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TECHNICAL SPECIFICATION

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LTE Positioning Protocol A (LPPa)
(3GPP TS 36.455 version 15.1.0 Release 15)

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Contents

Foreword

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1 Scope

The present document specifies the control plane radio network layer signalling procedures between eNB and E-SMLC. LPPa supports the concerned functions by signalling procedures defined in this document. LPPa is developed in accordance with the general principles stated in TS 36.401 [2].

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 36.401:"Evolved Universal Terrestrial Radio Access Network (E-UTRAN); Architecture Description".

[3]   3GPP TS 36.413:"Evolved Universal Terrestrial Radio Access Network (E-UTRAN); S1 Application Protocol (S1AP)".

[4]   ITU-T Recommendation X.691 (2002-07): "Information technology - ASN.1 encoding rules - Specification of Packed Encoding Rules (PER) ".

[5]   3GPP TS 36.104:"Evolved Universal Terrestrial Radio Access Network (E-UTRAN); Base Station (BS) radio transmission and reception".

[6]   3GPP TS 36.211:"Evolved Universal Terrestrial Radio Access Network (E-UTRAN); Physical Channels and Modulation".

[7]   3GPP TS 23.032:"Technical Specification Group Services and System Aspects; Universal Geographical Area Description (GAD)".

[8]   3GPP TS 36.133:"Evolved Universal Terrestrial Radio Access (E-UTRA); Requirements for support of radio resource management".

[9]   3GPP TR 25.921 (version.7.0.0): "Guidelines and principles for protocol description and error handling".

[10]   3GPP TS 36.331:"Evolved Universal Terrestrial Radio Access (E-UTRA); Radio Resource Control (RRC); Protocol specification".

[11]   IEEE Std 802.11™-2012, IEEE Standard for Information technology - Telecommunications and information exchange between systems - Local and metropolitan area network.

[12]   3GPP TS 36.213: "Evolved Universal Terrestrial Radio Access (E-UTRA); Physical layer procedures".

[13]   3GPP TS 36.355: "Evolved Universal Terrestrial Radio Access (E-UTRA); LTE Positioning Protocol (LPP)".

3   Definitions, symbols and abbreviations

3.1   Definitions

For the purposes of the present document, the terms and definitions 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].

Elementary Procedure: LPPa protocol consists of Elementary Procedures (EPs). An LPPa Elementary Procedure is a unit of interaction between the eNB and the E-SMLC. An EP consists of an initiating message and possibly a response message. Two kinds of EPs are used:

- **Class 1:** Elementary Procedures with response (success or failure),

- **Class 2:** Elementary Procedures without response.

Cell Portion: A geographical part of a cell. A cell portion is semi-static, and identical for both the UL and the DL. Within a cell, a cell portion is uniquely identified by its Cell Portion ID.

Transmission Point (TP): A set of geographically co-located transmit antennas for one cell, part of one cell or one PRS-only TP. Transmission Points can include base station (eNB) antennas, remote radio heads, a remote antenna of a base station, an antenna of a PRS-only TP, etc. One cell can be formed by one or multiple transmission points. For a homogeneous deployment, each transmission point may correspond to one cell.

PRS-only TP: A TP which only transmits PRS signals for PRS-based TBS positioning and is not associated with a cell.

3.2   Symbols

For the purposes of the present document, the following symbols apply:

    <symbol>   <Explanation>

3.3   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].

BSSID	Basic Service Set IDentifier
CID	Cell-ID (positioning method)
DL	Downlink
E-CID	Enhanced Cell-ID (positioning method)
eNB	E-UTRAN NodeB
EP	Elementary Procedure
EPC	Evolved Packet Core
E-SMLC	Evolved Serving Mobile Location Centre
E-UTRAN	Evolved UTRAN
GNSS	Global Navigation Satellite System
HESSID	Homogeneous Extended Service Set IDentifier
IE	Information Element
LCS	LoCation Services
LPP	LTE Positioning Protocol
LPPa	LTE Positioning Protocol Annex
MME	Mobility Management Entity
NW	Network
OTDOA	Observed Time Difference of Arrival
RSSI	Received Signal Strength Indicator
S1AP	S1 Application Protocol
SBAS	Satellite-based Augmentation System
SRS	Sounding Reference Signal
SSID	Service Set IDentifier
TP	Transmission Point

UE	User Equipment
UL	Uplink
UTDOA	Uplink Time Difference of Arrival
WLAN	Wireless Local Area Network

4 General

4.1 Procedure specification principles

The principle for specifying the procedure logic is to specify the functional behaviour of the terminating eNB exactly and completely. Any rule that specifies the behaviour of the originating eNB shall be possible to be verified with information that is visible within the system.

The following specification principles have been applied for the procedure text in clause 8:

- The procedure text discriminates between:

  1) Functionality which "shall" be executed

     The procedure text indicates that the receiving node "shall" perform a certain function Y under a certain condition. If the receiving node supports procedure X but cannot perform functionality Y requested in the initiating message of a Class 1 EP, the receiving node shall respond with the message used to report unsuccessful outcome for this procedure, containing an appropriate cause value.

  2) Functionality which "shall, if supported" be executed

     The procedure text indicates that the receiving node "shall, if supported," perform a certain function Y under a certain condition. If the receiving node supports procedure X, but does not support functionality Y, the receiving node shall proceed with the execution of the EP, possibly informing the requesting node about the not supported functionality.

- Any required inclusion of an optional IE in a response message is explicitly indicated in the procedure text. If the procedure text does not explicitly indicate that an optional IE shall be included in a response message, the optional IE shall not be included. For requirements on including *Criticality Diagnostics* IE, see section 10.

4.2 Forwards and backwards compatibility

The forwards and backwards compatibility of the protocol is assured by a mechanism where all current and future messages, and IEs or groups of related IEs, include ID and criticality fields that are coded in a standard format that will not be changed in the future. These parts can always be decoded regardless of the standard version.

4.3 Specification notations

For the purposes of the present document, the following notations apply:

Procedure	When referring to an elementary procedure in the specification the Procedure Name is written with the first letters in each word in upper case characters followed by the word "procedure", e.g. Handover Preparation procedure.
Message	When referring to a message in the specification the MESSAGE NAME is written with all letters in upper case characters followed by the word "message", e.g. ERROR INDICATION message.
IE	When referring to an information element (IE) in the specification the *Information Element Name* is written with the first letters in each word in upper case characters and all letters in Italic font followed by the abbreviation "IE", e.g. *Cause* IE.
Value of an IE	When referring to the value of an information element (IE) in the specification the "Value" is written as it is specified in sub clause 9.2 enclosed by quotation marks, e.g. "Value".

5   LPPa services

The present clause describes the services an eNB offers to the E-SMLC.

5.1   LPPa procedure modules

The procedures are divided into two modules as follows:

1. LPPa Location Information Transfer Procedures;

2. LPPa Management Procedures;

The LPPa Location Information Transfer Procedures module contains procedures used to handle the transfer of positioning related information between eNB and E-SMLC.

The Management Procedures module contains procedures that are not related specifically to positioning, i.e. error handling.

5.2   Parallel transactions

Unless explicitly indicated in the procedure specification, at any instance in time one protocol peer may have more than one ongoing LPPa procedure.

6   Services expected from lower layer

Within E-UTRAN, LPPa protocol uses the services provided by the S1AP protocol. An LPPa message is carried inside an S1AP message.

S1AP signalling is described in TS 36.413 [3].

7   Functions of LPPa

The LPPa protocol provides the following functions:

- E-CID Location Information Transfer. This function allows the eNB to exchange location information with the E-SMLC for the purpose of E-CID positioning.

- OTDOA Information Transfer. This function allows the eNB to exchange information with the E-SMLC for the purpose of OTDOA positioning.

- UTDOA Information Transfer. This function allows the eNB to exchange information with the E-SMLC for the purpose of supporting UTDOA.

- Assistance Information Transfer. This function allows the E-SMLC to exchange information with the eNB for the purpose of assistance information broadcasting.

- Reporting of General Error Situations. This function allows reporting of general error situations, for which function specific error messages have not been defined.

The mapping between the above functions and LPPa EPs is shown in the table below.

Table 7-1: Mapping between LPPa functions and LPPa EPs

Function	Elementary Procedure(s)
E-CID Location Information Transfer	a) E-CID Measurement Initiation b) E-CID Measurement Failure Indication c) E-CID Measurement Report d) E-CID Measurement Termination
OTDOA Information Transfer	OTDOA Information Exchange
UTDOA Information Transfer	a) UTDOA Information Exchange b) UTDOA Information Update
Assistance Information Transfer	a) Assistance Information Control b) Assistance Information Feedback
Reporting of General Error Situations	Error Indication

8 LPPa procedures

8.1 Elementary procedures

In the following tables, all EPs are divided into Class 1 and Class 2 EPs.

Table 8.1-1: Class 1 Elementary Procedures

Elementary Procedure	Initiating Message	Successful Outcome Response message	Unsuccessful Outcome Response message
E-CID Measurement Initiation	E-CID MEASUREMENT INITIATION REQUEST	E-CID MEASUREMENT INITIATION RESPONSE	E-CID MEASUREMENT INITIATION FAILURE
OTDOA Information Exchange	OTDOA INFORMATION REQUEST	OTDOA INFORMATION RESPONSE	OTDOA INFORMATION FAILURE
UTDOA Information Exchange	UTDOA INFORMATION REQUEST	UTDOA INFORMATION RESPONSE	UTDOA INFORMATION FAILURE

Table 8.1-2: Class 2 Elementary Procedures

Elementary Procedure	Initiating Message
E-CID Measurement Failure Indication	E-CID MEASUREMENT FAILURE INDICATION
E-CID Measurement Report	E-CID MEASUREMENT REPORT
E-CID Measurement Termination	E-CID MEASUREMENT TERMINATION COMMAND
UTDOA Information Update	UTDOA INFORMATION UPDATE
Error Indication	ERROR INDICATION
Assistance Information Control	ASSISTANCE INFORMATION CONTROL
Assistance Information Feedback	ASSISTANCE INFORMATION FEEDBACK

8.2 Location Information Transfer Procedures

8.2.1 E-CID Measurement Initiation

8.2.1.1 General

The purpose of E-CID Measurement Initiation procedure is to allow the E-SMLC to request the eNB to report E-CID measurements used by E-SMLC to compute the location of the UE.

8.2.1.2 Successful Operation
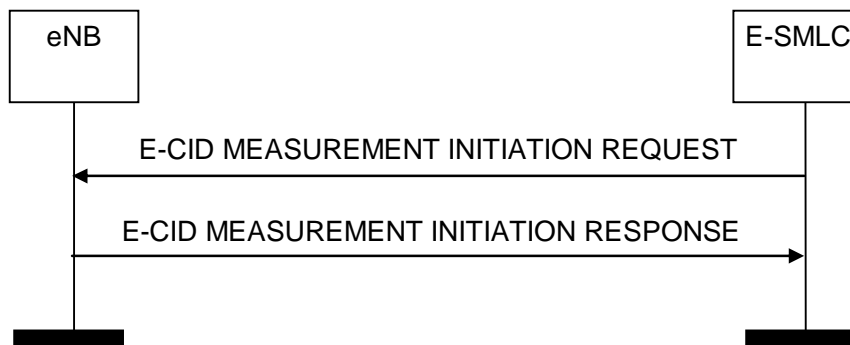
Figure 8.2.1.2-1: E-CID Measurement Initiation procedure, successful operation

The E-SMLC initiates the procedure by sending an E-CID MEASUREMENT INITIATION REQUEST message. If the eNB is able to initiate the requested E-CID measurements, it shall reply with the E-CID MEASUREMENT INITIATION RESPONSE message.

The *Measured Results* IE shall be included in the *E-CID Measurement Result* IE of the E-CID MEASUREMENT INITIATION RESPONSE message when measurement results other than the "Cell-ID" have been requested.

If the *Report Characteristics* IE is set to "OnDemand", the eNB shall return the result of the measurement in the E-CID MEASUREMENT INITIATION RESPONSE message including, if available, the *E-UTRAN Access Point Position* IE in the *E-CID Measurement Result* IE, and the E-SMLC shall consider that the E-CID measurements for the UE has been terminated by the eNB. If available, the eNB shall include the *Cell Portion ID* IE in the E-CID MEASUREMENT INITIATION RESPONSE message. Upon reception of the *Cell Portion ID* IE, the E-SMLC may use the value as the cell portion for the measurement. If the *Report Characteristics* IE is set to "OnDemand" and the *Inter-RAT Measurement Quantities* IE is included in the E-CID MEASUREMENT INITIATION REQUEST message, the eNB shall, if supported, provide the corresponding measurements, if available in the eNB, in the *Inter-RAT Measurement Result* IE in E-CID MEASUREMENT INITIATION RESPONSE message. If the *Report Characteristics* IE is set to "OnDemand" and the *WLAN Measurement Quantities* IE is included in the E-CID MEASUREMENT INITIATION REQUEST message, the eNB shall, if supported, provide the corresponding measurements, if available in the eNB, in the *WLAN Measurement Result* IE in E-CID MEASUREMENT INITIATION RESPONSE message.

If the *Report Characteristics* IE is set to "Periodic", the eNB shall initiate the requested measurements and shall reply with the E-CID MEASUREMENT INITIATION RESPONSE message without including either the *E-CID Measurement Result* IE or the *Cell Portion ID* IE in this message. The eNB shall then periodically initiate the E-CID Measurement Report procedure for the measurements, with the requested reporting periodicity.

8.2.1.3 Unsuccessful Operation
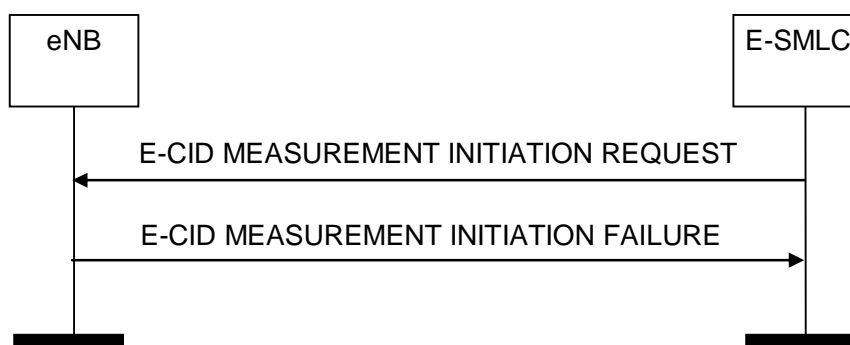
Figure 8.2.1.3-1: E-CID Measurement Initiation procedure, unsuccessful operation

If the eNB is not able to initiate at least one of the requested E-CID measurements, the eNB shall respond with an E-CID MEASUREMENT INITIATION FAILURE message.

8.2.1.4 Abnormal Conditions

Void

8.2.2 E-CID Measurement Failure Indication

8.2.2.1 General

The purpose of the E-CID Measurement Failure Indication procedure is for the eNB to notify the E-SMLC that the E-CID measurements previously requested with the E-CID Measurement Initiation procedure can no longer be reported.

8.2.2.2 Successful Operation

```
  eNB                                              E-SMLC
   │                                                  │
   │   E-CID MEASUREMENT FAILURE INDICATION           │
   │─────────────────────────────────────────────────▶│
   │                                                  │
  ▄▄▄                                                ▄▄▄
```
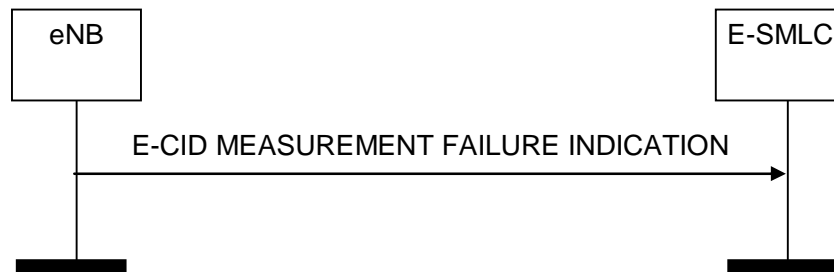
Figure 8.2.2.2-1: E-CID Measurement Failure Indication, successful operation

Upon reception of the E-CID MEASUREMENT FAILURE INDICATION message, the E-SMLC shall consider that the E-CID measurements for the UE have been terminated by the eNB.

8.2.2.3 Unsuccessful Operation

Not applicable.

8.2.2.4 Abnormal Conditions

Void.

8.2.3 E-CID Measurement Report

8.2.3.1 General

The purpose of E-CID Measurement Report procedure is for the eNB to provide the E-CID measurements for the UE to the E-SMLC.

8.2.3.2 Successful Operation

```
  eNB                                              E-SMLC
   │                                                  │
   │          E-CID MEASUREMENT REPORT                │
   │─────────────────────────────────────────────────▶│
   │                                                  │
  ▄▄▄                                                ▄▄▄
```

Figure 8.2.3.2-1: E-CID Measurement Report procedure, successful operation

The eNB initiates the procedure by sending an E-CID MEASUREMENT REPORT message. The E-CID MEASUREMENT REPORT message contains the E-CID measurement results according to the measurement configuration in the respective E-CID MEASUREMENT INITIATION REQUEST message.

The *Measured Results* IE shall be included in the *E-CID Measurement Result* IE of the E-CID MEASUREMENT REPORT message when measurement results other than the "Cell-ID" have been requested.

If available, the eNB shall include the *E-UTRAN Access Point Position* IE which is the configured estimated serving antenna position in the *E-CID Measurement Result* IE within the E-CID MEASUREMENT REPORT message. Upon reception of this *E-UTRAN Access Point Position* IE, the E-SMLC may use the value as the geographical position of the E-UTRAN access point.

If available, the eNB shall include the *Cell Portion ID* IE in the E-CID MEASUREMENT REPORT message. Upon reception of the *Cell Portion ID* IE, the E-SMLC may use the value as the cell portion for the measurement.

8.2.3.3 Unsuccessful Operation

Not applicable.

8.2.3.4 Abnormal Conditions

Void.

8.2.4 E-CID Measurement Termination

8.2.4.1 General

The purpose of E-CID Measurement Termination procedure is to terminate periodical E-CID measurements for the UE performed by the eNB.

8.2.4.2 Successful Operation

Figure 8.2.4.2-1: E-CID Measurement Termination procedure, successful operation

The E-SMLC initiates the procedure by generating an E-CID MEASUREMENT TERMINATION COMMAND message.

8.2.4.3 Unsuccessful Operation

Not applicable.

8.2.4.4 Abnormal Conditions

Void.

8.2.5 OTDOA Information Exchange

8.2.5.1 General

The purpose of the OTDOA Information Exchange procedure is to allow the E-SMLC to request the eNB to transfer OTDOA information to the E-SMLC.

