl-PRS-DelayBudget  INTEGER (0..1023)                            OPTIONAL,
        sl-PRS-Bandwidth    ENUMERATED {mhz5, mhz10, mhz15, mhz20, mhz25, mhz30, mhz35, mhz40,
                                        mhz45, mhz50, mhz60, mhz70, mhz80, mhz90, mhz100, mhz200, mhz400,
                                        spare15, spare14, spare13, spare12, spare11, spare10, spare9, spare8,
                                        spare7, spare6, spare5, spare4, spare3, spare2, spare1}          OPTIONAL,
        sl-PRS-Periodicity  ENUMERATED {ms100, ms200, ms300, ms400, ms500, ms600, ms700, ms800,
                                        ms900, ms1000, spare6, spare5, spare4, spare3, spare2, spare1}          OPTIONAL,
        sl-PRS-Transmission ENUMERATED {true}                            OPTIONAL
    }

-- TAG-COMMONSL-PRS-METHODSIESPROVIDEASSISTANCEDATA-STOP
-- ASN1STOP
```


CommonSL-PRS-MethodsIEsProvideAssistanceData field descriptions
<p>anchorUE-LocationInformation This field provides the location coordinates of a SL Anchor UE identified by <i>applicationLayerID</i>.</p>
<p>arp-LocationInfo This field provides the location coordinates of the ARPs of the UE identified by <i>applicationLayerID</i>.</p>
<p>applicationLayerID This field provides the application layer ID as defined in TS 23.287 [9] for which the <i>SL-PRS-AssistanceData</i> is applicable.</p>
<p>referencePoint This field provides the reference point used to define the location of ARPs provided in the <i>arp-LocationInfoList</i>. If this field is absent, the reference point is the same as in the previous entry of the <i>sl-PRS-AssistanceDataInfo</i> list.</p>
<p>sl-PRS-ARP-ID This field provides the ARP ID of an ARP. The ARP ID is used to uniquely identify an ARP associated with the UE identified by <i>applicationLayerID</i>.</p>
<p>sl-PRS-Bandwidth This field provides the bandwidth of SL-PRS transmission which is used in <i>UEAssistanceInformation</i> message as defined in TS 38.331 [2] and the SL-PRS resource request MAC CE as defined in TS 38.321 [15]. Value <i>mhz5</i> corresponds to 5 MHz, value <i>mhz10</i> corresponds to 10 MHz, and so on.</p>
<p>sl-PRS-DelayBudget This field provides the SL-PRS delay budget which is used in <i>UEAssistanceInformation</i> message as defined in TS 38.331 [2] and the resource selection as defined in TS 38.321 [15].</p>
<p>sl-PRS-Error This field provides SL-PRS error reasons.</p>
<p>sl-PRS-Periodicity This field provides the periodicity of SL-PRS which is used in <i>UEAssistanceInformation</i> message as defined in TS 38.331 [2]. Value <i>ms100</i> corresponds to 100 ms, value <i>ms200</i> corresponds to 200 ms, and so on.</p>
<p>sl-PRS-Priority This field provides the priority of SL-PRS which is used in <i>UEAssistanceInformation</i> message as defined in TS 38.331 [2] and the resource selection as defined in TS 38.321 [15]. Value 1 is the highest priority whereas value 8 is the lowest priority.</p>
<p>sl-PRS-SequenceID This field specifies the sequence ID used to initialize cinit value used in pseudo random generator for generation of SL PRS sequence for transmission on a given SL PRS Resource, as specified in TS 38.211 [6] for a UE identified by <i>applicationLayerID</i>. If an UE does not receive a sequence ID via this SLPP message, the sequence ID is based on the 12 LSB bits CRC of PSCCH associated with the SL PRS.</p>
<p>sl-PRS-Transmission This field, if present, indicates that the UE is requested to start the SL-PRS transmission once the resource is available. If this field is absent, the UE can store the <i>SL-PRS-TxInfo</i> for future SL-PRS transmission (e.g., triggered by SCI from a peer UE).</p>

– **CommonSL-PRS-MethodsIEsRequestLocationInformation**

```

-- ASN1START
-- TAG-COMMONSL-PRS-METHODSIESREQUESTLOCATIONINFORMATION-START

CommonSL-PRS-MethodsIEsRequestLocationInformation ::= SEQUENCE {
    sl-POS-ARP-ID-Tx-Req          ENUMERATED { true }           OPTIONAL,
    ...
}

-- TAG-COMMONSL-PRS-METHODSIESREQUESTLOCATIONINFORMATION-STOP
-- ASN1STOP

```

– *CommonSL-PRS-MethodsIEsProvideLocationInformation*

```

-- ASN1START
-- TAG-COMMONSL-PRS-METHODSIESPROVIDELOCAATIONINFORMATION-START

CommonSL-PRS-MethodsIEsProvideLocationInformation ::= SEQUENCE {
    sl-POS-ARP-ID-Tx                SL-POS-ARP-ID-Tx-InfoList                OPTIONAL,
    sl-PRS-Error                    SL-PRS-LocationInformationError        OPTIONAL,
    ...
}

SL-POS-ARP-ID-Tx-InfoList ::= SEQUENCE (SIZE (1..4)) OF SL-POS-ARP-ID-Tx-Info

SL-POS-ARP-ID-Tx-Info ::= SEQUENCE {
    sl-POS-ARP-ID                    INTEGER (1..4),
    sl-PRS-ResourceIdList-Tx        SEQUENCE (SIZE(1..16)) OF SL-PRS-ResourceId-Tx
}

SL-PRS-LocationInformationError ::= ENUMERATED { undefined, ... }

SL-PRS-ResourceId-Tx ::= SEQUENCE {
    sl-PRS-ResourceId                INTEGER (0..16)                OPTIONAL,
    tx-TimeStamp                    SL-TimeStamp
}

-- TAG-COMMONSL-PRS-METHODSIESPROVIDELOCAATIONINFORMATION-STOP
-- ASN1STOP

```

– *End of SLPP-PDU-CommonSL-PRS-MethodsContents*

```

-- ASN1START

END

-- ASN1STOP

```

6.7 SLPP PDU SL-AoA Contents

– *SLPP-PDU-SL-AoA-Contents*

This ASN.1 segment is the start of the SLPP PDU SL-AoA Contents definitions.

```

-- ASN1START
-- TAG-SLPP-PDU-SL-AOA-CONTENTS-START

```

```

SLPP-PDU-SL-AoA-Contents DEFINITIONS AUTOMATIC TAGS ::=
BEGIN

IMPORTS
    LCS-GCS-Translation,
    LOS-NLOS-Indicator,
    PositioningModes,
    SL-TimeStamp,
    SL-TimingQuality,
    maxNrOfUEs,
    ScheduledLocationTimeSupportPerMode,
    nrMaxBands
FROM
    SLPP-PDU-Definitions;

-- TAG-SLPP-PDU-SL-A0A-CONTENTS-STOP
-- ASN1STOP

```

– *SL-AoA-RequestCapabilities*

```

-- ASN1START
-- TAG-SL-AOA-REQUESTCAPABILITIES-START

SL-AoA-RequestCapabilities ::= SEQUENCE {
    ...
}

-- TAG-SL-AOA-REQUESTCAPABILITIES-STOP
-- ASN1STOP

```

– *SL-AoA-ProvideCapabilities*

The IE *SL-AoA-ProvideCapabilities* is used to indicate the support of SL-AoA and to provide SL-AoA positioning capabilities.