8.2.5.2 Successful Operation
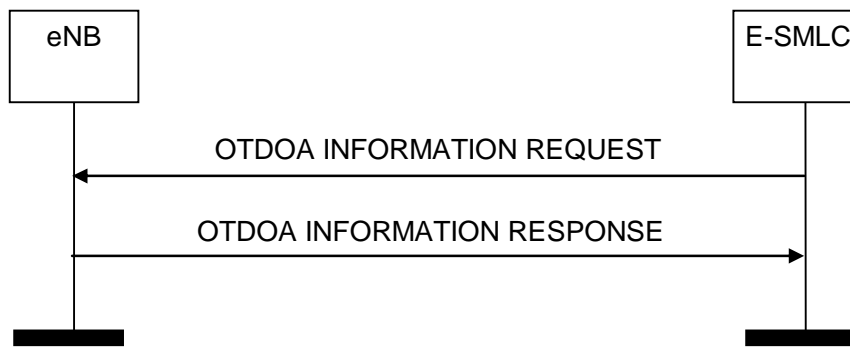
Figure 8.2.5.2-1: OTDOA Information Exchange procedure, successful operation

The E-SMLC initiates the procedure by sending an OTDOA INFORMATION REQUEST message. The eNB responds with OTDOA INFORMATION RESPONSE message that contains the available OTDOA information applicable to the relevant cells/TPs.

8.2.5.3 Unsuccessful Operation
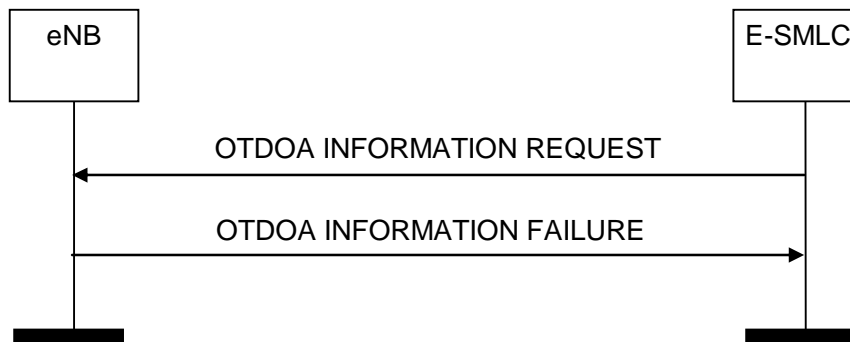
Figure 8.2.5.3-1: OTDOA Information Exchange procedure, unsuccessful operation

If the eNB does not have any OTDOA information to report, the eNB shall respond with an OTDOA INFORMATION FAILURE message.

8.2.5.4 Abnormal Conditions

Void.

8.2.6 UTDOA Information Exchange

8.2.6.1 General

The UTDOA Information Exchange procedure is initiated by the E-SMLC to indicate to the eNB the need to configure the UE to transmit periodic SRS signals and to retrieve the SRS configuration from the eNB.

8.2.6.2 Successful Operation
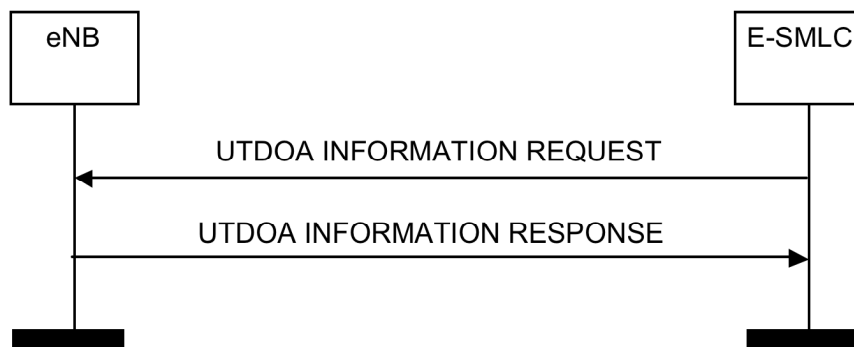
Figure 8.2.6.2-1: UTDOA Information Exchange procedure, successful operation

The E-SMLC initiates the procedure by sending a UTDOA INFORMATION REQUEST message to the eNB. This message may contain the bandwidth and number of SRS transmissions desired. If the E-SMLC requests a number of SRS transmissions, the eNB may take this information into account when configuring SRS transmissions for the UE. The eNB shall reply with the UTDOA INFORMATION RESPONSE message.

The UTDOA INFORMATION RESPONSE message contains the SRS configuration for the UE. The eNB shall include the *deltaSS* IE in the UTDOA INFORMATION RESPONSE message whenever SRS sequence hopping is enabled for the requested measurement. If the *deltaSS* IE is received by the E-SMLC in the UTDOA INFORMATION RESPONSE message, the E-SMLC shall consider that SRS sequence hopping is enabled for that particular measurement.

8.2.6.3 Unsuccessful Operation
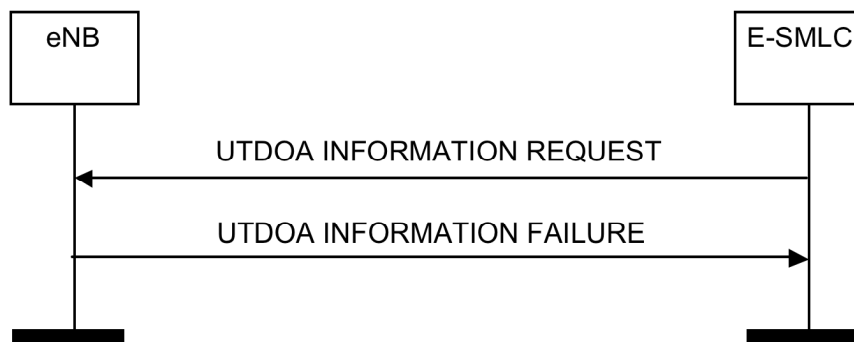
Figure 8.2.6.3-1: UTDOA Information Exchange procedure, unsuccessful operation

If the eNB is unable to configure any SRS transmissions for the UE, the eNB shall respond with a UTDOA INFORMATION FAILURE message. If a handover of the target UE has been triggered, the eNB shall send a UTDOA INFORMATION FAILURE message with an appropriate cause value.

8.2.6.4 Abnormal Conditions

Void.

8.2.7 UTDOA Information Update

8.2.7.1 General

The UTDOA Information Update procedure is sent by the eNB to indicate to the E-SMLC that a change has occurred in the SRS configuration, either due to a change in SRS configuration parameters in one or more cells, or because a cell change has been triggered.

8.2.7.2 Successful Operation
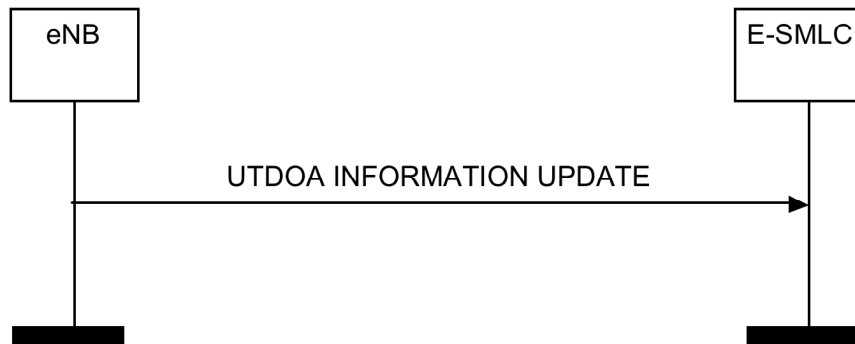
Figure 8.2.7.2-1: UTDOA Information Update procedure, successful operation

The eNB initiates the procedure by sending a UTDOA INFORMATION UPDATE message to the E-SMLC. This message contains, in the case of a change in SRS configuration parameters, the SRS configuration information for all cells with SRS configured. The eNB shall include the *deltaSS* IE in the UTDOA INFORMATION UPDATE message whenever SRS sequence hopping is enabled for the requested measurement. If the *deltaSS* IE is received by the E-SMLC in the UTDOA INFORMATION UPDATE message, the E-SMLC shall consider that SRS sequence hopping is enabled for that particular measurement.

8.2.7.3 Unsuccessful Operation

Not Applicable.

8.2.7.4 Abnormal Conditions

Void.

8.3 Management Procedures

8.3.1 Error Indication

8.3.1.1 General

The Error Indication procedure is initiated by a node to report detected errors in one incoming message, provided they cannot be reported by an appropriate failure message.

8.3.1.2 Successful Operation
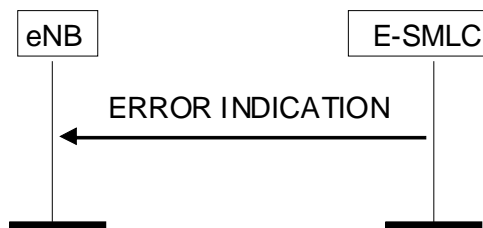
Figure 8.3.1.2-1: Error Indication procedure, E-SMLC originated, successful operation
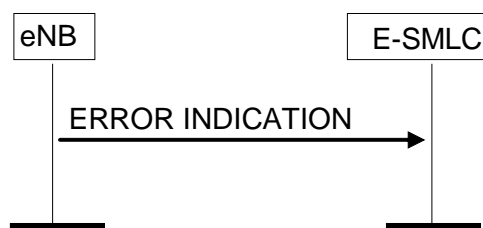
Figure 8.3.1.2-2: Error Indication procedure, eNB originated, successful operation

When the conditions defined in clause 10 are fulfilled, the Error Indication procedure is initiated by an ERROR INDICATION message sent from the receiving node.

The ERROR INDICATION message shall contain at least either the *Cause* IE or the *Criticality Diagnostics* IE.

8.3.1.3 Abnormal Conditions

Not applicable.

8.4 Assistance Information Transfer Procedures

8.4.1 Assistance Information Control

8.4.1.1 General

The purpose of the Assistance Information Control procedure is to allow the E-SMLC to signal positioning assistance information to the eNB for assistance information broadcasting.

8.4.1.2 Successful Operation
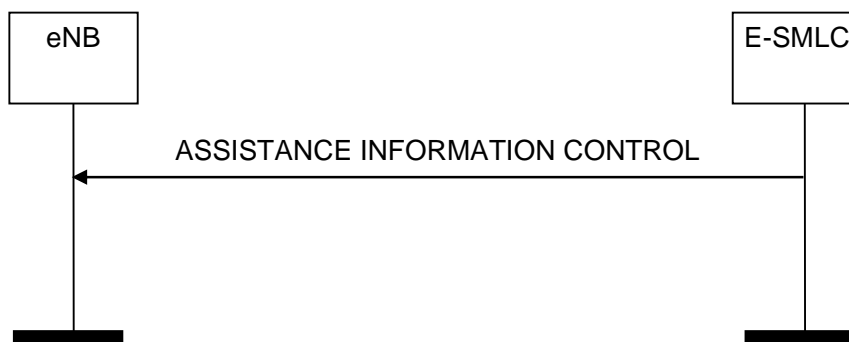
Figure 8.4.1.2-1: Assistance Information Control procedure

The E-SMLC initiates the procedure by sending an ASSISTANCE INFORMATION CONTROL message.

If the *Assistance Information* IE is included in the ASSISTANCE INFORMATION CONTROL message, the eNB shall replace any previously stored assistance information and use the received information to configure assistance information broadcasting.

If the *Broadcast Priority* IE is included in the *Assistance Information* IE, the eNB may take it into account when configuring broadcasting for the relevant information. Assistance information having the same Broadcast Priority value should receive the same treatment (i.e. broadcast by the eNB or not broadcast).

If the *Broadcast* IE is included in the ASSISTANCE INFORMATION CONTROL message and set to "start", the eNB may start broadcasting the assistance information. If the *Broadcast* IE is included in the ASSISTANCE INFORMATION CONTROL message and set to "stop", the eNB may stop broadcasting the assistance information.

8.4.1.3 Abnormal Conditions

If the *Broadcast* IE is included in the ASSISTANCE INFORMATION CONTROL message and set to "start", and no assistance information is available, the eNB shall consider the procedure as failed.

If neither the *Assistance Information* IE nor the *Broadcast* IE are included in the ASSISTANCE INFORMATION CONTROL message, the eNB shall consider the procedure as failed.

8.4.2 Assistance Information Feedback

8.4.2.1 General

The purpose of the Assistance Information Feedback procedure is to allow the eNB to give feedback to the E-SMLC on assistance information broadcasting.

8.4.2.2 Successful Operation
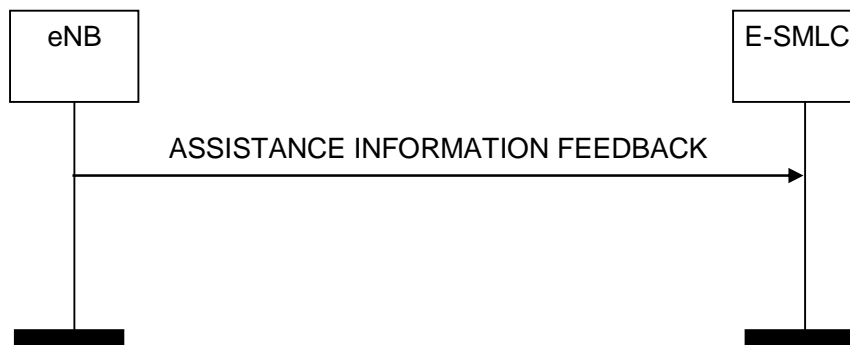
Figure 8.4.2.2-1: Assistance Information Feedback procedure

If the *Assistance Information Failure List* IE is included in the ASSISTANCE INFORMATION FEEDBACK message, the E-SMLC shall consider that assistance information broadcasting could not be configured for the relevant information.

8.4.2.3 Abnormal Conditions

Void.

9 Elements for LPPa Communication

9.0 General

Sub clauses 9.1 and 9.2 describe the structure of the messages and information elements required for the LPPa protocol in tabular format. Sub clause 9.3 provides the corresponding ASN.1 definition.

The following attributes are used for the tabular description of the messages and information elements: Presence, Range Criticality and Assigned Criticality. Their definition and use can be found in TS 36.413 [3].

NOTE: The messages have been defined in accordance to the guidelines specified in TR 25.921 [9].

9.1 Message Functional Definition and Content

9.1.1 Messages for Location Information Transfer Procedures

9.1.1.1 E-CID MEASUREMENT INITIATION REQUEST

This message is sent by E-SMLC to initiate E-CID measurements.

Direction: E-SMLC $\rightarrow$ eNB.

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Message Type	M		9.2.3		YES	reject
LPPa Transaction ID	M		9.2.4		-	
E-SMLC Measurement ID	M		INTEGER(1..15,…)		YES	reject
Report Characteristics	M		ENUMERATED(OnDemand, Periodic,…)		YES	reject
Measurement Periodicity	C-ifReportCharacteristicsPeriodic		ENUMERATED(120ms, 240ms, 480ms, 640ms, 1024ms, 2048ms, 5120ms, 10240ms, 1min, 6min, 12min, 30min, 60min,…)		YES	reject
Measurement Quantities		*1 .. <maxnoMeas>*			EACH	reject
>Measurement Quantities Item	M		ENUMERATED (Cell-ID, Angle of Arrival, Timing Advance Type 1, Timing Advance Type 2, RSRP, RSRQ,…)		-	-
Inter-RAT Measurement Quantities		*0 .. <maxnoMeas>*			EACH	ignore
>Inter-RAT Measurement Quantities Item	M		ENUMERATED(GERAN, UTRAN,…)			
WLAN Measurement Quantities		*0 .. <maxnoMeas>*			EACH	ignore
>WLAN Measurement Quantities Item	M		ENUMERATED (WLAN, ...)		-	

Range bound	Explanation
maxnoMeas	Maximum no. of measured quantities that can be configured and reported with one message. Value is 63.

Condition	Explanation
ifReportCharacteristicsPeriodic	This IE shall be present if the *Report Characteristics* IE is set to the value "Periodic".

9.1.1.2 E-CID MEASUREMENT INITIATION RESPONSE

This message is sent by eNB to indicate that the requested E-CID measurement is successfully initiated.

Direction: eNB → E-SMLC.

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Message Type	M		9.2.3		YES	reject
LPPa Transaction ID	M		9.2.4		-	
E-SMLC UE Measurement ID	M		INTEGER(1..15,…)		YES	reject
eNB UE Measurement ID	M		INTEGER(1..15,…)		YES	reject
E-CID Measurement Result	O		9.2.5		YES	ignore
Criticality Diagnostics	O		9.2.2		YES	ignore
Cell Portion ID	O		9.2.12		YES	ignore
Inter-RAT Measurement Result	O		9.2.13		YES	ignore
WLAN Measurement Result	O		9.2.15		YES	ignore

9.1.1.3   E-CID MEASUREMENT INITIATION FAILURE

This message is sent by eNB to indicate that the requested E-CID measurement cannot be initiated.

Direction: eNB → E-SMLC.

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Message Type	M		9.2.3		YES	reject
LPPa Transaction ID	M		9.2.4		-	
E-SMLC UE Measurement ID	M		INTEGER(1..15,…)		YES	reject
Cause	M		9.2.1		YES	ignore
Criticality Diagnostics	O		9.2.2		YES	ignore

9.1.1.4   E-CID MEASUREMENT FAILURE INDICATION

This message is sent by eNB to indicate that the previously requested E-CID measurement can no longer be reported.

Direction: eNB → E-SMLC.

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Message Type	M		9.2.3		YES	ignore
LPPa Transaction ID	M		9.2.4		-	
E-SMLC UE Measurement ID	M		INTEGER(1..15,…)		YES	reject
eNB UE Measurement ID	M		INTEGER(1..15,…)		YES	reject
Cause	M		9.2.1		YES	ignore

9.1.1.5   E-CID MEASUREMENT REPORT

This message is sent by eNB to report the results of the requested E-CID measurement.

Direction: eNB → E-SMLC.

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Message Type	M		9.2.3		YES	ignore
LPPa Transaction ID	M		9.2.4		-	
E-SMLC UE Measurement ID	M		INTEGER(1..15,…)		YES	reject
eNB UE Measurement ID	M		INTEGER(1..15,…)		YES	reject
E-CID Measurement Result	M		9.2.5		YES	ignore
Cell Portion ID	O		9.2.12		YES	ignore

9.1.1.6 E-CID MEASUREMENT TERMINATION COMMAND

This message is sent by the E-SMLC to terminate the requested E-CID measurement.

Direction: E-SMLC → eNB.