```

-- ASN1START
-- TAG-SL-AOA-PROVIDECAPABILITIES-START

SL-AoA-ProvideCapabilities ::= SEQUENCE {
    positioningModes                PositioningModes,
    tenMsUnitResponseTime           PositioningModes OPTIONAL,
    periodicalReporting              PositioningModes OPTIONAL,
    scheduledLocationRequestSupported ScheduledLocationTimeSupportPerMode OPTIONAL,
    sl-AoA-CapabilityBandList        SEQUENCE (SIZE (1..nrMaxBands)) OF SL-AoA-CapabilityPerBand,
    ...
}

SL-AoA-CapabilityPerBand ::= SEQUENCE {

```

```

--R1 41-1-7g SL PRS measurement for SL AoA
sl-AoA-Meas          BIT STRING { gcs (0), lcsWithTranslation (1), lcsWithoutTranslation (2) } (SIZE (1..8))
                    OPTIONAL,
measurementsForMultipleARP-IDs-Rx  ENUMERATED { supported }          OPTIONAL,
...
}

-- TAG-SL-AOA-PROVIDECAPABILITIES-STOP
-- ASN1STOP

```

SL-AoA-ProvideCapabilities field descriptions

measurementsForMultipleARP-IDs-Rx

This field, if present, indicates that the UE supports SL-AoA measurements for multiple SL-PRS Rx ARP-IDs.

periodicalReporting

This field, if present, specifies the positioning modes for which the UE supports *periodicalReporting*. This is represented by a bit string, with a one value at the bit position means *periodicalReporting* for the positioning mode is supported; a zero value means not supported. If this field is absent, the UE does not support *periodicalReporting* in *CommonIEsRequestLocationInformation*.

positioningModes

This field specifies the SL-AoA mode(s) supported by the UE.

scheduledLocationRequestSupported

This field, if present, specifies the positioning modes for which the UE supports scheduled location requests, i.e., supports the IE *ScheduledLocationTime* in IE *CommonIEsRequestLocationInformation* and the time base(s) supported for the scheduled location time for each positioning mode. If this field is absent, the UE does not support scheduled location requests.

sl-AoA-Meas

Indicates whether UE supports SL PRS measurement for SL-AoA, and is comprised of the following functional components:

- Support SL AoA measurement based on SL-PRS;
- Support SL AoA measurement reporting types.

The value indicates the supported SL AoA measurement reporting types. The left most bit in the bitmap corresponds to GCS, the next bit in the bitmap corresponds to LCS with translation, the right most bit in the bitmap corresponds to LCS without translation. A bit in the bitmap is set to 1 if the corresponding type is supported by the UE.

UE supporting this feature shall also support *sl-PRS-CommonProcCapabilityPerBand*.

tenMsUnitResponseTime

This field, if present, specifies the positioning modes for which the UE supports the enumerated value '*ten-milli-seconds*' in the IE *ResponseTime* in IE *CommonIEsRequestLocationInformation*. This is represented by a bit string, with a one value at the bit position means '*ten-milli-seconds*' response time unit for the positioning mode is supported; a zero value means not supported. If this field is absent, the UE does not support '*ten-milli-seconds*' response time unit in *CommonIEsRequestLocationInformation*.

– SL-AoA-RequestAssistanceData

```

-- ASN1START
-- TAG-SL-AOA-REQUESTASSISTANCEDATA-START

SL-AoA-RequestAssistanceData ::= SEQUENCE {
    expectedSL-ElevationAoA-AndUncertainty  ENUMERATED { true }          OPTIONAL,
    ...
}

-- TAG-SL-AOA-REQUESTASSISTANCEDATA-STOP
-- ASN1STOP

```

– *SL-AoA-ProvideAssistanceData*

```
-- ASN1START
-- TAG-SL-AOA-PROVIDEASSISTANCEDATA-START

SL-AoA-ProvideAssistanceData ::= SEQUENCE {
    sl-AoA-AssistanceDataInfo      SEQUENCE (SIZE (1..maxNrOfUEs)) OF SL-AoA-AssistanceData  OPTIONAL,
    sl-AoA-Error                   SL-AoA-AssistanceDataError                            OPTIONAL,
    ...
}

SL-AoA-AssistanceData ::= SEQUENCE {
    applicationLayerID             OCTET STRING,
    expectedSL-AoA                 SEQUENCE {
        expectedSL-AzimuthAoA      INTEGER(0..3599),                -- expected-SL-AoA-and-Uncertainty
        expectedSL-AzimuthAoA-Uncertainty  INTEGER (0..60)          OPTIONAL,
        expectedSL-ElevationAoA    INTEGER(0..1800)                OPTIONAL, -- expected-SL-AoA-and-Uncertainty
        expectedSL-ElevationAoA-Uncertainty  INTEGER(0..30)          OPTIONAL
    },
    lcs-GCS-TranslationParameter   LCS-GCS-Translation            OPTIONAL,
    ...
}

SL-AoA-AssistanceDataError ::= ENUMERATED { undefined, assistanceDataNotAvailable, ... }

-- TAG-SL-AOA-PROVIDEASSISTANCEDATA-STOP
-- ASN1STOP
```

<i>SL-AoA-ProvideAssistanceData</i> field descriptions
<i>applicationLayerID</i> This field provides an application layer ID as defined in TS 23.287 [9] which is used to identify a UE.
<i>expectedSL-AzimuthAoA</i> This field specifies expected azimuth angle of arrival. Scale factor 0.1 degree; range 0 to 359.9 degrees.
<i>expectedSL-AzimuthAoA-Uncertainty</i> This field specifies the (single-sided) uncertainty of the expected azimuth angle of arrival. If this field is absent, it indicates maximum uncertainty (60 degrees). Scale factor 1 degree; range 0 to 60 degrees.
<i>expectedSL-ElevationAoA</i> This field specifies expected elevation angle of arrival. Scale factor 0.1 degree; range 0 to 180 degrees.
<i>expectedSL-ElevationAoA-Uncertainty</i> This field specifies expected the (single-sided) uncertainty of the expected elevation angle of arrival. If this field is absent, it indicates maximum uncertainty (30 degrees). Scale factor 1 degree; range 0 to 30 degrees.
<i>lcs-GCS-TranslationParameter</i> This field provides the angles α (bearing angle), β (downtilt angle) and γ (slant angle) for the translation of a Local Coordinate System (LCS) to a Global Coordinate System (GCS) as defined in TR 38.901 [8].
<i>sl-AoA-Error</i> This field provides SL-AoA error reasons.

– *SL-AoA-RequestLocationInformation*

```

-- ASN1START
-- TAG-SL-AOA-REQUESTLOCATIONINFORMATION-START

SL-AoA-RequestLocationInformation ::= SEQUENCE {
    sl-AoA-Request                ENUMERATED { aoa, zoa, both },
    measurementReportingType      ENUMERATED { gcs, lcsWithTranslation, lcsWithoutTranslation } OPTIONAL,
    measurementsForMultipleARP-IDs-Rx SEQUENCE {
        requestedARP-IDs-Rx      BIT STRING (SIZE (4))                OPTIONAL
    }                               OPTIONAL,
    sl-ARP-InfoRequest            ENUMERATED { true }                OPTIONAL,
    sl-LOS-NLOS-IndicatorRequest  ENUMERATED { true }                OPTIONAL,
    sl-PRS-RSRP-Request           ENUMERATED { true }                OPTIONAL,
    sl-RSRPP-Request              ENUMERATED { true }                OPTIONAL,
    sl-AdditionalPathsRequest     ENUMERATED { true }                OPTIONAL,
    ...
}

-- TAG-SL-AOA-REQUESTLOCATIONINFORMATION-STOP
-- ASN1STOP

```

<i>SL-AoA-RequestLocationInformation</i> field descriptions
<i>measurementsForMultipleARP-IDs-Rx</i> This field, if present, indicates that the UE is requested to provide the requested SL-AoA measurements for multiple SL-PRS Rx ARP-IDs.
<i>requestedARP-IDs-Rx</i> This field, if present, indicates that the UE is requested to provide the requested SL-AoA measurements for indicated SL-PRS Rx ARP-IDs. Bit 1 in the bit string indicates ARP-ID = 1, bit 2 indicates ARP-ID = 2, and so on.
<i>sl-AdditionalPathsRequest</i> This field, if present, indicates that the UE is requested to provide <i>sl-AoA-AdditionalPathList</i> .
<i>sl-ARP-InfoRequest</i> This field, if present, indicates that the UE is requested to provide <i>sl-POS-ARP-ID-Rx</i> .
<i>sl-LOS-NLOS-IndicatorRequest</i> This field, if present, indicates that the UE is requested to provide the estimated LOS-NLOS-Indicator.
<i>sl-PRS-RSRP-Request</i> This field, if present, indicates that the UE is requested to provide <i>sl-PRS-RSRP-Result</i> .
<i>sl-RSRPP-Request</i> <i>This field, if present, indicates that the UE is requested to provide sl-RSRPP.</i>

– *SL-AoA-ProvideLocationInformation*

```

-- ASN1START
-- TAG-SL-AOA-PROVIDELOCATIONINFORMATION-START

SL-AoA-ProvideLocationInformation ::= SEQUENCE {
    sl-AoA-SignalMeasurementInformation    SL-AoA-SignalMeasurementInformation    OPTIONAL,
    sl-AoA-Error                          SL-AoA-LocationInformationError        OPTIONAL,
    ...
}

SL-AoA-SignalMeasurementInformation ::= SEQUENCE {
    sl-AoA-MeasList                        SEQUENCE (SIZE(1.. maxNrOfUEs)) OF SL-AoA-MeasElementPerARP-ID-Rx,
    ...
}