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Message Type	M		9.2.3		YES	ignore
LPPa Transaction ID	M		9.2.4		-	
E-SMLC UE Measurement ID	M		INTEGER(1..15,…)		YES	reject
eNB UE Measurement ID	M		INTEGER(1..15,…)		YES	reject

9.1.1.7 OTDOA INFORMATION REQUEST

This message is sent by E-SMLC to request OTDOA information.

Direction: E-SMLC → eNB.

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Message Type	M		9.2.3		YES	reject
LPPa Transaction ID	M		9.2.4		-	
OTDOA Information Type		1 .. <maxnoOTDOAtypes>			EACH	reject
>OTDOA Information Item	M		ENUMERATED (pci, cellid, tac, earfcn, prsBandwidth, prsConfigIndex, cpLength, noDlFrames, noAntennaPorts, sFNInitTime, …, e-UTRANAccessPointPosition, prsmutingconfiguration, prsid, tpid, tpType, crsCPlength, MBSFNsubframeConfiguration, nPRSConfiguration, offsetNBChanneltoEARFCN, operationModeInfo, NPRS-ID, dlBandwidth, multipleprsConfigurationsperCell, prsOccasionGroup, prsFrequencyHoppingConfiguration, repetitionNumberofSIB1-NB, nPRSsequenceInfo, NPRS Type 2)		-	-

Range bound	Explanation
maxnoOTDOAtypes	Maximum no. of OTDOA information types that can be requested and reported with one message. Value is 63.

9.1.1.8 OTDOA INFORMATION RESPONSE

This message is sent by eNB to provide OTDOA information.

Direction: eNB → E-SMLC.

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Message Type	M		9.2.3		YES	reject
LPPa Transaction ID	M		9.2.4		-	
OTDOA Cells		*1 .. <maxCelline NB>*		Served cells/TPs that broadcast PRS. May be used to signal multiple PRS configurations per cell/TPs (up to 3 are supported in this release).	GLOBAL	ignore
>OTDOA Cell Information	M		9.2.7		-	-
Additional OTDOA Cells		0 .. <maxCelline NB-ext>		Served cells/TPs that broadcast PRS. May be used to signal multiple PRS configurations per cell/TPs (up to 3 are supported in this release).	GLOBAL	ignore
>OTDOA Cell Information	M		9.2.7		-	-
Criticality Diagnostics	O		9.2.2		YES	ignore

Range bound	Explanation
maxCellineNB	Maximum no. cells that can be served by an eNB. Value is 256.
maxCellineNB-ext	Maximum no. of additional cells/TPs that can be served by an eNB. Value is 3840.

9.1.1.9   OTDOA INFORMATION FAILURE

This message is sent by eNB to indicate that the OTDOA information cannot be provided.

Direction: eNB → E-SMLC.

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Message Type	M		9.2.3		YES	reject
LPPa Transaction ID	M		9.2.4		-	
Cause	M		9.2.1		YES	ignore
Criticality Diagnostics	O		9.2.2		YES	ignore

9.1.1.10   UTDOA INFORMATION REQUEST

This message is sent by the E-SMLC to indicate to the eNB the need to configure the UE to transmit periodic SRS signals for UTDOA positioning.

Direction: E-SMLC → eNB.

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Message Type	M		9.2.3		YES	reject
LPPa Transaction ID	M		9.2.4		-	
Requested SRS Transmission Characteristics	O		9.2.10		YES	ignore

9.1.1.11   UTDOA INFORMATION RESPONSE

This message is sent by the eNB to provide the configured SRS information to the E-SMLC.

Direction: eNB → E-SMLC.

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Message Type	M		9.2.3		YES	reject
LPPa Transaction ID	M		9.2.4		-	
UL Configuration	M		9.2.11		YES	reject
Criticality Diagnostics	O		9.2.2		YES	ignore

9.1.1.12   UTDOA INFORMATION FAILURE

This message is sent by the eNB to indicate that no SRS transmissions could be configured for the UE for UTDOA positioning.

Direction: eNB → E-SMLC.

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Message Type	M		9.2.3		YES	reject
LPPa Transaction ID	M		9.2.4		-	
Cause	M		9.2.1		YES	ignore
Criticality Diagnostics	O		9.2.2		YES	ignore

9.1.1.13   UTDOA INFORMATION UPDATE

This message is sent by the eNB to indicate that the SRS configuration for the UE, for one or more cells, has changed.

Direction: eNB → E-SMLC.

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Message Type	M		9.2.3		YES	reject
LPPa Transaction ID	M		9.2.4		-	
UL Configuration	O		9.2.11		YES	ignore

9.1.2   Messages for Management Procedures

9.1.2.1   ERROR INDICATION

This message is used to indicate that some error has been detected in the eNB or in the E-SMLC.

Direction: E-SMLC → eNB and eNB → E-SMLC.

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Message Type	M		9.2.3		YES	ignore
LPPa Transaction ID	M		9.2.4		–	
Cause	O		9.2.1		YES	ignore
Criticality Diagnostics	O		9.2.2		YES	ignore

9.1.3 Messages for Assistance Information Transfer Procedures

9.1.3.1 ASSISTANCE INFORMATION CONTROL

This message is sent by the E-SMLC to transfer assistance information.

Direction: E-SMLC → eNB.

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Message Type	M		9.2.3		YES	reject
LPPa Transaction ID	M		9.2.4		-	
Assistance Information	O		9.2.20		YES	reject
Broadcast	O		ENUMERATED (start, stop, ...)		YES	reject

9.1.3.2 ASSISTANCE INFORMATION FEEDBACK

This message is sent by the eNB to give feedback on assistance information broadcasting.

Direction: eNB → E-SMLC.

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Message Type	M		9.2.3		YES	reject
LPPa Transaction ID	M		9.2.4		-	
Assistance Information Failure List	O		9.2.24		YES	reject
Criticality Diagnostics	O		9.2.2		YES	ignore

9.2 Information Element definitions

9.2.0 General

When specifying information elements which are to be represented by bit strings, if not otherwise specifically stated in the semantics 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);

- When importing bit strings from other specifications, the first bit of the bit string contains the first bit of the concerned information.

9.2.1 Cause

The purpose of the cause information element is to indicate the reason for a particular event for the whole protocol.

IE/Group Name	Presence	Range	IE Type and Reference	Semantics Description
CHOICE *Cause Group*	M			
>*Radio Network Layer*				
>>Radio Network Layer Cause	M		ENUMERATED (Unspecified, Requested Item not Supported, Requested Item Temporarily not Available, ...)	
>*Protocol*				
>>Protocol Cause	M		ENUMERATED (Transfer Syntax Error, Abstract Syntax Error (Reject), Abstract Syntax Error (Ignore and Notify), Message not Compatible with Receiver State, Semantic Error, Unspecified, Abstract Syntax Error (Falsely Constructed Message),...)	
>*Misc*				
>>Miscellaneous Cause	M		ENUMERATED (Unspecified, ...)	

The meaning of the different cause values is described in the following table. In general, "not supported" cause values indicate that the concerned capability is missing. On the other hand, "not available" cause values indicate that the concerned capability is present, but insufficient resources were available to perform the requested action.

Radio Network Layer cause	Meaning
Unspecified	Sent when none of the above cause values applies but still the cause is Radio Network Layer related
Requested Item not Supported	The eNB does not support the requested measurement object, or cannot provide the requested information item.
Requested Item Temporarily not Available	The eNB can temporarily not provide the requested measurement object or information item.

Protocol cause	Meaning
Abstract Syntax Error (Reject)	The received message included an abstract syntax error and the concerned criticality indicated "reject" (see sub clause 10.3)
Abstract Syntax Error (Ignore and Notify)	The received message included an abstract syntax error and the concerned criticality indicated "ignore and notify" (see sub clause 10.3)
Abstract syntax error (falsely constructed message)	The received message contained IEs or IE groups in wrong order or with too many occurrences (see sub clause 10.3)
Message not Compatible with Receiver State	The received message was not compatible with the receiver state (see sub clause 10.4)
Semantic Error	The received message included a semantic error (see sub clause 10.4)
Transfer Syntax Error	The received message included a transfer syntax error (see sub clause 10.2)
Unspecified	Sent when none of the above cause values applies but still the cause is Protocol related

Miscellaneous cause	Meaning
Unspecified	Sent when none of the above cause values applies and the cause is not related to any of the categories Radio Network Layer, Transport Network Layer or Protocol.

9.2.2 Criticality Diagnostics

The *Criticality Diagnostics* IE is sent by the eNB or E-SMLC when parts of a received message have not been comprehended or were missing, or if the message contained logical errors. When applicable, it contains information about which IEs were not comprehended or were missing. The conditions for inclusion of the *LPPa Transaction ID* IE are described in clause 10.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
Procedure Code	O		INTEGER (0..255)	Procedure Code is to be used if Criticality Diagnostics is part of Error Indication procedure, and not within the response message of the same procedure that caused the error.
Triggering Message	O		ENUMERATED (initiating message, successful outcome, unsuccessful outcome)	The Triggering Message is used only if the Criticality Diagnostics is part of Error Indication procedure.
Procedure Criticality	O		ENUMERATED (reject, ignore, notify)	This Procedure Criticality is used for reporting the Criticality of the Triggering message (Procedure).
LPPa Transaction ID	O		9.2.4	
Information Element Criticality Diagnostics		*0 .. <maxNrOfErrors>*		
>IE Criticality	M		ENUMERATED (reject, ignore, notify)	The IE Criticality is used for reporting the criticality of the triggering IE. The value "ignore'" shall not be used.
>IE ID	M		INTEGER (0..65535)	The IE ID of the not understood or missing IE.
>Type Of Error	M		ENUMERATED (not understood, missing, …)	

Range bound	Explanation
maxNrOfErrors	Maximum no. of IE errors allowed to be reported with a single message. The value for maxNroOfErrors is 256.

9.2.3 Message Type

The *Message Type* IE uniquely identifies the message being sent. It is mandatory for all messages.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
Procedure Code	M		INTEGER (0..255)	
Type of Message	M		CHOICE (Initiating Message, Successful Outcome, Unsuccessful Outcome, …)	

9.2.4 LPPa Transaction ID

The *LPPa Transaction ID* IE is used to associate all the messages belonging to the same procedure. Messages belonging to the same procedure shall use the same LPPa Transaction ID.

The LPPa Transaction ID is determined by the initiating peer of a procedure.

The LPPa Transaction ID shall uniquely identify a procedure among all ongoing parallel procedures using the same procedure code, and initiated by the same protocol peer.

IE/Group Name	Presence	Range	IE Type and Reference	Semantics Description
LPPa Transaction ID	M		INTEGER (0..32767)	

9.2.5 E-CID Measurement Result

The purpose of the E-CID Measurement Result information element is to provide the E-CID measurement result.

IE/Group Name	Presence	Range	IE Type and Reference	Semantics Description
Serving Cell ID	M		ECGI 9.2.6	E-UTRAN Cell Identifier of the serving cell
Serving Cell TAC	M		OCTET STRING(2)	Tracking Area Code of the serving cell
E-UTRAN Access Point Position	O		9.2.8	The configured estimated geographical position of the antenna of the cell.
Measured Results		*0 .. <maxnoMeas>*		
>CHOICE *Measured Results Value*	M			
>>Value Angle of Arrival	M		INTEGER (0..719)	According to mapping in TS 36.133 [8]
>>Value Timing Advance Type 1	M		INTEGER (0..7690)	According to mapping in TS 36.133 [8]
>>Value Timing Advance Type 2	M		INTEGER (0..7690)	According to mapping in TS 36.133 [8]
>>**Result RSRP**		*1 .. <maxCellReport>*		
>>>PCI	M		INTEGER (0..503, …)	Physical Cell Identifier of the reported cell
>>>EARFCN	M		INTEGER (0..65535, ..., 65536..262143)	Corresponds to NDL for FDD and NDL/UL for TDD in ref. TS 36.104 [5]
>>>ECGI	O		ECGI 9.2.6	E-UTRAN Cell Global Identifier of the reported cell
>>>Value RSRP	M		INTEGER(0..97, …)	
>>**Result RSRQ**		*1 . <maxCellReport>*		
>>>PCI	M		INTEGER (0..503, …)	Physical Cell Identifier of the reported cell
>>>EARFCN	M		INTEGER (0..65535, ..., 65536..262143)	Corresponds to NDL for FDD and NDL/UL for TDD in ref. TS 36.104 [5]
>>>ECGI	O		ECGI 9.2.6	E-UTRAN Cell Global Identifier of the reported cell
>>>Value RSRQ	M		INTEGER(0..34, …)	

Range bound	Explanation

maxnoMeas	Maximum no. of measured quantities that can be configured and reported with one message. Value is 63.
maxCellReport	Maximum no. of cells that can be reported with one message. Value is 9.

9.2.6   ECGI

The E-UTRAN Cell Global Identifier (ECGI) is used to globally identify a cell.

IE/Group Name	Presence	Range	IE Type and Reference	Semantics Description
PLMN identity	M		OCTET STRING (SIZE (3))	PLMN identity - digits 0 to 9, encoded 0000 to 1001, - 1111 used as filler digit, two digits per octet, - bits 4 to 1 of octet n encoding digit 2n-1 - bits 8 to 5 of octet n encoding digit 2n -The Selected PLMN identity consists of 3 digits from MCC followed by either -a filler digit plus 2 digits from MNC (in case of 2 digit MNC) or -3 digits from MNC (in case of a 3 digit MNC).
E-UTRAN Cell Identifier	M		BIT STRING (28)	

9.2.7   OTDOA Cell Information

This IE contains OTDOA information of a cell/TP.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
OTDOA Cell Information		1 .. <*maxnoOTDOAtypes*>		
>CHOICE *OTDOA Cell Information Item*	M			
>>PCI	M		INTEGER (0..503, …)	Physical Cell ID
>>Cell ID	M		ECGI 9.2.6	
>>TAC	M		OCTET STRING(2)	Tracking Area Code
>>EARFCN	M		INTEGER (0..65535, ..., 65536..262143)	Corresponds to N_{DL} for FDD and $N_{DL/UL}$ for TDD in ref. TS 36.104 [5]. For an inband mode NB-IoT Cell, this IE indicates the E-UTRAN EARFCN.
>>PRS Bandwidth	M		ENUMERATED (bw6, bw15, bw25, bw50, bw75, bw100, ...)	Transmission bandwidth of PRS
>>PRS Configuration Index	M		INTEGER (0..4095, ...)	PRS Configuration Index, ref TS 36.211 [6]
>>CP Length	M		ENUMERATED (Normal, Extended,...)	Cyclic prefix length of the PRS
>>Number of DL Frames	M		ENUMERATED (sf1, sf2, sf4, sf6,…)	Number of consecutive downlink subframes N_{PRS} with PRS, ref TS 36.211 [6]
>>Number of Antenna Ports	M		ENUMERATED(n1-or-n2, n4,…)	Number of used antenna ports, where n1-or-n2 corresponds to 1 or 2 ports, n4 corresponds to 4 ports
>>SFN Initialisation Time	M		BIT STRING (64)	Time in seconds relative to 00:00:00 on 1 January 1900 (calculated as continuous time without leap seconds and traceable to a common time reference) where binary encoding of the integer part is in the first 32 bits and binary encoding of the fraction part in the last 32 bits. The fraction part is expressed with a granularity of 1 /2**32 second.
>>E-UTRAN Access Point Position	M		9.2.8	The configured estimated geographical position of the antenna of the cell/TP.
>>PRS Muting Configuration	M		9.2.9	The configuration of positioning reference signals muting pattern.
>>PRS-ID	M		INTEGER (0..4095,…)	PRS ID, ref TS 36.211 [6].
>>TP-ID	M		INTEGER (0..4095,…)	Identity of the transmission point. This IE together with the *PCI* and/or *PRS-ID* may be used to identify the transmission point in case the same physical cell ID is shared by multiple transmission points.
>>TP Type	M		ENUMERATED (prs-only-tp, …)	A TP which transmits PRS only.

>>Number of DL Frames-Extended	M		INTEGER (1..160,…)	Number of consecutive downlink subframes N_{PRS} with PRS, ref TS 36.211 [6].
>>CRS CP Length	M		ENUMERATED (Normal, Extended,...)	Cyclic prefix length of the CRS.
>>MBSFN subframe Configuration	M		9.2.14	The MBSFN subframe configuration.
>>NPRS configuration	M		9.2.16	The NPRS configuration with the mapping to resource elements as specified for the Type 1 NPRS in TS 36.211 sub-clause 10.2.6A.2 [6]. Only applicable for inband mode NB-IoT operation.
>>Offset of NB-IoT Channel Number to DL EARFCN	M		Offset of NB-IoT Channel Number to EARFCN 9.2.18	Corresponds to MDL in TS 36.104 [5]
>>operationModeInfo	M		ENUMERATED (inband, guardband, standalone,...)	
>>NPRS-ID	M		INTEGER (0..4095,…)	NPRS ID, ref TS 36.211 [6].
>>DL Bandwidth	M		ENUMERATED (bw6, bw15, bw25, bw50, bw75, bw100, ...)	DL transmission bandwidth expressed in units of resource blocks N_{RB}, ref TS 36.104 [5].
>>PRS Occasion Group	M		ENUMERATED (og2, og4, og8, og16, og32, og64, og128, ...)	PRS occasion group in a PRS period, ref TS 36.211 [6].
>>PRS Frequency Hopping Configuration	M		9.2.19	PRS frequency hopping configuration.
>>Repetition Number of SIB1-NB	M		ENUMERATED (r4, r8, r16, ...)	Repetition Number of SIB1-NB, refer to TS36.213 [12]. Value r4 corresponds to 4 repetitions, r8 to 8 repetitions, and r16 to 16 repetitions.
>>NPRSsequenceInfo	M		INTEGER (0..174,…)	The index of the PRB containing the NPRS as defined in the table *nprsSequenceInfo* to E-UTRA PRB index relation, refer to TS 36.355 [13]. Only included in case of inband mode NB-IoT operation.
>>NPRS Type 2	M		9.2.16	The NPRS configuration with the mapping to resource elements as specified for the Type 2 NPRS in TS 36.211 sub-clause 10.2.6A.2 [6].

Range bound	Explanation
maxnoOTDOAtypes	Maximum no. of OTDOA information types that can be requested and reported with one message. Value is 63.

9.2.8   E-UTRAN Access Point Position

E-UTRAN Access Point Position IE is used to identify the geographical position of an E-UTRAN Access Point. It is expressed as ellipsoid point with altitude and uncertainty ellipsoid according to TS 23.032 [7].