SL-AoA-MeasElementPerARP-ID-Rx ::= SEQUENCE (SIZE(1..4)) OF SL-AoA-MeasElement

SL-AoA-MeasElement ::= SEQUENCE {
    applicationLayerID                    OCTET STRING                        OPTIONAL, -- Cond FirstElement
    sl-LCS-GCS-Translation                 LCS-GCS-Translation                OPTIONAL, -- Cond FirstElement
    los-NLOS-Indicator                    LOS-NLOS-Indicator                 OPTIONAL, -- sl-losNlosIndicator
    sl-AngleQuality                        MeasurementAngleQuality             OPTIONAL, -- sl-AngleQuality
    sl-AoA-AdditionalPathList              SL-AoA-AdditionalPathList          OPTIONAL,
    sl-AzimuthAoA-Result                   INTEGER (0..3599)                   OPTIONAL, -- sl-PRS-AoA
    sl-POS-ARP-ID-Rx                       INTEGER (1..4)                       OPTIONAL, -- sl-pos-arpID-Rx
    sl-PRS-ResourceId                      INTEGER (0..16)                       OPTIONAL, -- sl-PRS-ResourceId
    sl-PRS-RSRP-Result                     INTEGER (0..126)                     OPTIONAL, -- sl-PRS-RSRP
    sl-PRS-RSRPP-Result                    INTEGER (0..126)                     OPTIONAL, -- sl-PRS-RSRPP
    sl-TimeStamp                           SL-TimeStamp                         OPTIONAL, -- sl-Timestamp
    sl-ElevationAoA-Result                  INTEGER (0..1800)                     OPTIONAL, -- sl-PRS-AoA
    ...
}

```

```

}
SL-AoA-AdditionalPathList ::= SEQUENCE (SIZE(1..2)) OF SL-AoA-AdditionalPath

SL-AoA-AdditionalPath ::= SEQUENCE {
    sl-AngleQuality          MeasurementAngleQuality  OPTIONAL, -- sl-AngleQuality
    sl-AzimuthAoA-AdditionalPathResult  INTEGER (0..3599)      OPTIONAL, -- additionalPath-SL-PRS-AoA
    sl-ElevationAoA-AdditionalPathResult  INTEGER (0..1800)      OPTIONAL, -- additionalPath-SL-PRS-AoA
    sl-PRS-AdditionalPathRSRPP-Result    INTEGER (0..126)      OPTIONAL, -- additionalPath-SL-PRS-RSRPP
    ...
}

MeasurementAngleQuality ::= SEQUENCE {
    azimuthQuality          INTEGER (0..255),
    elevationQuality        INTEGER (0..255)      OPTIONAL
}

SL-AoA-LocationInformationError ::= ENUMERATED { undefined, assistanceDataMissing, notAllRequestedMeasurementsPossible, ... }

-- TAG-SL-AOA-PROVIDELOCAATIONINFORMATION-STOP
-- ASN1STOP

```

Conditional presence	Explanation
<i>FirstElement</i>	The field is mandatory present in the first <i>SL-AoA-MeasElement</i> in IE <i>SL-AoA-MeasElementPerARP-ID-Rx</i> . Otherwise, it is not present.

SL-AoA-ProvideLocationInformation field descriptions
los-NLOS-Indicator This field specifies the UE's best estimate of the LOS or NLOS of the UE measurements (including RSTD, RTOA, RSRP, RSRPP, AoA and UE Rx-Tx time difference).
sl-AngleQuality This field specifies the angle quality for measurement results reported. Scale factor 0.1 degree.
sl-AoA-AdditionalPathList This field specifies the sidelink PRS measurements based on additional path of arrival.
sl-AzimuthAoA-LCS-GCS-Translation This field provides the angles α (bearing angle), β (downtilt angle) and γ (slant angle) for the translation of a Local Coordinate System (LCS) to a Global Coordinate System (GCS) as defined in TR 38.901 [8].
sl-AzimuthAoA-Result This field specifies the first path result of azimuth angle of arrival. Scale factor 0.1 degree; range 0 to 359.9 degrees.
sl-ElevationAoA-LCS-GCS-Translation This field provides the angles α (bearing angle), β (downtilt angle) and γ (slant angle) for the translation of a Local Coordinate System (LCS) to a Global Coordinate System (GCS) as defined in TR 38.901 [8].
sl-ElevationAoA-Result This field specifies the first path result of elevation angle of arrival. Scale factor 0.1 degree; range 0 to 180 degrees.
sl-POS-ARP-ID-Rx This field indicates ARP ID of an ARP used for reception for per-ARP measurement reporting. The ARP ID is used to uniquely identify an ARP associated with a UE.
sl-PRS-ResourceID This field specifies the PRS resource ID used for SL positioning measurements.
sl-PRS-RSRP-Result This field specifies the sidelink PRS reference signal received power (RSRP) measurement.
sl-PRS-RSRPP-Result This field specifies the SL-RSRPP measurement based on first path of arrival.
sl-TimeStamp This field specifies the time instance at which the SL-PRS RSRP (if included) measurement is performed.

– *End of SLPP-PDU-SL-AoA-Contents*

```
-- ASN1START
END
-- ASN1STOP
```

6.8 SLPP PDU SL-RTT Contents

– *SLPP-PDU-SL-RTT-Contents*

This ASN.1 segment is the start of the SLPP PDU SL-RTT Contents definitions.

```

-- ASN1START
-- TAG-SLPP-PDU-SL-RTT-CONTENTS-START

SLPP-PDU-SL-RTT-Contents DEFINITIONS AUTOMATIC TAGS ::=

BEGIN

IMPORTS
    LOS-NLOS-Indicator,
    PositioningModes,
    SL-TimeStamp,
    SL-TimingQuality,
    maxNrOfUEs,
    ScheduledLocationTimeSupportPerMode,
    nrMaxBands

FROM
    SLPP-PDU-Definitions;

-- TAG-SLPP-PDU-SL-RTT-CONTENTS-STOP
-- ASN1STOP

```

– *SL-RTT-RequestCapabilities*

```

-- ASN1START
-- TAG-SL-RTT-REQUESTCAPABILITIES-START

SL-RTT-RequestCapabilities ::= SEQUENCE {
    ...
}

-- TAG-SL-RTT-REQUESTCAPABILITIES-STOP
-- ASN1STOP

```

– *SL-RTT-ProvideCapabilities*

The IE SL-RTT-ProvideCapabilities is used to indicate the support of SL-RTT and to provide SL-RTT positioning capabilities.

```

-- ASN1START
-- TAG-SL-RTT-PROVIDECAPABILITIES-START

SL-RTT-ProvideCapabilities ::= SEQUENCE {
    positioningModes                PositioningModes,
    tenMsUnitResponseTime           PositioningModes                OPTIONAL,
    periodicalReporting              PositioningModes                OPTIONAL,
    scheduledLocationRequestSupported ScheduledLocationTimeSupportPerMode OPTIONAL,
    sl-RTT-CapabilityBandList        SEQUENCE (SIZE (1..nrMaxBands)) OF SL-RTT-CapabilityPerBand,
    ...
}

```

```
SL-RTT-CapabilityPerBand ::= SEQUENCE {
  --R1 41-1-7c SL PRS measurement for UE Rx-Tx time difference without Tx time stamp
  sl-PRS-RxTxTimeDiffWithoutTxTimeStamp ENUMERATED {n1,n2,n3,n4} OPTIONAL,
  --R1 41-1-7d SL PRS measurement for UE Rx-Tx time difference with Tx time stamp
  sl-PRS-RxTxTimeDiffWithTxTimeStamp SEQUENCE {
    numOfMeasForSameSL-PRS ENUMERATED {n1,n2,n3,n4},
    maxMeasReportingForDiffSL-PRS ENUMERATED {n1,n2,n3,n4}
  } OPTIONAL,
  measurementsForMultipleARP-IDs-Rx ENUMERATED { supported } OPTIONAL,
  ...
}

-- TAG-SL-RTT-PROVIDECAPABILITIES-STOP
-- ASN1STOP
```

SL-RTT-ProvideCapabilities field descriptions
<p>measurementsForMultipleARP-IDs-Rx This field, if present, indicates that the UE supports SL-RTT measurements for multiple SL-PRS Rx ARP-IDs.</p>
<p>periodicalReporting This field, if present, specifies the positioning modes for which the UE supports <i>periodicalReporting</i>. This is represented by a bit string, with a one value at the bit position means <i>periodicalReporting</i> for the positioning mode is supported; a zero value means not supported. If this field is absent, the UE does not support <i>periodicalReporting</i> in <i>CommonEsRequestLocationInformation</i>.</p>
<p>positioningModes This field specifies the SL-RTT mode(s) supported by the UE.</p>
<p>scheduledLocationRequestSupported This field, if present, specifies the positioning modes for which the UE supports scheduled location requests, i.e., supports the IE <i>ScheduledLocationTime</i> in IE <i>CommonEsRequestLocationInformation</i> and the time base(s) supported for the scheduled location time for each positioning mode. If this field is absent, the UE does not support scheduled location requests.</p>
<p>sl-PRS-RxTxTimeDiffWithoutTxTimeStamp Indicates whether UE supports SL PRS measurement for UE Rx–Tx time difference without Tx time stamp, and is comprised of the following functional components:</p> <ul style="list-style-type: none"> - Support UE Rx–Tx time difference measurement based on SL PRS; - Support UE Rx–Tx time difference measurement reporting without Tx time stamp. <p>The value indicates the supported maximum number of Rx-Tx measurement reporting for different SL-PRS reception for the same pair of UEs. UE supporting this feature shall also support <i>sl-PRS-CommonProcCapabilityPerBand</i>, and at least one of <i>sl-PRS-TxInSharedResourcePool</i>, <i>sl-PRS-TxScheme1InDedicatedResourcePool</i> or <i>sl-PRS-TxScheme2InDedicatedResourcePool</i>.</p>
<p>sl-PRS-RxTxTimeDiffWithTxTimeStamp Indicates whether UE supports SL PRS measurement for UE Rx–Tx time difference with Tx time stamp, and is comprised of the following functional components:</p> <ul style="list-style-type: none"> - Support UE Rx–Tx time difference measurement based on SL PRS; - Support UE Rx–Tx time difference measurement reporting with Tx time stamp; <p>This field comprises the following sub-fields:</p> <ul style="list-style-type: none"> - <i>numOfMeasForSameSL-PRS</i>: indicates the reported number of Rx-Tx measurements for the same SL-PRS transmission (or reception) and different SL-PRS reception (or transmission) for the same pair of UEs; - <i>maxMeasReportingForDiffSL-PRS</i>: indicates the supported maximum number of Rx-Tx measurement reporting for different SL-PRS reception for the same pair of UEs. <p>UE supporting this feature shall also support <i>sl-PRS-CommonProcCapabilityPerBand</i>, and at least one of <i>sl-PRS-TxInSharedResourcePool</i>, <i>sl-PRS-TxScheme1InDedicatedResourcePool</i> or <i>sl-PRS-TxScheme2InDedicatedResourcePool</i>.</p>
<p>tenMsUnitResponseTime This field, if present, specifies the positioning modes for which the UE supports the enumerated value '<i>ten-milli-seconds</i>' in the IE <i>ResponseTime</i> in IE <i>CommonEsRequestLocationInformation</i>. This is represented by a bit string, with a one value at the bit position means '<i>ten-milli-seconds</i>' response time unit for the positioning mode is supported; a zero value means not supported. If this field is absent, the UE does not support '<i>ten-milli-seconds</i>' response time unit in <i>CommonEsRequestLocationInformation</i>.</p>

– **SL-RTT-RequestAssistanceData**

```
-- ASN1START
-- TAG-SL-RTT-REQUESTASSISTANCEDATA-START

SL-RTT-RequestAssistanceData ::= SEQUENCE {
    ...
}
-- TAG-SL-RTT-REQUESTASSISTANCEDATA-STOP
-- ASN1STOP
```

– *SL-RTT-ProvideAssistanceData*

```
-- ASN1START
-- TAG-SL-RTT-PROVIDEASSISTANCEDATA-START

SL-RTT-ProvideAssistanceData ::= SEQUENCE {
    ...
}

-- TAG-SL-RTT-PROVIDEASSISTANCEDATA-STOP
-- ASN1STOP
```

– *SL-RTT-RequestLocationInformation*

```
-- ASN1START
-- TAG-SL-RTT-REQUESTLOCATIONINFORMATION-START

SL-RTT-RequestLocationInformation ::= SEQUENCE {
    sl-ARP-InfoRequest          ENUMERATED { true }          OPTIONAL,
    sl-LOS-NLOS-IndicatorRequest  ENUMERATED { true }          OPTIONAL,
    sl-PRS-RSRP-Request          ENUMERATED { true }          OPTIONAL,
    sl-RSRPP-Request            ENUMERATED { true }          OPTIONAL,
    sl-AdditionalPathsRequest    ENUMERATED { true }          OPTIONAL,
    tx-TimeInfoRequest          ENUMERATED { true }          OPTIONAL,
    multipleSL-PRS-RxTxTimeDiffRequest  SEQUENCE {
        diffSL-PRS-Receptions      ENUMERATED { n2, n3, n4 }  OPTIONAL,
        diffSL-PRS-Transmissions   ENUMERATED { n2, n3, n4 }  OPTIONAL
    } OPTIONAL,
    measurementsForMultipleARP-IDs-Rx  SEQUENCE {
        requestedARP-IDs-Rx        BIT STRING (SIZE (4))  OPTIONAL
    } OPTIONAL,
    associatedSL-PRS-TxTimeStampRequest  ENUMERATED { true }          OPTIONAL,
    ...
}

-- TAG-SL-RTT-REQUESTLOCATIONINFORMATION-STOP
-- ASN1STOP
```

SL-RTT-RequestLocationInformation field descriptions
<p>associatedSL-PRS-TxTimeStampRequest This field, if present, indicates that the UE is requested to provide the associated SL PRS transmission time stamp.</p>
<p>measurementsForMultipleARP-IDs-Rx This field, if present, indicates that the UE is requested to provide the requested SL-RTT measurements for multiple SL-PRS Rx ARP-IDs.</p>
<p>multipleSL-PRS-RxTxTimeDiffRequest This field, if present, indicates that the UE is requested to provide multiple Rx-Tx measurements for the same SL PRS transmission (resp. reception) and up to N different SL PRS receptions (resp. transmissions) for the same pair of UE(s). Fields are as follows:</p> <ul style="list-style-type: none"> - diffSL-PRS-Receptions indicates that the UE is requested to provide multiple Rx-Tx measurements for the same SL PRS transmission and up to N different SL PRS receptions. - diffSL-PRS-Transmissions indicates that the UE is requested to provide multiple Rx-Tx measurements for the same SL PRS transmission and up to N different SL PRS transmissions.
<p>requestedARP-IDs-Rx This field, if present, indicates that the UE is requested to provide the requested SL-RTT measurements for indicated SL-PRS Rx ARP-IDs. Bit 1 in the bit string indicates ARP-ID = 1, bit 2 indicates ARP-ID = 2, and so on.</p>
<p>sl-AdditionalPathsRequest This field, if present, indicates that the UE is requested to provide <i>sl-RTT-AdditionalPathList</i>.</p>
<p>sl-ARP-InfoRequest This field, if present, indicates that the UE is requested to provide <i>sl-POS-ARP-ID-Rx</i>.</p>
<p>sl-RSRPP-Request This field, if present, indicates that the UE is requested to provide <i>sl-RSRPP</i>.</p>
<p>sl-LOS-NLOS-IndicatorRequest This field, if present, indicates that the UE is requested to provide the estimated LOS-NLOS-Indicator.</p>
<p>sl-PRS-RSRP-Request This field, if present, indicates that the UE is requested to provide <i>sl-PRS-RSRP-Result</i>.</p>

– SL-RTT-ProvideLocationInformation

```

-- ASN1START
-- TAG-SL-RTT-PROVIDELOCAATIONINFORMATION-START

SL-RTT-ProvideLocationInformation ::= SEQUENCE {
    sl-RTT-SignalMeasurementInformation    SL-RTT-SignalMeasurementInformation    OPTIONAL,
    sl-RTT-Error                          SL-RTT-LocationInformationError        OPTIONAL,
    ...
}

SL-RTT-MeasElementPerARP-ID-Rx ::= SEQUENCE (SIZE(1..4)) OF SL-RTT-MeasElement

SL-RTT-SignalMeasurementInformation ::= SEQUENCE {
    sl-RTT-MeasList                        SEQUENCE (SIZE(1..maxNrOfUEs)) OF SL-RTT-MeasElementPerARP-ID-Rx,
    ...
}

SL-RTT-MeasElement ::= SEQUENCE {
    applicationLayerID                     OCTET STRING                        OPTIONAL, -- Cond FirstElement
    los-NLOS-Indicator                     LOS-NLOS-Indicator                 OPTIONAL, -- sl-losNlosIndicator

```