IE/Group Name	Presence	Range	IE Type and Reference	Semantics Description
Latitude Sign	M		ENUMERATED (North, South)	
Degrees Of Latitude	M		INTEGER $(0..2^{23}-1)$	The IE value (N) is derived by this formula: $N \leq 2^{23}$ X /90 < N+1 X being the latitude in degrees (0°.. 90°).
Degrees Of Longitude	M		INTEGER $(-2^{23}..2^{23}-1)$	The IE value (N) is derived by this formula: $N \leq 2^{24}$ X /360 < N+1 X being the longitude in degrees (-180°..+180°).
Direction of Altitude	M		ENUMERATED (Height, Depth)	
Altitude	M		INTEGER $(0..2^{15}-1)$	The relation between the value (N) and the altitude (a) in meters it describes is $N \leq a < N+1$, except for $N=2^{15}-1$ for which the range is extended to include all greater values of (a).
Uncertainty semi-major	M		INTEGER (0..127)	The uncertainty "r" is derived from the "uncertainty code" k by r = 10x(1.1^k-1).
Uncertainty semi-minor	M		INTEGER (0..127)	The uncertainty "r" is derived from the "uncertainty code" k by r = 10x(1.1^k-1).
Orientation of major axis	M		INTEGER (0..179)	
Uncertainty Altitude	M		INTEGER (0..127)	The uncertainty altitude "h" expressed in metres is derived from the "uncertainty code" k, by: h=45x(1.025^k-1).
Confidence	M		INTEGER(0..100)	In percentage

9.2.9   PRS Muting Configuration

The *PRS Muting Configuration* IE is used to describe the configuration of PRS muting patterns for the concerned cell/TP, according to TS 36.211 [6] and TS 36.133 [8].

IE/Group Name	Presence	Range	IE Type and Reference	Semantics Description
CHOICE *PRS Muting Configuration*	M			
>Two	M		BIT STRING (2)	If a bit is set to "0", it indicates that the PRS is muted in the corresponding PRS positioning occasion (numbering from any sub frame for which SFN=0) in a periodic cycle of length equal to the length of the bit string
>Four	M		BIT STRING (4)	Same as above
>Eight	M		BIT STRING (8)	Same as above
>Sixteen	M		BIT STRING (16)	Same as above
>thirty-two	M		BIT STRING (32)	Same as above
>sixty-four	M		BIT STRING (64)	Same as above
>one-hundred-and-twenty-eight	M		BIT STRING (128)	Same as above
>two-hundred-and-fifty-six	M		BIT STRING (256)	Same as above
>five-hundred-and-twelve	M		BIT STRING (512)	Same as above
>one-thousand-and-twenty-four	M		BIT STRING (1024)	Same as above

9.2.10   Requested SRS Transmission Characteristics

The purpose of the Requested SRS Transmissions Characteristics information element is to inform the eNB of the number and bandwidth of periodic SRS transmissions requested for the UE for the purpose of UTDOA positioning.

IE/Group Name	Presence	Range	IE Type and Reference	Semantics Description
Number Of Transmissions	M		INTEGER (0..500,…)	The number of periodic SRS transmissions requested. The value of '0' represents an infinite number of SRS transmissions.
Bandwidth	M		INTEGER (1..100,…)	The requested bandwidth of the SRS transmissions, the value of which corresponds to the number of resource blocks requested to be allocated.

9.2.11   UL Configuration

The purpose of the Uplink Configuration information element is to inform the E-SMLC of the uplink configuration parameters.

IE/Group Name	Presence	Range	IE Type and Reference	Semantics Description
PCI	M		INTEGER (0..503, …)	Physical Cell Identifier of the PCell
UL EARFCN	M		INTEGER (0..262143, …)	The uplink E-UTRA carrier frequency of the PCell
TA Type1	O		INTEGER (0..7690)	Timing advance measurement, the mapping of the reported quantity is defined in TS 36.133 [8]
TA Type2	O		INTEGER (0..7690)	Timing advance measurement, the mapping of the reported quantity is defined in TS 36.133 [8]
Number of Transmissions	M		INTEGER (0..500,…)	The number of periodic SRS transmissions. The value of '0' represents an infinite number of SRS transmissions.
SRS Configuration	M	*1 ..<maxServCell>*		Configuration of SRS for corresponding serving cells.
>PCI	M		INTEGER (0..503, …)	Physical Cell ID.
>UL EARFCN	M		INTEGER (0..262143, ...)	The uplink E-UTRA carrier frequency of the corresponding serving cell. Corresponds to NUL in TS 36.104 [5].
>UL-bandwidth	M		ENUMERATED (n6, n15, n25, n50, n75, n100)	Cell transmission bandwidth configuration in uplink corresponding to an E-UTRA channel bandwidth TS 36.104 [5], Table 5.6-1. Value n6 corresponds to 6 resource blocks, n15 to 15 resource blocks and so on.
>UL-CyclicPrefixLength	M		ENUMERATED (Normal, Extended)	Uplink cyclic prefix.
>srs-BandwidthConfig	M		ENUMERATED (bw0, bw1, bw2, bw3, bw4, bw5, bw6, bw7)	Cell-specific SRS bandwidth configuration TS 36.211 [6]. bw0 corresponds to value 0, bw1 to value 1 and so on
>srs-Bandwidth	M		ENUMERATED (bw0, bw1, bw2, bw3)	UE-specific SRS bandwidth configuration TS 36.211 [6]
>srs-AntennaPort	M		ENUMERATED (an1, an2, an4, ...)	.Number of antenna ports for SRS transmission. TS 36.211 [6]
>srs-HoppingBandwidth	M		ENUMERATED (hbw0, hbw1, hbw2, hbw3)	SRS frequency hopping bandwidth configuration TS 36.211 [6]
>srs-cyclicShift	M		ENUMERATED (cs0, cs1, cs2, cs3, cs4, cs5, cs6, cs7)	SRS-Cyclic shift TS 36.211 [6]
>srs-ConfigIndex	M		INTEGER (0..1023)	SRS configuration index TS 36.211 [6]
>MaxUpPt	C-IfTDD		ENUMERATED (true)	MaxUpPt TS 36.211[6]

>transmissionComb	M		INTEGER (0..1)	Transmission comb TS 36.211 [6]
>freqDomainPosition	M		INTEGER (0..23)	Frequency domain position TS 36.211 [6]
>groupHoppingEnabled	M		BOOLEAN	Group-hopping-enabled TS 36.211 [6]
>deltaSS	O		INTEGER (0..29)	deltaSS TS 36.211 [6]
>SFN Initialisation Time	M		BIT STRING (64)	Time in seconds relative to 00:00:00 on 1 January 1900 (calculated as continuous time without leap seconds and traceable to a common time reference) where binary encoding of the integer part is in the first 32 bits and binary encoding of the fraction part in the last 32 bits. The fraction part is expressed with a granularity of 1 /2**32 second.

Condition	Explanation
IfTDD	This IE shall be present if the *UL-EARFCN* IE refers to TDD operation.

Range bound	Explanation
maxServCell	Maximum number of serving cells with SRS configuration. Value is 5.

9.2.12   Cell Portion ID

This parameter gives the current Cell Portion associated with the target UE. The Cell Portion ID is the unique identifier for a cell portion within a cell.

Table 9.2.12-1: Cell Portion

IE/Group Name	Presence	Range	IE type and reference	Semantics description
Cell Portion ID	M		INTEGER (0..255, …, 256..4095)	

9.2.13   Inter-RAT Measurement Result

The purpose of the Inter-RAT Measurement Result information element is to provide the Inter-RAT measurement results.

IE/Group Name	Presence	Range	IE Type and Reference	Semantics Description
Inter-RAT Measured Results		*1.. <maxnoMeas>*		
>CHOICE *Inter-RAT Measured Results Value*	M			
>>**Result GERAN**	M	*1..<maxGERAN Meas>*		
>>>ARFCN of BCCH	M		INTEGER (0..1023, ...)	
>>>Physical CellId GERAN	M		INTEGER (0..63, ...)	
>>>RSSI	M		INTEGER(0..63, ...)	
>>**Result UTRAN**		*1..<maxUTRAN Meas>*		
>>>UARFCN	M		INTEGER (0..16383, ...)	
>>>CHOICE Physical CellId UTRA	M			
>>>>Physical CellId UTRA FDD	M		INTEGER (0..511, ...)	
>>>>Physical CellId UTRA TDD	M		INTEGER (0..127, ...)	
>>>UTRA RSCP	O		INTEGER(-5..91, ...)	
>>>UTRA EcNo	O		INTEGER(0..49, ...)	This IE applies to FDD only.

Range bound	Explanation
maxnoMeas	Maximum no. of measured quantities that can be configured and reported with one message. Value is 63.
maxGERANMeas	Maximum no. of GERAN cells that can be reported with one message. Value is 8.
maxUTRANMeas	Maximum no. of UTRAN cells that can be reported with one message. Value is 8.

9.2.14   MBSFN subframe Configuration

The *MBSFN subframe Configuration* IE describes the MBSFN subframe configuration for the concerned cell/TP.

IE/Group Name	Presence	Range	IE Type and Reference	Semantics Description
MBSFN subframe Configuration Value		*1 .. < maxMBSFN-Allocations >*		
>Radio Frame Allocation Period	M		ENUMERATED (n1, n2, n4, n8, n16, n32)	Radio frame allocation period, ref TS 36.331 [10]
>Radio Frame Allocation Offset	M		INTEGER (0..7)	Radio frame allocation offset, ref TS 36.331 [10]
> CHOICE *Subframe Allocation*	M			Subframe allocation, ref TS 36.331 [10]
>>oneFrame	M		BIT STRING (SIZE(6))	
>>fourFrames	M		BIT STRING (SIZE(24))	

Range bound	Explanation
maxMBSFN-Allocations	Maximum number of MBSFN frame allocations with different offset as defined in TS36.331 [10]. Value is 8.

9.2.15   WLAN Measurement Result

The WLAN Measurement Result information element provides the WLAN measurement results.

IE/Group Name	Presence	Range	IE Type and Reference	Semantics Description
WLAN Measured Results		*1.. <maxnoMeas>*		
>WLAN RSSI	M		INTEGER (0..141, ...)	
>SSID	O		OCTET STRING (SIZE(1..32))	Includes the SSID field as defined in subclause 8.4.2.2 of IEEE 802.11™ [11].
>BSSID	M		OCTET STRING (SIZE(6))	Includes the BSSID field as defined in subclause 8.2.4.3.4 of IEEE 802.11™ [11].
>HESSID	O		OCTET STRING (SIZE(6))	Includes the HESSID field as defined in subclause 8.4.2.94 of IEEE 802.11™ [11].
>Operating Class	O		INTEGER (0..255)	Indicates the WLAN Operating Class as defined in IEEE 802.11™ [11].
>Country Code			ENUMERATED (unitedStates, europe, japan, global, …)	Indicates the WLAN country code as defined in IEEE 802.11™ [11].
>WLAN Channel List		*0..1*		
>>WLAN Channel List Item		*1..<maxWLANchannels>*		
>>>WLAN Channel			INTEGER (0..255)	Indicates the WLAN channel number as defined in IEEE 802.11™ [11].
>WLAN Band	O		ENUMERATED (band2dot4, band5, …)	Indicates the WLAN band as defined in IEEE 802.11™ [11].

Range bound	Explanation
maxnoMeas	Maximum no. of measured quantities that can be configured and reported with one message. Value is 63.
maxWLANchannels	Maximum no. of WLAN channels that can be reported within one list. Value is 16.

9.2.16   NPRS configuration

The *NPRS Configuration* IE is used to describe the configuration of NPRS for the concerned NB-IOT carrier.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
NPRS subframe configuration Part A	O			For *NPRS subframe configuration Part A* and *NPRS subframe configuration Part B*, at least one of them must be present in *NPRS configuration*.
>CHOICE *Bitmaps for NPRS subframes*	M			
>>Ten			BIT STRING(SIZE(10))	Subframes not containing NPRS are indicated with '0'. Subframes containing NPRS are indicated with '1'
>> Forty			BIT STRING(SIZE(40))	Same as above
>>Ten-TDD			BIT STRING(SIZE(8))	Subframes not containing NPRS are indicated with '0'. Subframes containing NPRS are indicated with '1'. The subframe #1 and #2 are not included in this Bit String. This IE applies to NB-IoT TDD only.
>> Forty-TDD			BIT STRING(SIZE(32))	Same as above.
>NPRS Muting Configuration	O		9.2.17	
NPRS subframe configuration Part B	O			For *NPRS subframe configuration Part A* and *NPRS subframe configuration Part B*, at least one of them must be present in *NPRS configuration*.
>Number of NPRS subframes in one occasion	M		ENUMERATED (sf10, sf20, sf40, sf80, sf160, sf320, sf640, sf1280, …, sf2560)	Number of consecutive subframes containing NPRS in one NPRS occasion
>Periodicity of NPRS	M		ENUMERATED (sf160, sf320, sf640, sf1280, …, sf2560)	Periodicity of NPRS occasion T_{NPRS}
>starting subframe offset of NPRS occasion	M		ENUMERATED (zero, one-Eighth, two-Eighths, three-Eighths, four-Eighths, five-Eighths, six-Eighths, seven-Eighths, …)	For a given periodicity of NPRS occasion T_{NPRS}, the starting subframe offset of NPRS occasion = a* T_{NPRS}. $$\alpha \in \{0, \frac{1}{8}, \frac{2}{8}, \frac{3}{8}, \frac{4}{8}, \frac{5}{8},$$
>NPRS Muting Configuration	O		9.2.17	

9.2.17 NPRS Muting Configuration

The *NPRS Muting Configuration* IE is used to describe the configuration of NPRS muting patterns for the concerned NB-IOT carrier.

IE/Group Name	Presence	Range	IE Type and Reference	Semantics Description
CHOICE *NPRS Muting Configuration*	M			
>Two	M		BIT STRING (SIZE(2))	Each bit in a muting pattern corresponds to: for Part A, consecutive 10 subframes, for Part B, one NPRS occasion. The first bit of the NPRS muting sequence corresponds to the first NPRS positioning occasion (for Part B) or the first NPRS subframes (for PartA) that starts from any subframe for which SFN=0. The sequence is valid for all subframes after the target device has received the *nprs-MutingInfo*.
>Four	M		BIT STRING (SIZE(4))	Same as above
>Eight	M		BIT STRING (SIZE(8))	Same as above
>Sixteen	M		BIT STRING (SIZE(16))	Same as above

9.2.18 Offset of NB-IoT Channel Number to EARFCN

This IE is used to indicate the offset of the NB-IoT Channel Number to the EARFCN (TS 36.104 [5]).

IE/Group Name	Presence	Range	IE Type and Reference	Semantics Description
Offset of NB-IoT Channel Number to DL EARFCN	M		ENUMERATED (-10,-9,-8,-7,-6,-5,-4,-3,-2,-1,-0.5,0,1,2,3,4,5,6,7,8,9,...)	

9.2.19 PRS Frequency Hopping Configuration

The *PRS Frequency Hopping Configuration* IE is used to describe the configuration of PRS frequency hopping for the concerned cell/TP, according to TS 36.211 [6].

IE/Group Name	Presence	Range	IE Type and Reference	Semantics Description
Number of Frequency Hopping Bands	M		ENUMERATED (twobands, fourbands, ...)	Number of bands for frequency hopping.
Band Positions		1..<*maxnoFreqHoppingBandsMinusOne,...*>		
>NarrowBand Index	M		INTEGER (0..15, ...)	Narrowband Index

Range bound	Explanation
maxnoFreqHoppingBandsMinusOne	Maximum no. of frequency hopping bands minus one. Value is 7.

9.2.20   Assistance Information

This IE contains the assistance information.

Table 9.2.20-1: Assistance Information

IE/Group Name	Presence	Range	IE type and reference	Semantics description
Assistance Information	M			
>System Information		*1..<maxNrOf PosSImessag e>*		Corresponds to the number of SI messages with posSIBs to be scheduled
>>Broadcast Periodicity	M		ENUMERATED (ms80, ms160, ms320, ms640, ms1280, ms2560, ms5120, ...)	Broadcast Peiriodicity for the Pos SIBs, see TS 36.331 [10]
>>Pos SIBs		1..<maxNrOf PosSIBs>		Number of posSIBs in the System Information.
>>>PosSIB-Type	M		9.2.23	
>>>PosSIB Segments	M		9.2.21	
>>>Assistance Information Meta Data	O		9.2.22	
>>>Broadcast Priority	O		INTEGER (1..16, ...)	The priority of the assistance Information where 1 represents the highest priority and 16 the lowest priority

Range bound	Explanation
maxNrOfPosSImessage	Maximum number of positioning system information messages. Value is 32.
maxNrOfPosSIBs	Maximum number of positioning system information blocks included in the message. Value is 32.

9.2.21   PosSIB Segments

This IE provides one posSIB or two or more posSIB segments which must be scheduled in series in consecutive transmissions of the same SI message.

Table 9.2.21-1: PosSIB Segments

IE/Group Name	Presence	Range	IE type and reference	Semantics description
PosSIB Segments		1..<maxNr OfSegment s>		
>Assistance Data SIB Element	M		OCTET STRING	TS 36.355 [13]

Range bound	Explanation
maxNrOfSegments	Maximum number of positioning SIB segments (in case of *Assistance Information Element* contains segmented data according to TS 36.355 [13]). Value is 64.

9.2.22   Assistance Information Meta Data

This parameter contains meta data for an assistance information element.

Table 9.2.22-1: Assistance Information Meta Data

IE/Group Name	Presence	Range	IE type and reference	Semantics description
Encrypted	O		ENUMERATED (true, …)	TS 36.331 [10]
GNSS ID	O		ENUMERATED (gps, sbas, qzss, galileo, glonass, bds, ...)	TS 36.331 [10]
SBAS ID	O		ENUMERATED (waas, egnos, msas, gagan, ...)	TS 36.331 [10]

9.2.23   Positioning SIB Type

This parameter defines a specific positioning SIB, as defined in TS 36.355 [13].

IE/Group Name	Presence	Range	IE type and reference	Semantics description
Positioning SIB Type	M		ENUMERATED (posSibType1-1, posSibType1-2, posSibType1-3, posSibType1-4, posSibType1-5, posSibType1-6, posSibType1-7, posSibType2-1, posSibType2-2, posSibType2-3, posSibType2-4, posSibType2-5, posSibType2-6, posSibType2-7, posSibType2-8, posSibType2-9, posSibType2-10, posSibType2-11, posSibType2-12, posSibType2-13, posSibType2-14, posSibType2-15, posSibType2-16, posSibType2-17, posSibType2-18, posSibType2-19, posSibType3-1, ...)	