```

sl-POS-ARP-ID-Rx          INTEGER (1..4)          OPTIONAL, -- sl-pos-arpID-Rx
sl-PRS-RxTxTimeDiffMeasResult  SL-PRS-RxTxTimeDiffMeasResult,
...
}

SL-PRS-RxTxTimeDiffMeasResult ::= CHOICE {
  single-SL-PRS-RxTxTimeDiff      SL-PRS-RxTxTimeDiffResult,
  multiple-SL-PRS-RxTxTimeDiff    SEQUENCE {
    sameSL-PRS-TxAndDiffSL-PRS-Rx  SEQUENCE (SIZE (2..4)) OF SL-PRS-RxTxTimeDiffResult  OPTIONAL,
    sameSL-PRS-RxAndDiffSL-PRS-Tx  SEQUENCE (SIZE (2..4)) OF SL-PRS-RxTxTimeDiffResult  OPTIONAL
  },
  ...
}

SL-PRS-RxTxTimeDiffResult ::= SEQUENCE {
  sl-PRS-ResourceId          INTEGER (0..16)          OPTIONAL, -- sl-PRS-ResourceId
  sl-PRS-RxTxTimeDiffResult  CHOICE {
    k0          INTEGER (0..1970049),
    k1          INTEGER (0..985025),
    k2          INTEGER (0..492513),
    k3          INTEGER (0..246257),
    k4          INTEGER (0..123129),
    k5          INTEGER (0..61565)
  }
  sl-PRS-RSRP-Result          INTEGER (0..126)          OPTIONAL, -- sl-PRS-RxTxTimeDiff
  sl-PRS-RSRPP-Result        INTEGER (0..126)          OPTIONAL, -- sl-PRS-RSRP
  sl-RTT-AdditionalPathList  SL-RTT-AdditionalPathList  OPTIONAL, -- sl-PRS-RSRPP
  sl-TimeStamp               SL-TimeStamp              OPTIONAL, -- sl-RTT-AdditionalPathList
  sl-TimingQuality           SL-TimingQuality          OPTIONAL, -- sl-TimeStamp
  tx-TimeInfo                SL-TimeStamp              OPTIONAL, -- sl-TimingQuality
  ...
}

SL-RTT-AdditionalPathList ::= SEQUENCE (SIZE(1..8)) OF SL-RTT-AdditionalPath

SL-RTT-AdditionalPath ::= SEQUENCE {
  sl-PRS-RxTxTimeDiffAdditionalPathResult  CHOICE {
    k0          INTEGER (0..8191),
    k1          INTEGER (0..4095),
    k2          INTEGER (0..2047),
    k3          INTEGER (0..1023),
    k4          INTEGER (0..511),
    k5          INTEGER (0..255)
  }
  sl-PRS-AdditionalPathRSRPP-Result        INTEGER (0..126)          OPTIONAL, -- additionalPath-SL-PRS-Rx-Tx-TimeDiff
  sl-TimingQuality                         SL-TimingQuality          OPTIONAL, -- additionalPath-SL-PRS-RSRPP
  ...
}

SL-RTT-LocationInformationError ::= ENUMERATED { undefined, assistanceDataMissing, notAllRequestedMeasurementsPossible, ... }

-- TAG-SL-RTT-PROVIDELOCATIONINFORMATION-STOP

```

```
-- ASN1STOP
```

Conditional presence	Explanation
<i>FirstElement</i>	The field is mandatory present in the first <i>SL-RTT-MeasElement</i> in IE <i>SL-RTT-MeasElementPerARP-ID-Rx</i> . Otherwise, it is not present.

<i>SL-RTT-ProvideLocationInformation</i> field descriptions
<i>los-NLOS-Indicator</i> This field specifies the UE's best estimate of the LOS or NLOS of the UE measurements (including RSTD, RTOA, RSRP, RSRPP, AoA and UE Rx-Tx time difference).
<i>sl-POS-ARP-ID-Rx</i> This field indicates ARP ID of an ARP used for reception for per-ARP measurement reporting. The ARP ID is used to uniquely identify an ARP associated with a UE.
<i>sl-PRS-ResourceID</i> This field specifies the PRS resource ID used for SL positioning measurements.
<i>sl-PRS-RxTxTimeDiffResult</i> This field specifies SL Rx-Tx time difference measurement based on first path of arrival. The mapping of the field is defined in TS 38.133 [13].
<i>sl-PRS-RSRP-Result</i> This field specifies the sidelink PRS reference signal received power (RSRP) measurement.
<i>sl-PRS-RSRPP-Result</i> This field specifies the SL-RSRPP measurement based on first path of arrival.
<i>sl-RTT-AdditionalPathList</i> This field specifies the sidelink PRS measurements based on additional path of arrival.
<i>sl-TimeStamp</i> This field specifies the time instance at which the SL Rx-Tx time difference and SL-PRS RSRP (if included) measurement is performed.

– *End of SLPP-PDU-SL-RTT-Contents*

```
-- ASN1START
```

```
END
```

```
-- ASN1STOP
```

6.9 SLPP PDU SL-TDOA Contents

– *SLPP-PDU-SL-TDOA-Contents*

This ASN.1 segment is the start of the SLPP PDU SL-TDOA Contents definitions.

```
-- ASN1START
```

```
-- TAG-SLPP-PDU-SL-TDOA-CONTENTS-START
```



```

SLPP-PDU-SL-TDOA-Contents DEFINITIONS AUTOMATIC TAGS ::=
BEGIN

IMPORTS
    LOS-NLOS-Indicator,
    PositioningModes,
    SL-RTD-Info,
    SL-TimeStamp,
    SL-TimingQuality,
    maxNrOfUEs,
    ScheduledLocationTimeSupportPerMode,
    nrMaxBands

FROM
    SLPP-PDU-Definitions;

-- TAG-SLPP-PDU-SL-TDOA-CONTENTS-STOP
-- ASN1STOP

```

– *SL-TDOA-RequestCapabilities*

```

-- ASN1START
-- TAG-SL-TDOA-REQUESTCAPABILITIES-START

SL-TDOA-RequestCapabilities ::= SEQUENCE {
    ...
}

-- TAG-SL-TDOA-REQUESTCAPABILITIES-STOP
-- ASN1STOP

```

– *SL-TDOA-ProvideCapabilities*

The IE *SL-TDOA-ProvideCapabilities* is used to indicate the support of SL-TDOA and to provide SL-TDOA positioning capabilities.

```

-- ASN1START
-- TAG-SL-TDOA-PROVIDECAPABILITIES-START

SL-TDOA-ProvideCapabilities ::= SEQUENCE {
    positioningModes          PositioningModes,
    tenMsUnitResponseTime    PositioningModes          OPTIONAL,
    periodicalReporting       PositioningModes          OPTIONAL,
    scheduledLocationRequestSupported ScheduledLocationTimeSupportPerMode OPTIONAL,
    sl-TDOA-CapabilityBandList SEQUENCE (SIZE (1..nrMaxBands)) OF SL-TDOA-CapabilityPerBand,
    ...
}

SL-TDOA-CapabilityPerBand ::= SEQUENCE {

```

```

--R1 41-1-7a    SL PRS measurement for SL-RSTD
sl-PRS-RSTD-Meas      ENUMERATED {n1,n2,n3,n4}      OPTIONAL,
measurementsForMultipleARP-IDs-Rx  ENUMERATED { supported }  OPTIONAL,
...
}

-- TAG-SL-TDOA-PROVIDECAPABILITIES-STOP
-- ASN1STOP

```

SL-TDOA-ProvideCapabilities field descriptions

measurementsForMultipleARP-IDs-Rx

This field, if present, indicates that the UE supports SL-TDOA measurements for multiple SL-PRS Rx ARP-IDs.

periodicalReporting

This field, if present, specifies the positioning modes for which the UE supports *periodicalReporting*. This is represented by a bit string, with a one value at the bit position means *periodicalReporting* for the positioning mode is supported; a zero value means not supported. If this field is absent, the UE does not support *periodicalReporting* in *CommonEsRequestLocationInformation*.

positioningModes

This field specifies the SL-TDOA mode(s) supported by the UE.

scheduledLocationRequestSupported

This field, if present, specifies the positioning modes for which the UE supports scheduled location requests, i.e., supports the IE *ScheduledLocationTime* in IE *CommonEsRequestLocationInformation* and the time base(s) supported for the scheduled location time for each positioning mode. If this field is absent, the UE does not support scheduled location requests.

sl-PRS-RSTD-Meas

Indicates whether UE supports SL PRS measurement for SL-RSTD, and is comprised of the following functional components:

- Support SL RSTD measurement based on SL-PRS;
- Support SL RSTD measurement reporting;

The value indicates the supported maximum number of SL RSTD measurement reporting for different SL-PRS reception for the same pair of UEs.

UE supporting this feature shall also support *sl-PRS-CommonProcCapabilityPerBand*.

tenMsUnitResponseTime

This field, if present, specifies the positioning modes for which the UE supports the enumerated value '*ten-milli-seconds*' in the IE *ResponseTime* in IE *CommonEsRequestLocationInformation*. This is represented by a bit string, with a one value at the bit position means '*ten-milli-seconds*' response time unit for the positioning mode is supported; a zero value means not supported. If this field is absent, the UE does not support '*ten-milli-seconds*' response time unit in *CommonEsRequestLocationInformation*.

– SL-TDOA-RequestAssistanceData