9.2.24   Assistance Information Failure List

This parameter identifies the assistance information for which the eNB failed to configure broadcasting.

Table 9.2.24-1: Assistance Information Failure List

IE/Group Name	Presence	Range	IE type and reference	Semantics description
Assistance Information Failure List		*1..<maxnoAssistInfoFailureListItems>*		
>PosSIB-Type	M		9.2.23	
>Outcome	M		ENUMERATED (failed, ...)	

Range bound	Explanation
maxnoAssistInfoFailureListItems	Maximum no. of assistance information failure list items that can be signaled with one message. Value is 32.

9.3 Message and Information Element Abstract Syntax (with ASN.1)

9.3.1 General

Sub clause 9.3 presents the Abstract Syntax of the LPPa protocol with ASN.1. In case there is contradiction between the ASN.1 definition in this sub clause and the tabular format in sub clause 9.1 and 9.2, the ASN.1 shall take precedence, except for the definition of conditions for the presence of conditional elements, in which the tabular format shall take precedence.

The ASN.1 definition specifies the structure and content of LPPa messages. LPPa messages can contain any IEs specified in the object set definitions for that message without the order or number of occurrence being restricted by ASN.1. However, for this version of the standard, a sending entity shall construct an LPPa message according to the PDU definitions module and with the following additional rules (Note that in the following, "IE" means an IE in the object set with an explicit id. If one IE needs to appear more than once in one object set, then the different occurrences have different IE ids):

- IEs shall be ordered (in an IE container) in the order they appear in object set definitions.

- Object set definitions specify how many times IEs may appear. An IE shall appear exactly once if the presence field in an object has value "mandatory". An IE may appear at most once if the presence field in an object has value "optional" or "conditional". If in a tabular format there is multiplicity specified for an IE (i.e. an IE list) then in the corresponding ASN.1 definition the list definition is separated into two parts. The first part defines an IE container list in which the list elements reside. The second part defines list elements. The IE container list appears as an IE of its own. For this version of the standard an IE container list may contain only one kind of list elements.

If an LPPa message that is not constructed as defined above is received, this shall be considered as Abstract Syntax Error, and the message shall be handled as defined for Abstract Syntax Error in clause 10.

9.3.2 Usage of Private Message Mechanism for Non-standard Use

The private message mechanism for non-standard use may be used:

- for special operator (and/or vendor) specific features considered not to be part of the basic functionality, i.e. the functionality required for a complete and high-quality specification in order to guarantee multivendor inter-operability.

- by vendors for research purposes, e.g. to implement and evaluate new algorithms/features before such features are proposed for standardisation.

The private message mechanism shall not be used for basic functionality. Such functionality shall be standardised.

9.3.3 Elementary Procedure Definitions

```
-- **************************************************************
--
-- Elementary Procedure definitions
--
-- **************************************************************

LPPA-PDU-Descriptions {
itu-t (0) identified-organization (4) etsi (0) mobileDomain (0)
eps-Access (21) modules (3) lppa (6) version1 (1) lppa-PDU-Descriptions (0) }
```

```
DEFINITIONS AUTOMATIC TAGS ::=

BEGIN

-- ************************************************************
--
-- IE parameter types from other modules.
--
-- ************************************************************

IMPORTS
    Criticality,
    ProcedureCode,
    LPPATransactionID

FROM LPPA-CommonDataTypes


    ErrorIndication,
    PrivateMessage,
    E-CIDMeasurementInitiationRequest,
    E-CIDMeasurementInitiationResponse,
    E-CIDMeasurementInitiationFailure,
    E-CIDMeasurementFailureIndication,
    E-CIDMeasurementReport,
    E-CIDMeasurementTerminationCommand,
    OTDOAInformationRequest,
    OTDOAInformationResponse,
    OTDOAInformationFailure,
    UTDOAInformationRequest,
    UTDOAInformationResponse,
    UTDOAInformationFailure,
    UTDOAInformationUpdate,
    AssistanceInformationControl,
    AssistanceInformationFeedback


FROM LPPA-PDU-Contents

    id-errorIndication,
    id-privateMessage,
    id-e-CIDMeasurementInitiation,
    id-e-CIDMeasurementFailureIndication,
    id-e-CIDMeasurementReport,
    id-e-CIDMeasurementTermination,
    id-oTDOAInformationExchange,
    id-uTDOAInformationExchange,
    id-uTDOAInformationUpdate,
    id-assistanceInformationControl,
    id-assistanceInformationFeedback


FROM LPPA-Constants;
```

```
-- **************************************************************
--
-- Interface Elementary Procedure Class
--
-- **************************************************************

LPPA-ELEMENTARY-PROCEDURE ::= CLASS {
    &InitiatingMessage                 ,
    &SuccessfulOutcome                 OPTIONAL,
    &UnsuccessfulOutcome               OPTIONAL,
    &procedureCode          ProcedureCode   UNIQUE,
    &criticality            Criticality     DEFAULT ignore
}
WITH SYNTAX {
    INITIATING MESSAGE      &InitiatingMessage
    [SUCCESSFUL OUTCOME     &SuccessfulOutcome]
    [UNSUCCESSFUL OUTCOME   &UnsuccessfulOutcome]
    PROCEDURE CODE          &procedureCode
    [CRITICALITY            &criticality]
}

-- **************************************************************
--
-- Interface PDU Definition
--
-- **************************************************************

LPPA-PDU ::= CHOICE {
    initiatingMessage    InitiatingMessage,
    successfulOutcome    SuccessfulOutcome,
    unsuccessfulOutcome UnsuccessfulOutcome,
    ...
}

InitiatingMessage ::= SEQUENCE {
    procedureCode       LPPA-ELEMENTARY-PROCEDURE.&procedureCode          ({LPPA-ELEMENTARY-PROCEDURES}),
    criticality         LPPA-ELEMENTARY-PROCEDURE.&criticality            ({LPPA-ELEMENTARY-PROCEDURES}{@procedureCode}),
    lppatransactionID   LPPATransactionID,
    value               LPPA-ELEMENTARY-PROCEDURE.&InitiatingMessage      ({LPPA-ELEMENTARY-PROCEDURES}{@procedureCode})
}

SuccessfulOutcome ::= SEQUENCE {
    procedureCode       LPPA-ELEMENTARY-PROCEDURE.&procedureCode          ({LPPA-ELEMENTARY-PROCEDURES}),
    criticality         LPPA-ELEMENTARY-PROCEDURE.&criticality            ({LPPA-ELEMENTARY-PROCEDURES}{@procedureCode}),
    lppatransactionID   LPPATransactionID,
    value               LPPA-ELEMENTARY-PROCEDURE.&SuccessfulOutcome      ({LPPA-ELEMENTARY-PROCEDURES}{@procedureCode})
}

UnsuccessfulOutcome ::= SEQUENCE {
    procedureCode       LPPA-ELEMENTARY-PROCEDURE.&procedureCode          ({LPPA-ELEMENTARY-PROCEDURES}),
    criticality         LPPA-ELEMENTARY-PROCEDURE.&criticality            ({LPPA-ELEMENTARY-PROCEDURES}{@procedureCode}),
    lppatransactionID   LPPATransactionID,
    value               LPPA-ELEMENTARY-PROCEDURE.&UnsuccessfulOutcome    ({LPPA-ELEMENTARY-PROCEDURES}{@procedureCode})
```

```
}


-- *************************************************************
--
-- Interface Elementary Procedure List
--
-- *************************************************************

LPPA-ELEMENTARY-PROCEDURES LPPA-ELEMENTARY-PROCEDURE ::= {
    LPPA-ELEMENTARY-PROCEDURES-CLASS-1         |
    LPPA-ELEMENTARY-PROCEDURES-CLASS-2         ,
    ...
}

LPPA-ELEMENTARY-PROCEDURES-CLASS-1 LPPA-ELEMENTARY-PROCEDURE ::= {
    e-CIDMeasurementInitiation       |
    oTDOAInformationExchange         ,
    ...,
    uTDOAInformationExchange
}

LPPA-ELEMENTARY-PROCEDURES-CLASS-2 LPPA-ELEMENTARY-PROCEDURE ::= {
    e-CIDMeasurementFailureIndication        |
    e-CIDMeasurementReport                   |
    e-CIDMeasurementTermination              |
    errorIndication                          |
    privateMessage                           ,
    ...,
    uTDOAInformationUpdate                   |
    assistanceInformationControl             |
    assistanceInformationFeedback
}


-- *************************************************************
--
-- Interface Elementary Procedures
--
-- *************************************************************

e-CIDMeasurementInitiation LPPA-ELEMENTARY-PROCEDURE ::= {
    INITIATING MESSAGE        E-CIDMeasurementInitiationRequest
    SUCCESSFUL OUTCOME        E-CIDMeasurementInitiationResponse
    UNSUCCESSFUL OUTCOME      E-CIDMeasurementInitiationFailure
    PROCEDURE CODE            id-e-CIDMeasurementInitiation
    CRITICALITY               reject
}

e-CIDMeasurementFailureIndication LPPA-ELEMENTARY-PROCEDURE ::= {
    INITIATING MESSAGE        E-CIDMeasurementFailureIndication
    PROCEDURE CODE            id-e-CIDMeasurementFailureIndication
    CRITICALITY               ignore
}
```

ETSI

```
e-CIDMeasurementReport LPPA-ELEMENTARY-PROCEDURE ::= {
    INITIATING MESSAGE        E-CIDMeasurementReport
    PROCEDURE CODE            id-e-CIDMeasurementReport
    CRITICALITY               ignore
}

e-CIDMeasurementTermination LPPA-ELEMENTARY-PROCEDURE ::= {
    INITIATING MESSAGE        E-CIDMeasurementTerminationCommand
    PROCEDURE CODE            id-e-CIDMeasurementTermination
    CRITICALITY               reject
}

oTDOAInformationExchange LPPA-ELEMENTARY-PROCEDURE ::= {
    INITIATING MESSAGE        OTDOAInformationRequest
    SUCCESSFUL OUTCOME        OTDOAInformationResponse
    UNSUCCESSFUL OUTCOME      OTDOAInformationFailure
    PROCEDURE CODE            id-oTDOAInformationExchange
    CRITICALITY               reject
}

uTDOAInformationExchange LPPA-ELEMENTARY-PROCEDURE ::= {
    INITIATING MESSAGE        UTDOAInformationRequest
    SUCCESSFUL OUTCOME        UTDOAInformationResponse
    UNSUCCESSFUL OUTCOME      UTDOAInformationFailure
    PROCEDURE CODE            id-uTDOAInformationExchange
    CRITICALITY               reject
}

uTDOAInformationUpdate LPPA-ELEMENTARY-PROCEDURE ::= {
    INITIATING MESSAGE        UTDOAInformationUpdate
    PROCEDURE CODE            id-uTDOAInformationUpdate
    CRITICALITY               ignore
}

assistanceInformationControl LPPA-ELEMENTARY-PROCEDURE ::= {
    INITIATING MESSAGE        AssistanceInformationControl
    PROCEDURE CODE            id-assistanceInformationControl
    CRITICALITY               reject
}

assistanceInformationFeedback LPPA-ELEMENTARY-PROCEDURE ::= {
    INITIATING MESSAGE        AssistanceInformationFeedback
    PROCEDURE CODE            id-assistanceInformationFeedback
    CRITICALITY               reject
}

errorIndication LPPA-ELEMENTARY-PROCEDURE ::= {
    INITIATING MESSAGE        ErrorIndication
    PROCEDURE CODE            id-errorIndication
    CRITICALITY               ignore
}
```

```
privateMessage          LPPA-ELEMENTARY-PROCEDURE ::= {
    INITIATING MESSAGE      PrivateMessage
    PROCEDURE CODE          id-privateMessage
    CRITICALITY             ignore
}

END
```

9.3.4   PDU Definitions

```
-- **************************************************************
--
-- PDU definitions for LPPa.
--
-- **************************************************************

LPPA-PDU-Contents {
itu-t (0) identified-organization (4) etsi (0) mobileDomain (0)
eps-Access (21) modules (3) lppa (6) version1 (1) lppa-PDU-Contents (1) }

DEFINITIONS AUTOMATIC TAGS ::=

BEGIN

-- **************************************************************
--
-- IE parameter types from other modules.
--
-- **************************************************************

IMPORTS

    Cause,
    CriticalityDiagnostics,
    E-CID-MeasurementResult,
    OTDOACells,
    OTDOA-Information-Item,
    Measurement-ID,
    MeasurementPeriodicity,
    MeasurementQuantities,
    ReportCharacteristics,
    RequestedSRSTransmissionCharacteristics,
    ULConfiguration,
    Cell-Portion-ID,
    InterRATMeasurementQuantities,
    InterRATMeasurementResult,
    Add-OTDOACells,
    WLANMeasurementQuantities,
    WLANMeasurementResult,
    Assistance-Information,
    Broadcast,
    AssistanceInformationFailureList
```

```
FROM LPPA-IEs

    PrivateIE-Container{},
    ProtocolExtensionContainer{},
    ProtocolIE-Container{},
    ProtocolIE-ContainerList{},
    ProtocolIE-ContainerPair{},
    ProtocolIE-ContainerPairList{},
    ProtocolIE-Single-Container{},
    LPPA-PRIVATE-IES,
    LPPA-PROTOCOL-EXTENSION,
    LPPA-PROTOCOL-IES,
    LPPA-PROTOCOL-IES-PAIR
FROM LPPA-Containers
    maxnoOTDOAtypes,
    id-Cause,
    id-CriticalityDiagnostics,
    id-E-SMLC-UE-Measurement-ID,
    id-OTDOACells,
    id-OTDOA-Information-Type-Group,
    id-OTDOA-Information-Type-Item,
    id-ReportCharacteristics,
    id-MeasurementPeriodicity,
    id-MeasurementQuantities,
    id-eNB-UE-Measurement-ID,
    id-E-CID-MeasurementResult,
    id-RequestedSRSTransmissionCharacteristics,
    id-ULConfiguration,
    id-Cell-Portion-ID,
    id-InterRATMeasurementQuantities,
    id-InterRATMeasurementResult,
    id-AddOTDOACells,
    id-WLANMeasurementQuantities,
    id-WLANMeasurementResult,
    id-Assistance-Information,
    id-Broadcast,
    id-AssistanceInformationFailureList

FROM LPPA-Constants;

-- **************************************************************
--
-- E-CID MEASUREMENT INITIATION REQUEST
--
-- **************************************************************

E-CIDMeasurementInitiationRequest ::= SEQUENCE {
    protocolIEs     ProtocolIE-Container    {{E-CIDMeasurementInitiationRequest-IEs}},
    ...
}

E-CIDMeasurementInitiationRequest-IEs LPPA-PROTOCOL-IES ::= {
    { ID id-E-SMLC-UE-Measurement-ID        CRITICALITY reject  TYPE Measurement-ID             PRESENCE mandatory}|
    { ID id-ReportCharacteristics           CRITICALITY reject  TYPE ReportCharacteristics      PRESENCE mandatory}|
```

```
    { ID id-MeasurementPeriodicity            CRITICALITY reject  TYPE MeasurementPeriodicity         PRESENCE conditional}|
-- The IE shall be present if the Report Characteritics IE is set to "periodic" --
    { ID id-MeasurementQuantities             CRITICALITY reject  TYPE MeasurementQuantities          PRESENCE mandatory}|
    { ID id-InterRATMeasurementQuantities     CRITICALITY ignore  TYPE InterRATMeasurementQuantities  PRESENCE optional}|
    { ID id-WLANMeasurementQuantities         CRITICALITY ignore  TYPE WLANMeasurementQuantities      PRESENCE optional},
    ...
}


-- *************************************************************
--
-- E-CID MEASUREMENT INITIATION RESPONSE
--
-- *************************************************************

E-CIDMeasurementInitiationResponse ::= SEQUENCE {
    protocolIEs    ProtocolIE-Container    {{E-CIDMeasurementInitiationResponse-IEs}},
    ...
}

E-CIDMeasurementInitiationResponse-IEs LPPA-PROTOCOL-IES ::= {
    { ID id-E-SMLC-UE-Measurement-ID    CRITICALITY reject  TYPE Measurement-ID              PRESENCE mandatory}|
    { ID id-eNB-UE-Measurement-ID       CRITICALITY reject  TYPE Measurement-ID              PRESENCE mandatory}|
    { ID id-E-CID-MeasurementResult     CRITICALITY ignore  TYPE E-CID-MeasurementResult     PRESENCE optional}|
    { ID id-CriticalityDiagnostics      CRITICALITY ignore  TYPE CriticalityDiagnostics      PRESENCE optional}|
    { ID id-Cell-Portion-ID             CRITICALITY ignore  TYPE Cell-Portion-ID             PRESENCE optional}|
    { ID id-InterRATMeasurementResult   CRITICALITY ignore  TYPE InterRATMeasurementResult   PRESENCE optional}|
    { ID id-WLANMeasurementResult       CRITICALITY ignore  TYPE WLANMeasurementResult       PRESENCE optional},
    ...
}


-- *************************************************************
--
-- E-CID MEASUREMENT INITIATION FAILURE
--
-- *************************************************************

E-CIDMeasurementInitiationFailure ::= SEQUENCE {
    protocolIEs                  ProtocolIE-Container         {{E-CIDMeasurementInitiationFailure-IEs}},
    ...
}

E-CIDMeasurementInitiationFailure-IEs LPPA-PROTOCOL-IES ::= {
    { ID id-E-SMLC-UE-Measurement-ID        CRITICALITY reject  TYPE Measurement-ID          PRESENCE mandatory}|
    { ID id-Cause                           CRITICALITY ignore  TYPE Cause                   PRESENCE mandatory}|
    { ID id-CriticalityDiagnostics          CRITICALITY ignore  TYPE CriticalityDiagnostics  PRESENCE optional},
    ...
}


-- *************************************************************
```

```
--
-- E-CID MEASUREMENT FAILURE INDICATION
--
-- *************************************************************

E-CIDMeasurementFailureIndication ::= SEQUENCE {
    protocolIEs                      ProtocolIE-Container        {{E-CIDMeasurementFailureIndication-IEs}},
    ...
}


E-CIDMeasurementFailureIndication-IEs LPPA-PROTOCOL-IES ::= {
    { ID id-E-SMLC-UE-Measurement-ID         CRITICALITY reject  TYPE Measurement-ID          PRESENCE mandatory}|
    { ID id-eNB-UE-Measurement-ID            CRITICALITY reject  TYPE Measurement-ID          PRESENCE mandatory}|
    { ID id-Cause                            CRITICALITY ignore  TYPE Cause                   PRESENCE mandatory},
    ...
}

-- *************************************************************
--
-- E-CID MEASUREMENT REPORT
--
-- *************************************************************

E-CIDMeasurementReport ::= SEQUENCE {
    protocolIEs                      ProtocolIE-Container        {{E-CIDMeasurementReport-IEs}},
    ...
}


E-CIDMeasurementReport-IEs LPPA-PROTOCOL-IES ::= {
    { ID id-E-SMLC-UE-Measurement-ID         CRITICALITY reject  TYPE Measurement-ID          PRESENCE mandatory}|
    { ID id-eNB-UE-Measurement-ID            CRITICALITY reject  TYPE Measurement-ID          PRESENCE mandatory}|
    { ID id-E-CID-MeasurementResult          CRITICALITY ignore  TYPE E-CID-MeasurementResult PRESENCE mandatory}|
    { ID id-Cell-Portion-ID                  CRITICALITY ignore  TYPE Cell-Portion-ID         PRESENCE optional},
    ...
}

-- *************************************************************
--
-- E-CID MEASUREMENT TERMINATION
--
-- *************************************************************

E-CIDMeasurementTerminationCommand ::= SEQUENCE {
    protocolIEs                      ProtocolIE-Container        {{E-CIDMeasurementTerminationCommand-IEs}},
    ...
}


E-CIDMeasurementTerminationCommand-IEs LPPA-PROTOCOL-IES ::= {
    { ID id-E-SMLC-UE-Measurement-ID         CRITICALITY reject  TYPE Measurement-ID          PRESENCE mandatory}|
    { ID id-eNB-UE-Measurement-ID            CRITICALITY reject  TYPE Measurement-ID          PRESENCE mandatory},
    ...
```

```
}


-- *************************************************************
--
-- OTDOA INFORMATION REQUEST
--
-- *************************************************************

OTDOAInformationRequest ::= SEQUENCE {
    protocolIEs     ProtocolIE-Container    {{OTDOAInformationRequest-IEs}},
    ...
}

OTDOAInformationRequest-IEs LPPA-PROTOCOL-IES ::= {
    { ID id-OTDOA-Information-Type-Group       CRITICALITY reject  TYPE OTDOA-Information-Type      PRESENCE mandatory},
    ...
}

OTDOA-Information-Type ::= SEQUENCE (SIZE(1..maxnoOTDOAtypes)) OF ProtocolIE-Single-Container { { OTDOA-Information-TypeIEs} }

OTDOA-Information-TypeIEs   LPPA-PROTOCOL-IES ::= {
    { ID id-OTDOA-Information-Type-Item    CRITICALITY reject  TYPE OTDOA-Information-Type-Item  PRESENCE mandatory},
    ...
}

OTDOA-Information-Type-Item ::= SEQUENCE {
    oTDOA-Information-Type-Item    OTDOA-Information-Item,
    iE-Extensions                 ProtocolExtensionContainer { { OTDOA-Information-Type-ItemExtIEs} } OPTIONAL,
    ...
}

OTDOA-Information-Type-ItemExtIEs LPPA-PROTOCOL-EXTENSION ::= {
    ...
}

-- *************************************************************
--
-- OTDOA INFORMATION RESPONSE
--
-- *************************************************************

OTDOAInformationResponse ::= SEQUENCE {
    protocolIEs     ProtocolIE-Container    {{OTDOAInformationResponse-IEs}},
    ...
}

OTDOAInformationResponse-IEs LPPA-PROTOCOL-IES ::= {
    { ID id-OTDOACells                        CRITICALITY ignore  TYPE OTDOACells                  PRESENCE mandatory}|
    { ID id-CriticalityDiagnostics            CRITICALITY ignore  TYPE CriticalityDiagnostics      PRESENCE optional}|
    { ID id-AddOTDOACells                     CRITICALITY ignore  TYPE Add-OTDOACells              PRESENCE optional},
    ...
}
```

```
-- *************************************************************
--
-- OTDOA INFORMATION FAILURE
--
-- *************************************************************

OTDOAInformationFailure ::= SEQUENCE {
    protocolIEs                     ProtocolIE-Container         {{OTDOAInformationFailure-IEs}},
    ...
}


OTDOAInformationFailure-IEs LPPA-PROTOCOL-IES ::= {
    { ID id-Cause                       CRITICALITY ignore  TYPE Cause                      PRESENCE mandatory}|
    { ID id-CriticalityDiagnostics      CRITICALITY ignore  TYPE CriticalityDiagnostics     PRESENCE optional},
    ...
}

-- *************************************************************
--
-- UTDOA INFORMATION REQUEST
--
-- *************************************************************

UTDOAInformationRequest ::= SEQUENCE {
    protocolIEs             ProtocolIE-Container         {{UTDOAInformationRequest-IEs}},
    ...
}

UTDOAInformationRequest-IEs LPPA-PROTOCOL-IES ::= {
    { ID id-RequestedSRSTransmissionCharacteristics     CRITICALITY ignore  TYPE RequestedSRSTransmissionCharacteristics PRESENCE optional},
    ...
}

-- *************************************************************
--
-- UTDOA INFORMATION RESPONSE
--
-- *************************************************************

UTDOAInformationResponse ::= SEQUENCE {
    protocolIEs             ProtocolIE-Container         {{UTDOAInformationResponse-IEs}},
    ...
}

UTDOAInformationResponse-IEs LPPA-PROTOCOL-IES ::= {
    { ID id-ULConfiguration                 CRITICALITY reject  TYPE ULConfiguration            PRESENCE mandatory}|
    { ID id-CriticalityDiagnostics          CRITICALITY ignore  TYPE CriticalityDiagnostics     PRESENCE optional},
    ...
}

-- *************************************************************
--
-- UTDOA INFORMATION FAILURE
```

```
--
-- ***************************************************************

UTDOAInformationFailure ::= SEQUENCE {
    protocolIEs            ProtocolIE-Container        {{UTDOAInformationFailure-IEs}},
    ...
}


UTDOAInformationFailure-IEs LPPA-PROTOCOL-IES ::= {
    { ID id-Cause                          CRITICALITY ignore  TYPE Cause                     PRESENCE mandatory}|
    { ID id-CriticalityDiagnostics         CRITICALITY ignore  TYPE CriticalityDiagnostics    PRESENCE optional},
    ...
}

-- ***************************************************************
--
-- UTDOA INFORMATION UPDATE
--
-- ***************************************************************

UTDOAInformationUpdate ::= SEQUENCE {
    protocolIEs              ProtocolIE-Container        {{UTDOAInformationUpdate-IEs}},
    ...
}

UTDOAInformationUpdate-IEs LPPA-PROTOCOL-IES ::= {
    { ID id-ULConfiguration    CRITICALITY ignore  TYPE ULConfiguration    PRESENCE optional},
    ...
}

-- ***************************************************************
--
-- ASSISTANCE INFORMATION CONTROL
--
-- ***************************************************************

AssistanceInformationControl ::= SEQUENCE {
    protocolIEs    ProtocolIE-Container   {{AssistanceInformationControl-IEs}},
    ...
}

AssistanceInformationControl-IEs LPPA-PROTOCOL-IES ::= {
    { ID id-Assistance-Information  CRITICALITY reject  TYPE Assistance-Information     PRESENCE optional}|
    { ID id-Broadcast               CRITICALITY reject  TYPE Broadcast                  PRESENCE optional},
    ...
}

-- ***************************************************************
--
-- ASSISTANCE INFORMATION FEEDBACK
--
-- ***************************************************************
```

```
AssistanceInformationFeedback ::= SEQUENCE {
    protocolIEs     ProtocolIE-Container     {{AssistanceInformationFeedback-IEs}},
    ...
}

AssistanceInformationFeedback-IEs LPPA-PROTOCOL-IES ::= {
    { ID id-AssistanceInformationFailureList   CRITICALITY reject  TYPE AssistanceInformationFailureList PRESENCE optional}|
    { ID id-CriticalityDiagnostics             CRITICALITY ignore  TYPE CriticalityDiagnostics           PRESENCE optional},
    ...
}

-- *************************************************************
--
-- ERROR INDICATION
--
-- *************************************************************

ErrorIndication ::= SEQUENCE {
    protocolIEs     ProtocolIE-Container     {{ErrorIndication-IEs}},
    ...
}

ErrorIndication-IEs LPPA-PROTOCOL-IES ::= {

    { ID id-Cause                      CRITICALITY ignore  TYPE Cause                   PRESENCE optional}|
    { ID id-CriticalityDiagnostics     CRITICALITY ignore  TYPE CriticalityDiagnostics  PRESENCE optional},
    ...
}

-- *************************************************************
--
-- PRIVATE MESSAGE
--
-- *************************************************************

PrivateMessage ::= SEQUENCE {
    privateIEs     PrivateIE-Container {{PrivateMessage-IEs}},
    ...
}

PrivateMessage-IEs LPPA-PRIVATE-IES ::= {
    ...
}

END
```

9.3.5   Information Element definitions

```
-- *************************************************************
--
-- Information Element Definitions
--
-- *************************************************************
```

```
LPPA-IEs {
itu-t (0) identified-organization (4) etsi (0) mobileDomain (0)
eps-Access (21) modules (3) lppa (6) version1 (1) lppa-IEs (2) }

DEFINITIONS AUTOMATIC TAGS ::=

BEGIN

IMPORTS

    id-MeasurementQuantities-Item,
    maxCellineNB,
    maxCellReport,
    maxNrOfErrors,
    maxNoMeas,
    maxnoOTDOAtypes,
    maxServCell,
    id-InterRATMeasurementQuantities-Item,
    id-WLANMeasurementQuantities-Item,
    maxGERANMeas,
    maxUTRANMeas,
    maxCellineNB-ext,
    maxWLANchannels,
    maxMBSFN-Allocations,
    maxnoFreqHoppingBandsMinusOne,
    maxNrOfPosSImessage,
    maxnoAssistInfoFailureListItems,
    maxNrOfSegments,
    maxNrOfPosSIBs

FROM LPPA-Constants

    Criticality,
    LPPATransactionID,
    ProcedureCode,
    ProtocolIE-ID,
    TriggeringMessage

FROM LPPA-CommonDataTypes

    ProtocolExtensionContainer{},
    ProtocolIE-Single-Container{},

    LPPA-PROTOCOL-EXTENSION,
    LPPA-PROTOCOL-IES
FROM LPPA-Containers;

-- A

Add-OTDOACells ::= SEQUENCE (SIZE (1.. maxCellineNB-ext)) OF SEQUENCE {
    add-OTDOACellInfo           Add-OTDOACell-Information,
    iE-Extensions               ProtocolExtensionContainer { {Add-OTDOACells-ExtIEs} } OPTIONAL,
    ...
```

ETSI

```
}

Add-OTDOACells-ExtIEs LPPA-PROTOCOL-EXTENSION ::= {
    ...
}

Add-OTDOACell-Information ::= SEQUENCE (SIZE (1..maxnoOTDOAtypes)) OF OTDOACell-Information-Item

Assistance-Information ::= SEQUENCE {
    systemInformation              SystemInformation,
    iE-Extensions                  ProtocolExtensionContainer { { Assistance-Information-ExtIEs} } OPTIONAL,
    ...
}

Assistance-Information-ExtIEs LPPA-PROTOCOL-EXTENSION ::= {
    ...
}

AssistanceInformationFailureList ::= SEQUENCE (SIZE (1..maxnoAssistInfoFailureListItems)) OF SEQUENCE {
    posSIB-Type                    PosSIB-Type,
    outcome                        Outcome,
    iE-Extensions                  ProtocolExtensionContainer { {AssistanceInformationFailureList-ExtIEs} } OPTIONAL,
    ...
}

AssistanceInformationFailureList-ExtIEs LPPA-PROTOCOL-EXTENSION ::= {
    ...
}

AssistanceInformationMetaData ::= SEQUENCE {
    encrypted          ENUMERATED {true, ...}  OPTIONAL,
    gNSSID             ENUMERATED {gps, sbas, gzss, galileo, glonass, bds, ...}    OPTIONAL,
    sBASID             ENUMERATED {waas, egnos, msas, gagan, ...}               OPTIONAL,
    iE-Extensions                  ProtocolExtensionContainer { { AssistanceInformationMetaData-ExtIEs} }  OPTIONAL,
    ...
}

AssistanceInformationMetaData-ExtIEs LPPA-PROTOCOL-EXTENSION ::= {
    ...
}

-- B

BCCH ::= INTEGER (0..1023, ...)

BitmapsforNPRS  ::= CHOICE {
    ten        BIT STRING(SIZE (10)),
    forty      BIT STRING(SIZE (40)),
    ...,
    ten-tdd    BIT STRING(SIZE (8)),
    forty-tdd  BIT STRING(SIZE (32))}

Broadcast ::= ENUMERATED {
    start,
```

```
    stop,
    ...
}

BroadcastPeriodicity ::= ENUMERATED {
    ms80,
    ms160,
    ms320,
    ms640,
    ms1280,
    ms2560,
    ms5120,
    ...
}

BSSID ::= OCTET STRING (SIZE(6))


-- C

Cause ::= CHOICE {
    radioNetwork        CauseRadioNetwork,
    protocol            CauseProtocol,
    misc                CauseMisc,
    ...
}

CauseMisc ::= ENUMERATED {
    unspecified,
    ...
}

CauseProtocol ::= ENUMERATED {
    transfer-syntax-error,
    abstract-syntax-error-reject,
    abstract-syntax-error-ignore-and-notify,
    message-not-compatible-with-receiver-state,
    semantic-error,
    unspecified,
    abstract-syntax-error-falsely-constructed-message,
    ...
}

CauseRadioNetwork ::= ENUMERATED {
    unspecified,
    requested-item-not-supported,
    requested-item-temporarily-not-available,
    ...

}

Cell-Portion-ID ::= INTEGER (0..255,... , 256..4095)

CPLength ::= ENUMERATED {
```

ETSI

```
    normal,
    extended,
    ...
}

CriticalityDiagnostics ::= SEQUENCE {
    procedureCode                   ProcedureCode                                               OPTIONAL,
    triggeringMessage               TriggeringMessage                                           OPTIONAL,
    procedureCriticality            Criticality                                                 OPTIONAL,
    lppatransactionID               LPPATransactionID                                           OPTIONAL,
    iEsCriticalityDiagnostics       CriticalityDiagnostics-IE-List                              OPTIONAL,
    iE-Extensions                   ProtocolExtensionContainer { {CriticalityDiagnostics-ExtIEs} }   OPTIONAL,
    ...
}


CriticalityDiagnostics-ExtIEs LPPA-PROTOCOL-EXTENSION ::= {
    ...
}

CriticalityDiagnostics-IE-List ::= SEQUENCE (SIZE (1..maxNrOfErrors)) OF
    SEQUENCE {
        iECriticality           Criticality,
        iE-ID                   ProtocolIE-ID,
        typeOfError             TypeOfError,
        iE-Extensions           ProtocolExtensionContainer { {CriticalityDiagnostics-IE-List-ExtIEs} } OPTIONAL,
        ...
}

CriticalityDiagnostics-IE-List-ExtIEs LPPA-PROTOCOL-EXTENSION ::= {
    ...
}

-- D

DL-Bandwidth ::= ENUMERATED {
    bw6,
    bw15,
    bw25,
    bw50,
    bw75,
    bw100,
    ...
}

-- E

E-CID-MeasurementResult ::= SEQUENCE {
    servingCell-ID                  ECGI,
    servingCellTAC                  TAC,
    e-UTRANAccessPointPosition      E-UTRANAccessPointPosition  OPTIONAL,
    measuredResults                 MeasuredResults             OPTIONAL,
    ...
}
```

```
ECGI ::= SEQUENCE {
    pLMN-Identity              PLMN-Identity,
    eUTRANcellIdentifier       EUTRANCellIdentifier,
    iE-Extensions              ProtocolExtensionContainer { {ECGI-ExtIEs} } OPTIONAL,
    ...
}

ECGI-ExtIEs LPPA-PROTOCOL-EXTENSION ::= {
    ...
}

EUTRANCellIdentifier ::= BIT STRING (SIZE (28))

EARFCN ::= INTEGER (0..65535, ..., 65536..262143)

E-UTRANAccessPointPosition ::= SEQUENCE {
    latitudeSign               ENUMERATED {north, south},
    latitude                   INTEGER (0..8388607),
    longitude                  INTEGER (-8388608..8388607),
    directionOfAltitude        ENUMERATED {height, depth},
    altitude                   INTEGER (0..32767),
    uncertaintySemi-major      INTEGER (0..127),
    uncertaintySemi-minor      INTEGER (0..127),
    orientationOfMajorAxis     INTEGER (0..179),
    uncertaintyAltitude        INTEGER (0..127),
    confidence                 INTEGER (0..100),
    ...
}

-- F
-- G
-- H

HESSID ::= OCTET STRING (SIZE(6))


-- I

InterRATMeasurementQuantities ::= SEQUENCE (SIZE (0.. maxNoMeas)) OF ProtocolIE-Single-Container { {InterRATMeasurementQuantities-ItemIEs} }

InterRATMeasurementQuantities-ItemIEs LPPA-PROTOCOL-IES ::= {
    { ID id-InterRATMeasurementQuantities-Item  CRITICALITY reject  TYPE InterRATMeasurementQuantities-Item PRESENCE mandatory}}

InterRATMeasurementQuantities-Item ::= SEQUENCE {
    interRATMeasurementQuantitiesValue         InterRATMeasurementQuantitiesValue,
    iE-Extensions                              ProtocolExtensionContainer { { InterRATMeasurementQuantitiesValue-ExtIEs} } OPTIONAL,
    ...
}

InterRATMeasurementQuantitiesValue-ExtIEs LPPA-PROTOCOL-EXTENSION ::= {
    ...
}
```

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```
InterRATMeasurementQuantitiesValue ::= ENUMERATED {
    geran,
    utran,
    ...
}

InterRATMeasurementResult ::= SEQUENCE (SIZE (1.. maxNoMeas)) OF InterRATMeasuredResultsValue

InterRATMeasuredResultsValue ::= CHOICE {
    resultGERAN         ResultGERAN,
    resultUTRAN         ResultUTRAN,
    ...
}

-- J
-- K
-- L
-- M

Measurement-ID ::= INTEGER (1..15, ...)