```

-- ASN1START
-- TAG-SL-TDOA-REQUESTASSISTANCEDATA-START

SL-TDOA-RequestAssistanceData ::= SEQUENCE {
    sl-RTD-InfoRequest      ENUMERATED { true }      OPTIONAL,
    ...
}

-- TAG-SL-TDOA-REQUESTASSISTANCEDATA-STOP
-- ASN1STOP

```

SL-TDOA-RequestAssistanceData field descriptions**sl-RTD-InfoRequest**

This field indicates the SL RTD information requested.

SL-TDOA-ProvideAssistanceData

```
-- ASN1START
-- TAG-SL-TDOA-PROVIDEASSISTANCEDATA-START

SL-TDOA-ProvideAssistanceData ::= SEQUENCE {
    sl-RTD-Info          SL-RTD-Info          OPTIONAL,
    sl-TDOA-Error        SL-TDOA-AssistanceDataError OPTIONAL,
    ...
}

SL-TDOA-AssistanceDataError ::= ENUMERATED { undefined, assistanceDataNotAvailable, ... }

-- TAG-SL-TDOA-PROVIDEASSISTANCEDATA-STOP
-- ASN1STOP
```

SL-TDOA-ProvideAssistanceData field descriptions**sl-RTD-Info**

This field provides synchronization information of SL Anchor UEs.

sl-TDOA-Error

This field provides SL-TDOA error reasons.

SL-TDOA-RequestLocationInformation

```
-- ASN1START
-- TAG-SL-TDOA-REQUESTLOCATIONINFORMATION-START

SL-TDOA-RequestLocationInformation ::= SEQUENCE {
    sl-ARP-InfoRequest          ENUMERATED { true }          OPTIONAL,
    sl-LOS-NLOS-IndicatorRequest  ENUMERATED { true }          OPTIONAL,
    sl-PRS-RSRP-Request          ENUMERATED { true }          OPTIONAL,
    sl-RSRPP-Request             ENUMERATED { true }          OPTIONAL,
    sl-AdditionalPathsRequest     ENUMERATED { true }          OPTIONAL,
    measurementsForMultipleARP-IDs-Rx SEQUENCE {
        requestedARP-IDs-Rx      BIT STRING (SIZE (4))  OPTIONAL
    }
    ...
}

-- TAG-SL-TDOA-REQUESTLOCATIONINFORMATION-STOP
-- ASN1STOP
```

<i>SL-TDOA-RequestLocationInformation</i> field descriptions	
<i>measurementsForMultipleARP-IDs-Rx</i>	This field, if present, indicates that the UE is requested to provide the requested SL-TDOA measurements for multiple SL-PRS Rx ARP-IDs.
<i>requestedARP-IDs-Rx</i>	This field, if present, indicates that the UE is requested to provide the requested SL-TDOA measurements for indicated SL-PRS Rx ARP-IDs. Bit 1 in the bit string indicates ARP-ID = 1, bit 2 indicates ARP-ID = 2, and so on.
<i>sl-AdditionalPathsRequest</i>	This field, if present, indicates that the UE is requested to provide <i>sl-TDOA-AdditionalPathList</i> .
<i>sl-ARP-InfoRequest</i>	This field, if present, indicates that the UE is requested to provide <i>sl-POS-ARP-ID-Rx</i> .
<i>sl-LOS-NLOS-IndicatorRequest</i>	This field, if present, indicates that the UE is requested to provide the estimated LOS-NLOS-Indicator.
<i>sl-PRS-RSRP-Request</i>	This field, if present, indicates that the UE is requested to provide <i>sl-PRS-RSRP-Result</i> .
<i>sl-RSRPP-Request</i>	This field, if present, indicates that the UE is requested to provide <i>sl-RSRPP</i> .

– *SL-TDOA-ProvideLocationInformation*

```

-- ASN1START
-- TAG-SL-TDOA-PROVIDELOCAATIONINFORMATION-START

SL-TDOA-ProvideLocationInformation ::= SEQUENCE {
    sl-RSTD-ReferenceUE-Info          SEQUENCE {
        applicationLayerID          OCTET STRING
    }
    sl-TDOA-SignalMeasurementInformation  SL-TDOA-SignalMeasurementInformation  OPTIONAL,
    sl-TDOA-Error                    SL-TDOA-LocationInformationError          OPTIONAL,
    ...
}

SL-TDOA-SignalMeasurementInformation ::= SEQUENCE {
    sl-TDOA-MeasList                SEQUENCE (SIZE(1..maxNrOfUEs)) OF SL-TDOA-MeasElementPerARP-ID-Rx,
    ...
}

SL-TDOA-MeasElementPerARP-ID-Rx ::= SEQUENCE (SIZE(1..4)) OF SL-TDOA-MeasElement

SL-TDOA-MeasElement ::= SEQUENCE {
    applicationLayerID              OCTET STRING                OPTIONAL, -- Cond FirstElement
    los-NLOS-Indicator              LOS-NLOS-Indicator        OPTIONAL, -- sl-losNlosIndicator
    sl-POS-ARP-ID-Rx                INTEGER (1..4)          OPTIONAL, -- sl-pos-arpID-Rx
    sl-PRS-ResourceId               INTEGER (0..16)        OPTIONAL, -- sl-PRS-ResourceId
    sl-PRS-RSRP-Result              INTEGER (0..126)      OPTIONAL, -- sl-PRS-RSRP
    sl-PRS-RSRPP-Result             INTEGER (0..126)      OPTIONAL, -- sl-PRS-RSRPP
    sl-RSTD-Result                  CHOICE {
        k0                          INTEGER (0..1970049),

```

```

        k1                INTEGER (0..985025),
        k2                INTEGER (0..492513),
        k3                INTEGER (0..246257),
        k4                INTEGER (0..123129),
        k5                INTEGER (0..61565)
    }
    sl-TDOA-AdditionalPathList    SL-TDOA-AdditionalPathList    OPTIONAL, -- sl-PRS-RSTD
    sl-TimeStamp                SL-TimeStamp                OPTIONAL, -- sl-Timestamp
    sl-TimingQuality            SL-TimingQuality            OPTIONAL, -- sl-TimingQuality
    ...
}

SL-TDOA-AdditionalPathList ::= SEQUENCE (SIZE(1..8)) OF SL-TDOA-AdditionalPath

SL-TDOA-AdditionalPath ::= SEQUENCE {
    sl-RSTD-AdditionalPathResult    CHOICE {
        k0                INTEGER (0..1970049),
        k1                INTEGER (0..985025),
        k2                INTEGER (0..492513),
        k3                INTEGER (0..246257),
        k4                INTEGER (0..123129),
        k5                INTEGER (0..61565)
    }
    sl-PRS-AdditionalPathRSRPP-Result    INTEGER (0..126)
    sl-TimingQuality                    SL-TimingQuality
    ...
}

SL-TDOA-LocationInformationError ::= ENUMERATED { undefined, assistanceDataMissing, notAllRequestedMeasurementsPossible, ... }

-- TAG-SL-TDOA-PROVIDELOCAATIONINFORMATION-STOP
-- ASN1STOP

```

Conditional presence	Explanation
<i>FirstElement</i>	The field is mandatory present in the first <i>SL-TDOA-MeasElement</i> in IE <i>SL-TDOA-MeasElementPerARP-ID-Rx</i> . Otherwise, it is not present.

<i>SL-TDOA-ProvideLocationInformation</i> field descriptions
<i>los-NLOS-Indicator</i> This field specifies the UE's best estimate of the LOS or NLOS of the UE measurements (including RSTD, RTOA, RSRP, RSRPP, AoA and UE Rx-Tx time difference).
<i>sl-POS-ARP-ID-Rx</i> This field indicates ARP ID of an ARP used for reception for per-ARP measurement reporting. The ARP ID is used to uniquely identify an ARP associated with a UE.
<i>sl-PRS-ResourceID</i> This field specifies the PRS resource ID used for SL positioning measurements.
<i>sl-PRS-RSRP-Result</i> This field specifies the sidelink PRS reference signal received power (RSRP) measurement.
<i>sl-PRS-hRSRPP-Result</i> This field specifies the SL-RSRPP measurement based on first path of arrival.
<i>sl-TDOA-AdditionalPathList</i> This field specifies the sidelink PRS measurements based on additional path of arrival.
<i>sl-RSTD-Result</i> This field specifies the SL-RSTD measurement based on first path of arrival.
<i>sl-RSTD-ReferenceUE-Info</i> This field indicates reference UE information for SL-PRS based RSTD measurement report.
<i>sl-TimeStamp</i> This field specifies the time instance at which the SL RSTD and SL-PRS RSRP (if included) measurement is performed.

– *End of SLPP-PDU-SL-TDOA-Contents*

```
-- ASN1START
END
-- ASN1STOP
```

6.10 SLPP PDU SL-TOA Contents

– *SLPP-PDU-SL-TOA-Contents*

This ASN.1 segment is the start of the SLPP PDU SL-TOA Contents definitions.