MeasurementPeriodicity ::= ENUMERATED {
    ms120,
    ms240,
    ms480,
    ms640,
    ms1024,
    ms2048,
    ms5120,
    ms10240,
    min1,
    min6,
    min12,
    min30,
    min60,
    ...
}

MeasurementQuantities ::= SEQUENCE (SIZE (1.. maxNoMeas)) OF ProtocolIE-Single-Container { {MeasurementQuantities-ItemIEs} }

MeasurementQuantities-ItemIEs LPPA-PROTOCOL-IES ::= {
    { ID id-MeasurementQuantities-Item  CRITICALITY reject  TYPE MeasurementQuantities-Item     PRESENCE mandatory}
}

MeasurementQuantities-Item ::= SEQUENCE {
    measurementQuantitiesValue                          MeasurementQuantitiesValue,
    iE-Extensions                                       ProtocolExtensionContainer { { MeasurementQuantitiesValue-ExtIEs} } OPTIONAL,
    ...
}

MeasurementQuantitiesValue-ExtIEs LPPA-PROTOCOL-EXTENSION ::= {
    ...
}
```

ETSI

```
MeasurementQuantitiesValue ::= ENUMERATED {
    cell-ID,
    angleOfArrival,
    timingAdvanceType1,
    timingAdvanceType2,
    rSRP,
    rSRQ,
    ...
}


MeasuredResults ::= SEQUENCE (SIZE (1.. maxNoMeas)) OF MeasuredResultsValue


MeasuredResultsValue ::= CHOICE {
    valueAngleOfArrival          INTEGER (0..719),
    valueTimingAdvanceType1      INTEGER (0..7690),
    valueTimingAdvanceType2      INTEGER (0..7690),
    resultRSRP                   ResultRSRP,
    resultRSRQ                   ResultRSRQ,
    ...
}


MBSFNsubframeConfiguration ::= SEQUENCE (SIZE (1.. maxMBSFN-Allocations)) OF MBSFNsubframeConfigurationValue


MBSFNsubframeConfigurationValue ::=          SEQUENCE {
    radioframeAllocationPeriod          ENUMERATED {n1, n2, n4, n8, n16, n32},
    radioframeAllocationOffset          INTEGER (0..7),
    subframeAllocation                  Subframeallocation
}



-- N

NarrowBandIndex ::= INTEGER (0..15,...)

NPRSConfiguration ::=            SEQUENCE {
    nPRSSubframePartA            NPRSSubframePartA       OPTIONAL,
    nPRSSubframePartB            NPRSSubframePartB       OPTIONAL,
    ...
}

NPRSMutingConfiguration ::= CHOICE {
    two              BIT STRING (SIZE (2)),
    four             BIT STRING (SIZE (4)),
    eight            BIT STRING (SIZE (8)),
    sixteen          BIT STRING (SIZE (16)),
    ...
}

NPRSSubframePartA ::=           SEQUENCE {
    bitmapsforNPRS              BitmapsforNPRS,
    nPRSMutingConfiguration     NPRSMutingConfiguration        OPTIONAL,
    ...
}
```

ETSI

```
NPRSSubframePartB ::=              SEQUENCE {
    numberofNPRSOneOccasion       ENUMERATED {sf10, sf20, sf40, sf80, sf160, sf320, sf640, sf1280, ..., sf2560},
    periodicityofNPRS             ENUMERATED {sf160, sf320, sf640, sf1280, ..., sf2560},
    startingsubframeoffset        ENUMERATED {zero, one-Eighth, two-Eighths, three-Eighths, four-Eighths, five-Eighths, six-Eighths, seven-Eighths,
...},
    nPRSMutingConfiguration       NPRSMutingConfiguration        OPTIONAL,
    ...
}


NumberOfAntennaPorts ::= ENUMERATED {
        n1-or-n2,
        n4,
        ...
}


NumberOfDlFrames ::= ENUMERATED {
        sf1,
        sf2,
        sf4,
        sf6,
        ...
}



NumberOfDlFrames-Extended ::= INTEGER (1..160,...)

NumberOfFrequencyHoppingBands ::= ENUMERATED {
    twobands,
    fourbands,
    ...
}

NPRSSequenceInfo ::= INTEGER (0..174,...)

-- O

OffsetNBChanneltoEARFCN ::= ENUMERATED {
        minusTen,
        minusNine,
        minusEight,
        minusSeven,
        minusSix,
        minusFive,
        minusFour,
        minusThree,
        minusTwo,
        minusOne,
        minusZeroDotFive,
        zero,
        one,
        two,
        three,
        four,
```

```
        five,
        six,
        seven,
        eight,
        nine,
        ...
}

OperationModeInfo ::= ENUMERATED {
        inband,
        guardband,
        standalone,
        ...
}

OTDOACells ::= SEQUENCE (SIZE (1.. maxCellineNB)) OF SEQUENCE {
    oTDOACellInfo                 OTDOACell-Information,
    iE-Extensions                 ProtocolExtensionContainer { {OTDOACells-ExtIEs} } OPTIONAL,
    ...
}

OTDOACells-ExtIEs LPPA-PROTOCOL-EXTENSION ::= {
    ...
}

OTDOACell-Information ::= SEQUENCE (SIZE (1..maxnoOTDOAtypes)) OF OTDOACell-Information-Item

OTDOACell-Information-Item ::= CHOICE {
    pCI                          PCI,
    cellId                       ECGI,
    tAC                          TAC,
    eARFCN                       EARFCN,
    pRS-Bandwidth                PRS-Bandwidth,
    pRS-ConfigurationIndex       PRS-Configuration-Index,
    cPLength                     CPLength,
    numberOfDlFrames             NumberOfDlFrames,
    numberOfAntennaPorts         NumberOfAntennaPorts,
    sFNInitialisationTime        SFNInitialisationTime,
    e-UTRANAccessPointPosition   E-UTRANAccessPointPosition,
    ...,
    pRSMutingConfiguration       PRSMutingConfiguration,
    prsid                        PRS-ID,
    tpid                         TP-ID,
    tpType                       TP-Type,
    numberOfDlFrames-Extended    NumberOfDlFrames-Extended,
    crsCPlength                  CPLength,
    mBSFNsubframeConfiguration   MBSFNsubframeConfiguration,
    nPRSConfiguration            NPRSConfiguration,
    offsetNBChanneltoEARFCN      OffsetNBChanneltoEARFCN,
    operationModeInfo            OperationModeInfo,
    nPRS-ID                      INTEGER (0..4095, ...),
    dL-Bandwidth                 DL-Bandwidth,
    pRSOccasionGroup             PRSOccasionGroup,
    pRSFreqHoppingConfig         PRSFrequencyHoppingConfiguration,
```

ETSI

```
      repetitionNumberofSIB1-NB    RepetitionNumberofSIB1-NB,
      nPRSSequenceInfo             NPRSSequenceInfo,
      nPRSType2                    NPRSConfiguration

}

OTDOA-Information-Item ::= ENUMERATED {
      pci,
      cellid,
      tac,
      earfcn,
      prsBandwidth,
      prsConfigIndex,
      cpLength,
      noDlFrames,
      noAntennaPorts,
      sFNInitTime,
      ...,
      e-UTRANAccessPointPosition,
      prsmutingconfiguration,
      prsid,
      tpid,
      tpType,
      crsCPlength,
      mBSFNsubframeConfiguration,
      nPRSConfiguration,
      offsetNBChannelNumbertoEARFCN,
      operationModeInfo,
      nPRS-ID,
      dlBandwidth,
      multipleprsConfigurationsperCell,
      prsOccasionGroup,
      prsFrequencyHoppingConfiguration,
      repetitionNumberofSIB1-NB,
      nPRSSequenceInfo,
      nPRSType2
}

Outcome ::= ENUMERATED {
      failed,
      ...
}

-- P

PCI ::= INTEGER (0..503, ...)

PhysCellIDGERAN ::= INTEGER (0..63, ...)

PhysCellIDUTRA-FDD ::= INTEGER (0..511, ...)

PhysCellIDUTRA-TDD ::= INTEGER (0..127, ...)

PLMN-Identity ::= OCTET STRING (SIZE(3))
```

```
PosSIBs ::= SEQUENCE (SIZE (1.. maxNrOfPosSIBs)) OF SEQUENCE {
    posSIB-Type                     PosSIB-Type,
    posSIB-Segments                 PosSIB-Segments,
    assistanceInformationMetaData   AssistanceInformationMetaData    OPTIONAL,
    broadcastPriority               INTEGER (1..16,...)              OPTIONAL,
    iE-Extensions                   ProtocolExtensionContainer { { PosSIBs-ExtIEs} }    OPTIONAL,
    ...
}

PosSIBs-ExtIEs LPPA-PROTOCOL-EXTENSION ::= {
    ...
}

PosSIB-Segments ::= SEQUENCE (SIZE (1.. maxNrOfSegments)) OF SEQUENCE {
    assistanceDataSIBelement        OCTET STRING,
    iE-Extensions                   ProtocolExtensionContainer { { PosSIB-Segments-ExtIEs} } OPTIONAL,
    ...
}

PosSIB-Segments-ExtIEs LPPA-PROTOCOL-EXTENSION ::= {
    ...
}


PosSIB-Type ::= ENUMERATED {
    posSibType1-1,
    posSibType1-2,
    posSibType1-3,
    posSibType1-4,
    posSibType1-5,
    posSibType1-6,
    posSibType1-7,
    posSibType2-1,
    posSibType2-2,
    posSibType2-3,
    posSibType2-4,
    posSibType2-5,
    posSibType2-6,
    posSibType2-7,
    posSibType2-8,
    posSibType2-9,
    posSibType2-10,
    posSibType2-11,
    posSibType2-12,
    posSibType2-13,
    posSibType2-14,
    posSibType2-15,
    posSibType2-16,
    posSibType2-17,
    posSibType2-18,
    posSibType2-19,
    posSibType3-1,
    ...
```

ETSI

```
}

PRS-Bandwidth ::= ENUMERATED {
        bw6,
        bw15,
        bw25,
        bw50,
        bw75,
        bw100,
        ...
}

PRS-Configuration-Index ::= INTEGER (0..4095, ...)

PRS-ID  ::= INTEGER (0..4095, ...)

PRSMutingConfiguration ::= CHOICE {
    two            BIT STRING (SIZE (2)),
    four           BIT STRING (SIZE (4)),
    eight          BIT STRING (SIZE (8)),
    sixteen        BIT STRING (SIZE (16)),
    ...,
    thirty-two                   BIT STRING (SIZE (32)),
    sixty-four                   BIT STRING (SIZE (64)),
    one-hundred-and-twenty-eight   BIT STRING (SIZE (128)),
    two-hundred-and-fifty-six      BIT STRING (SIZE (256)),
    five-hundred-and-twelve        BIT STRING (SIZE (512)),
    one-thousand-and-twenty-four   BIT STRING (SIZE (1024))
}

PRSOccasionGroup ::= ENUMERATED {
    og2,
    og4,
    og8,
    og16,
    og32,
    og64,
    og128,
    ...
}

PRSFrequencyHoppingConfiguration ::= SEQUENCE {
    noOfFreqHoppingBands         NumberOfFrequencyHoppingBands,
    bandPositions                SEQUENCE(SIZE (1..maxnoFreqHoppingBandsMinusOne)) OF NarrowBandIndex,
    iE-Extensions                ProtocolExtensionContainer { { PRSFrequencyHoppingConfiguration-Item-IEs} } OPTIONAL,
    ...
}

PRSFrequencyHoppingConfiguration-Item-IEs LPPA-PROTOCOL-EXTENSION ::= {
    ...
}

-- Q
-- R
```

ETSI

```
RepetitionNumberofSIB1-NB ::= ENUMERATED {
    r4,
    r8,
    r16,
    ...
}

ReportCharacteristics ::= ENUMERATED {
    onDemand,
    periodic,
    ...
}

RequestedSRSTransmissionCharacteristics ::= SEQUENCE {
    numberOfTransmissions    INTEGER (0..500, ...),
    bandwidth                INTEGER (1..100, ...),
    ...
}

ResultRSRP ::= SEQUENCE (SIZE (1.. maxCellReport)) OF ResultRSRP-Item

ResultRSRP-Item ::= SEQUENCE {
    pCI             PCI,
    eARFCN          EARFCN,
    eCGI            ECGI OPTIONAL,
    valueRSRP       ValueRSRP,
    iE-Extensions   ProtocolExtensionContainer { { ResultRSRP-Item-ExtIEs} } OPTIONAL,
    ...
}

ResultRSRP-Item-ExtIEs LPPA-PROTOCOL-EXTENSION ::= {
    ...
}

ResultRSRQ ::= SEQUENCE (SIZE (1.. maxCellReport)) OF ResultRSRQ-Item

ResultRSRQ-Item ::= SEQUENCE {
    pCI             PCI,
    eARFCN          EARFCN,
    eCGI            ECGI OPTIONAL,
    valueRSRQ       ValueRSRQ,
    iE-Extensions   ProtocolExtensionContainer { { ResultRSRQ-Item-ExtIEs} } OPTIONAL,
    ...
}

ResultRSRQ-Item-ExtIEs LPPA-PROTOCOL-EXTENSION ::= {
    ...
}

ResultGERAN ::= SEQUENCE (SIZE (1.. maxGERANMeas)) OF ResultGERAN-Item

ResultGERAN-Item ::= SEQUENCE {
    bCCH                BCCH,
```

```
    physCellIDGERAN     PhysCellIDGERAN,
    rSSI                RSSI,
    iE-Extensions       ProtocolExtensionContainer { { ResultGERAN-Item-ExtIEs} } OPTIONAL,
    ...
}

ResultGERAN-Item-ExtIEs LPPA-PROTOCOL-EXTENSION ::= {
    ...
}

ResultUTRAN ::= SEQUENCE (SIZE (1.. maxUTRANMeas)) OF ResultUTRAN-Item

ResultUTRAN-Item ::= SEQUENCE {
    uARFCN              UARFCN,
    physCellIDUTRAN     CHOICE {
        physCellIDUTRA-FDD      PhysCellIDUTRA-FDD,
        physCellIDUTRA-TDD      PhysCellIDUTRA-TDD
    },
    uTRA-RSCP           UTRA-RSCP OPTIONAL,
    uTRA-EcN0           UTRA-EcN0 OPTIONAL,
    iE-Extensions       ProtocolExtensionContainer { { ResultUTRAN-Item-ExtIEs} } OPTIONAL,
    ...
}

ResultUTRAN-Item-ExtIEs LPPA-PROTOCOL-EXTENSION ::= {
    ...
}

RSSI ::= INTEGER (0..63, ...)

-- S

SFNInitialisationTime ::= BIT STRING (SIZE (64))

SRSConfigurationForAllCells ::= SEQUENCE (SIZE (1.. maxServCell)) OF SRSConfigurationForOneCell

SRSConfigurationForOneCell ::= SEQUENCE {
    pci                     PCI,
    ul-earfcn               EARFCN,
    ul-bandwidth            ENUMERATED {n6, n15, n25, n50, n75, n100},
    ul-cyclicPrefixLength   CPLength,
    srs-BandwidthConfig     ENUMERATED {bw0, bw1, bw2, bw3, bw4, bw5, bw6, bw7},
    srs-Bandwidth           ENUMERATED {bw0, bw1, bw2, bw3},
    srs-AntennaPort         ENUMERATED {an1, an2, an4, ...},
    srs-HoppingBandwidth    ENUMERATED {hbw0, hbw1, hbw2, hbw3},
    srs-cyclicShift         ENUMERATED {cs0, cs1, cs2, cs3, cs4, cs5, cs6, cs7},
    srs-ConfigIndex         INTEGER (0..1023),
    maxUpPts                ENUMERATED {true}            OPTIONAL,   -- Cond ifTDD
    transmissionComb        INTEGER (0..1),
    freqDomainPosition      INTEGER (0..23),
    groupHoppingEnabled     BOOLEAN,
    deltaSS                 INTEGER (0..29)              OPTIONAL,
    sfnInitialisationTime   SFNInitialisationTime,
    ...
```

```
}


Subframeallocation ::= CHOICE {
    oneFrame                        BIT STRING (SIZE(6)),
    fourFrames                      BIT STRING (SIZE(24))
}


SSID ::= OCTET STRING (SIZE(1..32))

SystemInformation ::= SEQUENCE (SIZE (1.. maxNrOfPosSImessage)) OF SEQUENCE {
    broadcastPeriodicity            BroadcastPeriodicity,
    posSIBs                         PosSIBs,
    iE-Extensions                   ProtocolExtensionContainer { { SystemInformation-ExtIEs} }  OPTIONAL,
    ...
}

SystemInformation-ExtIEs LPPA-PROTOCOL-EXTENSION ::= {
    ...
}

-- T

TAC ::= OCTET STRING (SIZE(2))

TP-ID ::= INTEGER (0..4095, ...)

TP-Type ::= ENUMERATED { prs-only-tp, ... }

TypeOfError ::= ENUMERATED {
    not-understood,
    missing,
    ...
}




-- U

ULConfiguration ::= SEQUENCE {
    pci                     PCI,
    ul-earfcn               EARFCN,
    timingAdvanceType1      INTEGER (0..7690)          OPTIONAL,
    timingAdvanceType2      INTEGER (0..7690)          OPTIONAL,
    numberOfTransmissions   INTEGER (0..500,...),
    srsConfiguration        SRSConfigurationForAllCells,
    ...
}

UARFCN ::= INTEGER (0..16383, ...)

UTRA-EcN0 ::= INTEGER (0..49, ...)
```

```
UTRA-RSCP ::= INTEGER (-5..91, ...)

-- V

ValueRSRP ::= INTEGER (0..97, ...)

ValueRSRQ ::= INTEGER (0..34, ...)

-- W

WLANMeasurementQuantities ::= SEQUENCE (SIZE (0.. maxNoMeas)) OF ProtocolIE-Single-Container { {WLANMeasurementQuantities-ItemIEs} }

WLANMeasurementQuantities-ItemIEs LPPA-PROTOCOL-IES ::= {
    { ID id-WLANMeasurementQuantities-Item  CRITICALITY reject  TYPE WLANMeasurementQuantities-Item PRESENCE mandatory}}

WLANMeasurementQuantities-Item ::= SEQUENCE {
    wLANMeasurementQuantitiesValue          WLANMeasurementQuantitiesValue,
    iE-Extensions                           ProtocolExtensionContainer { { WLANMeasurementQuantitiesValue-ExtIEs} } OPTIONAL,
    ...
}

WLANMeasurementQuantitiesValue-ExtIEs LPPA-PROTOCOL-EXTENSION ::= {
    ...
}

WLANMeasurementQuantitiesValue ::= ENUMERATED {
    wlan,
    ...
}


WLANMeasurementResult ::= SEQUENCE (SIZE (1..maxNoMeas)) OF WLANMeasurementResult-Item

WLANMeasurementResult-Item ::= SEQUENCE {
    wLAN-RSSI          WLAN-RSSI,
    sSID               SSID                 OPTIONAL,
    bSSID              BSSID                OPTIONAL,
    hESSID             HESSID               OPTIONAL,
    operatingClass     WLANOperatingClass   OPTIONAL,
    countryCode        WLANCountryCode      OPTIONAL,
    wLANChannelList    WLANChannelList      OPTIONAL,
    wLANBand           WLANBand             OPTIONAL,
    iE-Extensions      ProtocolExtensionContainer { { WLANMeasurementResult-Item-ExtIEs } }    OPTIONAL,
    ...
}

WLANMeasurementResult-Item-ExtIEs   LPPA-PROTOCOL-EXTENSION ::= {
    ...
}

WLAN-RSSI ::= INTEGER (0..141, ...)