```
-- ASN1START
-- TAG-SLPP-PDU-SL-TOA-CONTENTS-START
SLPP-PDU-SL-TOA-Contents DEFINITIONS AUTOMATIC TAGS ::=
BEGIN
IMPORTS
    LOS-NLOS-Indicator,
    PositioningModes,
```

```

SL-RTD-Info,
SL-TimeStamp,
SL-TimingQuality,
maxNrOfUEs,
ScheduledLocationTimeSupportPerMode,
nrMaxBands

FROM
  SLPP-PDU-Definitions;

-- TAG-SLPP-PDU-SL-TOA-CONTENTS-STOP
-- ASN1STOP

```

– *SL-TOA-RequestCapabilities*

```

-- ASN1START
-- TAG-SL-TOA-REQUESTCAPABILITIES-START

SL-TOA-RequestCapabilities ::= SEQUENCE {
  ...
}

-- TAG-SL-TOA-REQUESTCAPABILITIES-STOP
-- ASN1STOP

```

– *SL-TOA-ProvideCapabilities*

The IE *SL-TOA-ProvideCapabilities* is used to indicate the support of SL-TOA and to provide SL-TOA positioning capabilities.

```

-- ASN1START
-- TAG-SL-TOA-PROVIDECAPABILITIES-START

SL-TOA-ProvideCapabilities ::= SEQUENCE {
  positioningModes          PositioningModes,
  tenMsUnitResponseTime     PositioningModes          OPTIONAL,
  periodicalReporting        PositioningModes          OPTIONAL,
  scheduledLocationRequestSupported ScheduledLocationTimeSupportPerMode OPTIONAL,
  sl-TOA-CapabilityBandList SEQUENCE (SIZE (1..nrMaxBands)) OF SL-TOA-CapabilityPerBand,
  ...
}

SL-TOA-CapabilityPerBand ::= SEQUENCE {
  --R1 41-1-7b SL PRS measurement for SL RTOA
  sl-RTOA-Meas              ENUMERATED {n1,n2,n3,n4}          OPTIONAL,
  measurementsForMultipleARP-IDs-Rx ENUMERATED { supported }  OPTIONAL,
  ...
}

-- TAG-SL-TOA-PROVIDECAPABILITIES-STOP

```

-- ASN1STOP

SL-TOA-ProvideCapabilities field descriptions**measurementsForMultipleARP-IDs-Rx**

This field, if present, indicates that the UE supports SL-TOA measurements for multiple SL-PRS Rx ARP-IDs.

periodicalReporting

This field, if present, specifies the positioning modes for which the UE supports *periodicalReporting*. This is represented by a bit string, with a one value at the bit position means *periodicalReporting* for the positioning mode is supported; a zero value means not supported. If this field is absent, the UE does not support *periodicalReporting* in *CommonEsRequestLocationInformation*.

positioningModes

This field specifies the SL-TOA mode(s) supported by the UE.

scheduledLocationRequestSupported

This field, if present, specifies the positioning modes for which the UE supports scheduled location requests, i.e., supports the IE *ScheduledLocationTime* in IE *CommonEsRequestLocationInformation* and the time base(s) supported for the scheduled location time for each positioning mode. If this field is absent, the UE does not support scheduled location requests.

sl-RTOA-Meas

Indicates whether UE supports SL PRS measurement for SL-RTOA, and is comprised of the following functional components:

- Support SL RTOA measurement based on SL-PRS;
- Support SL RTOA measurement reporting.

The value indicates the supported maximum number of SL RTOA measurement reporting for different SL-PRS reception for the same pair of UEs.

UE supporting this feature shall also support *sl-PRS-CommonProcCapabilityPerBand*.

tenMsUnitResponseTime

This field, if present, specifies the positioning modes for which the UE supports the enumerated value '*ten-milli-seconds*' in the IE *ResponseTime* in IE *CommonEsRequestLocationInformation*. This is represented by a bit string, with a one value at the bit position means '*ten-milli-seconds*' response time unit for the positioning mode is supported; a zero value means not supported. If this field is absent, the UE does not support '*ten-milli-seconds*' response time unit in *CommonEsRequestLocationInformation*.

– **SL-TOA-RequestAssistanceData**

-- ASN1START

-- TAG-SL-TOA-REQUESTASSISTANCEDATA-START

```
SL-TOA-RequestAssistanceData ::= SEQUENCE {
    sl-RTD-InfoRequest          ENUMERATED { true }          OPTIONAL,
    ...
}
```

-- TAG-SL-TOA-REQUESTASSISTANCEDATA-STOP

-- ASN1STOP

SL-TOA-RequestAssistanceData field descriptions**sl-RTD-InfoRequest**

This field indicates the SL RTD information requested.

– *SL-TOA-ProvideAssistanceData*

```
-- ASN1START
-- TAG-SL-TOA-PROVIDEASSISTANCEDATA-START

SL-TOA-ProvideAssistanceData ::= SEQUENCE {
    sl-RTD-Info                SL-RTD-Info                OPTIONAL,
    sl-TOA-Error                SL-TOA-AssistanceDataError  OPTIONAL,
    ...
}

SL-TOA-AssistanceDataError ::= ENUMERATED { undefined, assistanceDataNotAvailable, ... }

-- TAG-SL-TOA-PROVIDEASSISTANCEDATA-STOP
-- ASN1STOP
```

<i>SL-TOA-ProvideAssistanceData</i> field descriptions
<i>sl-RTD-Info</i> This field provides synchronization information of SL Anchor UEs.
<i>sl-TOA-Error</i> This field provides SL-TOA error reasons.

– *SL-TOA-RequestLocationInformation*

```
-- ASN1START
-- TAG-SL-TOA-REQUESTLOCATIONINFORMATION-START

SL-TOA-RequestLocationInformation ::= SEQUENCE {
    sl-ARP-InfoRequest          ENUMERATED { true }          OPTIONAL,
    sl-LOS-NLOS-IndicatorRequest  ENUMERATED { true }          OPTIONAL,
    sl-PRS-RSRP-Request          ENUMERATED { true }          OPTIONAL,
    sl-RSRPP-Request             ENUMERATED { true }          OPTIONAL,
    sl-AdditionalPathsRequest     ENUMERATED { true }          OPTIONAL,
    measurementsForMultipleARP-IDs-Rx  SEQUENCE {
        requestedARP-IDs-Rx      BIT STRING (SIZE (4))  OPTIONAL
    }
    ...
}

-- TAG-SL-TOA-REQUESTLOCATIONINFORMATION-STOP
-- ASN1STOP
```

<i>SL-TOA-RequestLocationInformation</i> field descriptions
<i>measurementsForMultipleARP-IDs-Rx</i> This field, if present, indicates that the UE is requested to provide the requested SL-TOA measurements for multiple SL-PRS Rx ARP-IDs.
<i>requestedARP-IDs-Rx</i> This field, if present, indicates that the UE is requested to provide the requested SL-TOA measurements for indicated SL-PRS Rx ARP-IDs. Bit 1 in the bit string indicates ARP-ID = 1, bit 2 indicates ARP-ID = 2, and so on.
<i>sl-AdditionalPathsRequest</i> This field, if present, indicates that the UE is requested to provide <i>sl-TOA-AdditionalPathList</i> .
<i>sl-ARP-InfoRequest</i> This field, if present, indicates that the UE is requested to provide <i>sl-POS-ARP-ID-Rx</i> .
<i>sl-LOS-NLOS-IndicatorRequest</i> This field, if present, indicates that the UE is requested to provide the estimated <i>LOS-NLOS-Indicator</i> .
<i>sl-RSRPP-Request</i> This field, if present, indicates that the UE is requested to provide <i>sl-RSRPP</i> .
<i>sl-PRS-RSRP-Request</i> This field, if present, indicates that the UE is requested to provide <i>sl-PRS-RSRP-Result</i> .

– *SL-TOA-ProvideLocationInformation*