WLANBand ::= ENUMERATED {band2dot4, band5, ...}
```

```
WLANChannelList ::= SEQUENCE (SIZE (1..maxWLANchannels)) OF WLANChannel

WLANChannel ::= INTEGER (0..255)

WLANCountryCode ::= ENUMERATED {
    unitedStates,
    europe,
    japan,
    global,
    ...
}

WLANOperatingClass ::= INTEGER (0..255)

-- X
-- Y
-- Z

END
```

9.3.6   Common definitions

```
-- **************************************************************
--
-- Common definitions
--
-- **************************************************************

LPPA-CommonDataTypes {
itu-t (0) identified-organization (4) etsi (0) mobileDomain (0)
eps-Access (21) modules (3) lppa (6) version1 (1) lppa-CommonDataTypes (3)}

DEFINITIONS AUTOMATIC TAGS ::=

BEGIN

-- **************************************************************
--
-- Extension constants
--
-- **************************************************************

maxPrivateIEs                              INTEGER ::= 65535
maxProtocolExtensions                      INTEGER ::= 65535
maxProtocolIEs                             INTEGER ::= 65535

-- **************************************************************
--
-- Common Data Types
--
-- **************************************************************

Criticality    ::= ENUMERATED { reject, ignore, notify }
```

```
LPPATransactionID        ::= INTEGER (0..32767)


Presence        ::= ENUMERATED { optional, conditional, mandatory }

PrivateIE-ID    ::= CHOICE {
    local                INTEGER (0.. maxPrivateIEs),
    global               OBJECT IDENTIFIER
}

ProcedureCode        ::= INTEGER (0..255)


ProtocolIE-ID        ::= INTEGER (0..maxProtocolIEs)

TriggeringMessage    ::= ENUMERATED { initiating-message, successful-outcome, unsuccessful-outcome}

END
```

9.3.7   Constant definitions

```
-- *************************************************************
--
-- Constant definitions
--
-- *************************************************************

LPPA-Constants {
itu-t (0) identified-organization (4) etsi (0) mobileDomain (0)
eps-Access (21) modules (3) lppa (6) version1 (1) lppa-Constants (4) }

DEFINITIONS AUTOMATIC TAGS ::=

BEGIN

IMPORTS
    ProcedureCode,
    ProtocolIE-ID
FROM LPPA-CommonDataTypes;

-- *************************************************************
--
-- Elementary Procedures
--
-- *************************************************************

id-errorIndication                              ProcedureCode ::= 0
id-privateMessage                               ProcedureCode ::= 1
id-e-CIDMeasurementInitiation                   ProcedureCode ::= 2
id-e-CIDMeasurementFailureIndication            ProcedureCode ::= 3
id-e-CIDMeasurementReport                       ProcedureCode ::= 4
id-e-CIDMeasurementTermination                  ProcedureCode ::= 5
```

ETSI

```
id-oTDOAInformationExchange                              ProcedureCode ::= 6
id-uTDOAInformationExchange                              ProcedureCode ::= 7
id-uTDOAInformationUpdate                                ProcedureCode ::= 8
id-assistanceInformationControl                          ProcedureCode ::= 9
id-assistanceInformationFeedback                         ProcedureCode ::= 10


-- ************************************************************
--
-- Lists
--
-- ************************************************************

maxNrOfErrors                      INTEGER ::= 256
maxCellineNB                       INTEGER ::= 256
maxNoMeas                          INTEGER ::= 63
maxCellReport                      INTEGER ::= 9
maxnoOTDOAtypes                    INTEGER ::= 63
maxServCell                        INTEGER ::= 5
maxGERANMeas                       INTEGER ::= 8
maxUTRANMeas                       INTEGER ::= 8
maxCellineNB-ext                   INTEGER ::= 3840
maxMBSFN-Allocations               INTEGER ::= 8
maxWLANchannels                    INTEGER ::= 16
maxnoFreqHoppingBandsMinusOne      INTEGER ::= 7
maxNrOfPosSImessage                INTEGER ::= 32
maxnoAssistInfoFailureListItems    INTEGER ::= 32
maxNrOfSegments                    INTEGER ::= 64
maxNrOfPosSIBs                     INTEGER ::= 32


-- ************************************************************
--
-- IEs
--
-- ************************************************************

id-Cause                                         ProtocolIE-ID ::= 0
id-CriticalityDiagnostics                        ProtocolIE-ID ::= 1
id-E-SMLC-UE-Measurement-ID                      ProtocolIE-ID ::= 2
id-ReportCharacteristics                         ProtocolIE-ID ::= 3
id-MeasurementPeriodicity                        ProtocolIE-ID ::= 4
id-MeasurementQuantities                         ProtocolIE-ID ::= 5
id-eNB-UE-Measurement-ID                         ProtocolIE-ID ::= 6
id-E-CID-MeasurementResult                       ProtocolIE-ID ::= 7
id-OTDOACells                                    ProtocolIE-ID ::= 8
id-OTDOA-Information-Type-Group                  ProtocolIE-ID ::= 9
id-OTDOA-Information-Type-Item                   ProtocolIE-ID ::= 10
id-MeasurementQuantities-Item                    ProtocolIE-ID ::= 11
id-RequestedSRSTransmissionCharacteristics       ProtocolIE-ID ::= 12
id-ULConfiguration                               ProtocolIE-ID ::= 13
id-Cell-Portion-ID                               ProtocolIE-ID ::= 14
id-InterRATMeasurementQuantities                 ProtocolIE-ID ::= 15
id-InterRATMeasurementQuantities-Item            ProtocolIE-ID ::= 16
id-InterRATMeasurementResult                     ProtocolIE-ID ::= 17
id-AddOTDOACells                                 ProtocolIE-ID ::= 18
```

```
id-WLANMeasurementQuantities                          ProtocolIE-ID ::= 19
id-WLANMeasurementQuantities-Item                     ProtocolIE-ID ::= 20
id-WLANMeasurementResult                              ProtocolIE-ID ::= 21
id-Assistance-Information                             ProtocolIE-ID ::= 22
id-Broadcast                                          ProtocolIE-ID ::= 23
id-AssistanceInformationFailureList                   ProtocolIE-ID ::= 24

END
```

9.3.8   Container definitions

```
-- **************************************************************
--
-- Container definitions
--
-- **************************************************************

LPPA-Containers {
itu-t (0) identified-organization (4) etsi (0) mobileDomain (0)
eps-Access (21) modules (3) lppa (6) version1 (1) lppa-Containers (5)}

DEFINITIONS AUTOMATIC TAGS ::=

BEGIN

-- **************************************************************
--
-- IE parameter types from other modules.
--
-- **************************************************************

IMPORTS
    maxPrivateIEs,
    maxProtocolExtensions,
    maxProtocolIEs,
    Criticality,
    Presence,
    PrivateIE-ID,
    ProtocolIE-ID
FROM LPPA-CommonDataTypes;

-- **************************************************************
--
-- Class Definition for Protocol IEs
--
-- **************************************************************

LPPA-PROTOCOL-IES ::= CLASS {
    &id            ProtocolIE-ID          UNIQUE,
    &criticality   Criticality,
    &Value,
    &presence      Presence
}
```

```
WITH SYNTAX {
    ID              &id
    CRITICALITY     &criticality
    TYPE            &Value
    PRESENCE        &presence
}

-- **************************************************************
--
-- Class Definition for Protocol IEs
--
-- **************************************************************

LPPA-PROTOCOL-IES-PAIR ::= CLASS {
    &id                     ProtocolIE-ID       UNIQUE,
    &firstCriticality       Criticality,
    &FirstValue,
    &secondCriticality      Criticality,
    &SecondValue,
    &presence               Presence
}
WITH SYNTAX {
    ID                      &id
    FIRST CRITICALITY       &firstCriticality
    FIRST TYPE              &FirstValue
    SECOND CRITICALITY      &secondCriticality
    SECOND TYPE             &SecondValue
    PRESENCE                &presence
}

-- **************************************************************
--
-- Class Definition for Protocol Extensions
--
-- **************************************************************

LPPA-PROTOCOL-EXTENSION ::= CLASS {
    &id             ProtocolIE-ID       UNIQUE,
    &criticality    Criticality,
    &Extension,
    &presence       Presence
}
WITH SYNTAX {
    ID              &id
    CRITICALITY     &criticality
    EXTENSION       &Extension
    PRESENCE        &presence
}

-- **************************************************************
--
-- Class Definition for Private IEs
--
-- **************************************************************
```

```
LPPA-PRIVATE-IES ::= CLASS {
    &id                 PrivateIE-ID,
    &criticality        Criticality,
    &Value,
    &presence           Presence
}
WITH SYNTAX {
    ID                  &id
    CRITICALITY         &criticality
    TYPE                &Value
    PRESENCE            &presence
}

-- **************************************************************
--
-- Container for Protocol IEs
--
-- **************************************************************

ProtocolIE-Container { LPPA-PROTOCOL-IES : IEsSetParam} ::=
    SEQUENCE (SIZE (0..maxProtocolIEs)) OF
    ProtocolIE-Field {{IEsSetParam}}

ProtocolIE-Single-Container { LPPA-PROTOCOL-IES : IEsSetParam} ::=
    ProtocolIE-Field {{IEsSetParam}}

ProtocolIE-Field { LPPA-PROTOCOL-IES : IEsSetParam} ::= SEQUENCE {
    id              LPPA-PROTOCOL-IES.&id                ({IEsSetParam}),
    criticality     LPPA-PROTOCOL-IES.&criticality       ({IEsSetParam}{@id}),
    value           LPPA-PROTOCOL-IES.&Value             ({IEsSetParam}{@id})
}

-- **************************************************************
--
-- Container for Protocol IE Pairs
--
-- **************************************************************

ProtocolIE-ContainerPair { LPPA-PROTOCOL-IES-PAIR : IEsSetParam} ::=
    SEQUENCE (SIZE (0..maxProtocolIEs)) OF
    ProtocolIE-FieldPair {{IEsSetParam}}

ProtocolIE-FieldPair { LPPA-PROTOCOL-IES-PAIR : IEsSetParam} ::= SEQUENCE {
    id                  LPPA-PROTOCOL-IES-PAIR.&id                  ({IEsSetParam}),
    firstCriticality    LPPA-PROTOCOL-IES-PAIR.&firstCriticality    ({IEsSetParam}{@id}),
    firstValue          LPPA-PROTOCOL-IES-PAIR.&FirstValue          ({IEsSetParam}{@id}),
    secondCriticality   LPPA-PROTOCOL-IES-PAIR.&secondCriticality   ({IEsSetParam}{@id}),
    secondValue         LPPA-PROTOCOL-IES-PAIR.&SecondValue         ({IEsSetParam}{@id})
}

-- **************************************************************
--
-- Container Lists for Protocol IE Containers
```

```
--
-- *************************************************************

ProtocolIE-ContainerList {INTEGER : lowerBound, INTEGER : upperBound, LPPA-PROTOCOL-IES : IEsSetParam} ::=
    SEQUENCE (SIZE (lowerBound..upperBound)) OF
    ProtocolIE-Container {{IEsSetParam}}

ProtocolIE-ContainerPairList {INTEGER : lowerBound, INTEGER : upperBound, LPPA-PROTOCOL-IES-PAIR : IEsSetParam} ::=
    SEQUENCE (SIZE (lowerBound..upperBound)) OF
    ProtocolIE-ContainerPair {{IEsSetParam}}

-- *************************************************************
--
-- Container for Protocol Extensions
--
-- *************************************************************

ProtocolExtensionContainer { LPPA-PROTOCOL-EXTENSION : ExtensionSetParam} ::=
    SEQUENCE (SIZE (1..maxProtocolExtensions)) OF
    ProtocolExtensionField {{ExtensionSetParam}}

ProtocolExtensionField { LPPA-PROTOCOL-EXTENSION : ExtensionSetParam} ::= SEQUENCE {
    id                 LPPA-PROTOCOL-EXTENSION.&id              ({ExtensionSetParam}),
    criticality        LPPA-PROTOCOL-EXTENSION.&criticality     ({ExtensionSetParam}{@id}),
    extensionValue     LPPA-PROTOCOL-EXTENSION.&Extension       ({ExtensionSetParam}{@id})
}

-- *************************************************************
--
-- Container for Private IEs
--
-- *************************************************************

PrivateIE-Container { LPPA-PRIVATE-IES : IEsSetParam} ::=
    SEQUENCE (SIZE (1..maxPrivateIEs)) OF
    PrivateIE-Field {{IEsSetParam}}

PrivateIE-Field { LPPA-PRIVATE-IES : IEsSetParam} ::= SEQUENCE {
    id             LPPA-PRIVATE-IES.&id             ({IEsSetParam}),
    criticality    LPPA-PRIVATE-IES.&criticality    ({IEsSetParam}{@id}),
    value          LPPA-PRIVATE-IES.&Value          ({IEsSetParam}{@id})
}

END
```

9.4 Message transfer syntax

LPPa shall use the ASN.1 Basic Packed Encoding Rules (BASIC-PER) Aligned Variant as transfer syntax, as specified in ref. ITU-T Rec. X.691 [4].

9.5 Timers

Void.

10 Handling of unknown, unforeseen and erroneous protocol data

Section 10 of TS 36.413 [3] is applicable for the purposes of the present document, with the following additions:

- In case of Abstract Syntax Error, when reporting the *Criticality Diagnostics* IE for not comprehended IE/IEgroups or missing IE/IE groups, the *LPPa Transaction ID* IE shall also be included;

- In case of Logical Error, when reporting the *Criticality Diagnostics* IE, the *LPPa Transaction ID* IE shall also be included.

Annex A (informative):
Change History

TSG #	TSG Doc.	CR	Rev	Subject/Comment	New
11/2009				First version is created	0.0.0
12/2009				Increasing the version to 2.0.0 for approval at RAN#46	2.0.0
46	RP-091213			Approved at RAN#46	9.0.0
47	RP-100225	0001	3	Inclusion of Geographical Area and E-UTRAN Access Point Position information	9.1.0
47	RP-100225	0003	1	Introduction of new cause values in LPPa	9.1.0
47	RP-100225	0004		Introduction of EARFCN information in E-CID measurement results over LPPa	9.1.0
47	RP-100225	0007		Rapporteur's update of LPPa protocol	9.1.0
48	RP-100600	0010	1	Clarification on E-CID MEASUREMENT INITIATION procedure	9.2.0
48	RP-100600	0011		Correction of signalling of E-UTRAN Access Point Position	9.2.0
48	RP-100600	0013	2	Addition of PRS Muting Configuration information to LPPa	9.2.0
48	RP-100600	0015	2	Access Point reporting for OTDOA	9.2.0
49	RP-100906	0016		Rapporteur's update	9.3.0
50	RP-101270	0017		Object ID for LPPa modules	9.4.0
12/2010				Created Rel-10 version based v. 9.4.0	10.0.0
SP-49	SP-100629			Clarification on the use of References (TS 21.801 CR#0030)	10.0.1
52	RP-110689	0018	1	Correction of Measured Result IE	10.1.0
52	RP-110686	0019	1	Rapporteur's proposal following review of TS 36.455	10.1.0
52	RP-110685	0020		Reference review outcome in TS 36.455	10.1.0
53	RP-111196	0021		Encoding of SFN Initialisation Time	10.2.0
56	RP-120744	0026		Correction of SFN Initialization Time	10.3.0
56	RP-120744	0027		Correction of E-UTRAN Acess Point Position	10.3.0
57	RP-121131	0030	2	Correction on E-CID Measurements	10.4.0
09/2012				Update to Rel-11 version (MCC)	11.0.0
58	RP-121736	0036		Correction on Uncertainty Altitude	11.1.0
59	RP-130237	0042		Extending maxEARFCN	11.2.0
60	RP-130840	0045	3	Network Based Positioning Support in LTE	11.3.0
64	RP-140905	0046	4	Adding Cell Portion to E-CID Measurement Reporting	12.0.0
64	RP-140904	0047	4	Modifications of LPPa to Include inter-RAT Measurements	12.0.0
66	RP-142093	0048	1	LPPa Rapporteur Update	12.1.0
66	RP-142094	0049	1	Corrections to Inter-RAT Measurements in TS 36.455	12.1.0
67	RP-150356	0050	1	ASN.1 Corrections for LPPa	12.2.0
12/2015				Update to Rel-13 version (MCC)	13.0.0
71	RP-160449	0054		LPPa Rapporteur Update	13.1.0
74	RP-162334	0055	7	Reusing Available WLAN Measurements to Enhance E-CID	14.0.0
74	RP-162334	0069	1	Introduction of Transmission Points for OTDOA in Shared Cell-ID Scenario and PRS based Terrestrial Beacon Systems	14.0.0
74	RP-162334	0071		Cell Portion ID Extension	14.0.0

Change history							
Date	**Meeting**	**TDoc**	**CR**	**Rev**	**Cat**	**Subject/Comment**	**New version**
03/2017	RP-75	RP-170539	0072		B	Introduction of OTDOA enhancements for NB-IOT	14.1.0
03/2017	RP-75	RP-170691	0073	1	B	OTDOA Enhancements for FeMTC	14.1.0
06/2017	RP-76	RP-171323	0073	1	F	Correction on NB-IoT OTDOA	14.2.0
06/2017	RP-76	RP-171324	0075	1	F	Rapporteur's Review of LPPa Editorials	14.2.0
09/2017	RP-77	RP-171974	0077	-	F	Correction on MTC positioning	14.3.0
12/2017	RP-78	RP-172673	0086	1	F	Corrections on OTDOA information transmission in NB-IoT	14.4.0
06/2018	RP-80	RP-181341	0082	5	B	Assistance Information Broadcasting	15.0.0
06/2018	RP-80	RP-181241	0090	-	D	LPPa Rapporteur Update	15.0.0
06/2018	RP-80	RP-181313	0093	2	B	Support of OTDOA in NB-IoT enhancement	15.0.0
09/2018	RP-81	RP-181926	0095	1	A	Introduction of NPRS enhancement	15.1.0

History

Document history		
V15.0.0	July 2018	Publication
V15.1.0	September 2018	Publication