```
-- ASN1START
-- TAG-SL-TOA-PROVIDELOCATIONINFORMATION-START

SL-TOA-ProvideLocationInformation ::= SEQUENCE {
    sl-TOA-SignalMeasurementInformation    SL-TOA-MeasElementPerARP-ID-Rx        OPTIONAL,
    sl-TOA-Error                          SL-TOA-LocationInformationError    OPTIONAL,
    ...
}

SL-TOA-MeasElementPerARP-ID-Rx ::= SEQUENCE (SIZE(1..4)) OF SL-TOA-MeasElement

SL-TOA-MeasElement ::= SEQUENCE {
    los-NLOS-Indicator                    LOS-NLOS-Indicator                OPTIONAL, -- sl-losNlosIndicator
    sl-RTOA-Result                        CHOICE {
        k0                                INTEGER (0..1970049),
        k1                                INTEGER (0..985025),
        k2                                INTEGER (0..492513),
        k3                                INTEGER (0..246257),
        k4                                INTEGER (0..123129),
        k5                                INTEGER (0..61565)
    }
    sl-POS-ARP-ID-Rx                      INTEGER (1..4)                    OPTIONAL, -- sl-pos-arpID-Rx
    sl-PRS-ResourceId                      INTEGER (0..16)                   OPTIONAL, -- sl-PRS-ResourceId
    sl-PRS-RSRP-Result                    INTEGER (0..126)                  OPTIONAL, -- sl-PRS-RSRP
    sl-PRS-RSRPP-Result                   INTEGER (0..126)                  OPTIONAL, -- sl-PRS-RSRPP
    sl-TOA-AdditionalPathList              SL-TOA-AdditionalPathList        OPTIONAL,
    sl-TimeStamp                          SL-TimeStamp                      OPTIONAL, -- sl-Timestamp
    sl-TimingQuality                      SL-TimingQuality                  OPTIONAL, -- sl-TimingQuality
    ...
}
```

```

}
SL-TOA-AdditionalPathList ::= SEQUENCE (SIZE(1..8)) OF SL-TOA-AdditionalPath

SL-TOA-AdditionalPath ::= SEQUENCE {
    sl-RTOA-AdditionalPathResult          CHOICE {
        k0                               INTEGER (0..16351),
        k1                               INTEGER (0..8176),
        k2                               INTEGER (0..4088),
        k3                               INTEGER (0..2044),
        k4                               INTEGER (0..1022),
        k5                               INTEGER (0..511)
    }
    sl-PRS-AdditionalPathRSRPP-Result    INTEGER (0..126)      OPTIONAL, -- additionalPath-SL-PRS-RTOA
    sl-TimingQuality                    SL-TimingQuality      OPTIONAL, -- additionalPath-SL-PRS-RSRPP
    ...
}

SL-TOA-LocationInformationError ::= ENUMERATED { undefined, assistanceDataMissing, notAllRequestedMeasurementsPossible, ... }

-- TAG-SL-TOA-PROVIDELOCAATIONINFORMATION-STOP
-- ASN1STOP

```

***SL-TOA-ProvideLocationInformation* field descriptions**

los-NLOS-Indicator

This field specifies the UE's best estimate of the LOS or NLOS of the UE measurements (including RSTD, RTOA, RSRP, RSRPP, AoA and UE Rx-Tx time difference).

sl-TOA-AdditionalPathList

This field specifies the sidelink PRS measurements based on additional path of arrival.

sl-POS-ARP-ID-Rx

This field indicates ARP ID of an ARP used for reception for per-ARP measurement reporting. The ARP ID is used to uniquely identify an ARP associated with a UE.

sl-PRS-ResourceID

This field specifies the PRS resource ID used for SL positioning measurements.

sl-PRS-RSRP-Result

This field specifies the sidelink PRS reference signal received power (RSRP) measurement.

sl-PRS-RSRPP-Result

This field specifies the SL-RSRPP measurement based on first path of arrival.

sl-RTOA-Result

This field specifies the SL-RTOA measurement based on first path of arrival.

sl-TimeStamp

This field specifies the time instance at which the SL RTOA and SL-PRS RSRP (if included) measurement is performed.

– *End of SLPP-PDU-SL-TOA-Contents*

```
-- ASN1START
```

```
END
```

```
-- ASN1STOP
```

6.11 Information elements related to Discovery Message

This clause specifies information elements that are transferred in Discovery Message for ranging and sidelink positioning, as specified in TS 23.304 [14].

– *NR-DiscoveryMessageMetaDataContents*

This ASN.1 segment is the start of the *NR-DiscoveryMessageMetaDataContents* definitions.

```
-- ASN1START
-- TAG-NR-DISCOVERYMESSAGEMETADATACONTENTS-START

NR-DiscoveryMessageMetaDataContents DEFINITIONS AUTOMATIC TAGS ::=
BEGIN

-- TAG-NR-DISCOVERYMESSAGEMETADATACONTENTS-STOP
-- ASN1STOP
```

– *RSPP-Metadata*

The IE *RSPP-Metadata* includes the UE information included in Discovery Message for ranging and sidelink positioning.

```
-- ASN1START
-- TAG-RSPP-METADATA-START

RSPP-Metadata ::= SEQUENCE {
    ue-RoleList          BIT STRING { sl-anchorUE(0), sl-ServerUE(1), sl-TargetUE(2) } (SIZE (1..8)),
    knownLocationAvailable ENUMERATED {true} OPTIONAL,
    ...
}

-- TAG-RSPP-METADATA-STOP
-- ASN1STOP
```

RSPP-Metadata field descriptions***ue-RoleList***

This field indicates the UE role associate with the discovery message. This is represented by a bit string, with a one value at the bit position means the particular UE role associate with the discovery message.

In the case of solicitation message, this bit string is interpreted as:

- bit 0 indicates whether the UE role as a SL Anchor UE is requested or not;
- bit 1 indicates whether the UE role as a SL Server UE is requested or not;
- bit 2 indicates whether the UE role as a SL Target UE is requested or not;

Otherwise, the bit string is interpreted as:

- bit 0 indicates whether the UE supports UE role as a SL Anchor UE or not;
- bit 1 indicates whether the UE supports UE role as a SL Server UE or not;
- bit 2 indicates whether the UE supports UE role as a SL Target UE or not;

knownLocationAvailable

This field indicates whether the location of a SL Anchor UE is known or is able to be known, e.g., via Uu based positioning. The field can only be present if the bit 0 of *ue-RoleList* is set.

— *End of NR-DiscoveryMessageMetaDataContents*

```
-- ASN1START  
  
END  
  
-- ASN1STOP
```

Annex A (informative): Change history

Change history							
Date	Meeting	TDoc	CR	Rev	Cat	Subject/Comment	New version
04/2023	RAN2#121 bis-e	R2-2302739					0.0.1
04/2023	RAN2#121 bis-e	R2-2304306					0.0.2
05/2023	RAN2#122	R2-2305439					0.0.3
08/2023	RAN2#123	R2-2307663					0.0.4
09/2023	RAN2#123	R2-2309183				Endorsed by RAN2 in email discussion [Post123][415]	0.0.5
09/2023	RP-101	RP-232009				To be presented to RAN for information	1.0.0
10/2023	RAN2#123 bis	R2-2310222				Not endorsed in RAN2#123bis	1.1.0
11/2023	RAN2#124	R2-2312021					1.2.0
11/2023	RAN2#124	R2-2313630				Agreed by RAN2 in email discussion [Post124][419]	1.3.0
12/2023	RP-102	RP-233391				To be presented to RAN for Approval	2.0.0
12/2023	RP-102					Promoted to Rel-18 after approval	18.0.0
03/2024	RP-103	RP-240696	0001	1	F	Miscellaneous corrections to SLPP specification	18.1.0
	RP-103	RP-240696	0002	-	B	CR 38.355 for SLPP capability	18.1.0
06/2024	RP-104	RP-241566	0003	3	F	Miscellaneous corrections to SLPP specification	18.2.0
	RP-104	RP-241542	0004	2	B	CR 38.355 for SLPP capability	18.2.0

History

Document history		
V18.1.0	May 2024	Publication
V18.2.0	August 2024	Publication