**3GPP TSG-RAN WG2 Meeting #121-bis-e *darftR2-2304477***

**Online Apr 17th – 26th 2023**

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| *CR-Form-v12.2* | | | | | | | | |
| **CHANGE REQUEST** | | | | | | | | |
|  | | | | | | | | |
|  | **37.355** | **CR** | **0420** | **rev** | 1 | **Current version:** | **16.10.0** |  |
|  | | | | | | | | |
| *For* [***HE******LP***](http://www.3gpp.org/3G_Specs/CRs.htm#_blank)*on using this form: comprehensive instructions can be found at* [*http://www.3gpp.org/Change-Requests*](http://www.3gpp.org/Change-Requests)*.* | | | | | | | | |
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| ***Proposed change affects:*** | UICC apps |  | ME | **X** | Radio Access Network |  | Core Network | **X** |

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|  | | | | | | | | | | |
| ***Title:*** | Corrections on Figure 4.1.1-1 and the descriptions in Positioning methods IEs | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Source to WG:*** | CATT | | | | | | | | | |
| ***Source to TSG:*** | R2 | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Work item code:*** | NR\_newRAT-Core | | | | |  | ***Date:*** | | | 2023-04-24 |
|  |  | | | |  | |  | | |  |
| ***Category:*** | **A** |  | | | | | ***Release:*** | | | Rel-16 |
|  | *Use one of the following categories:* ***F*** *(correction)* ***A*** *(mirror corresponding to a change in an earlier release)* ***B*** *(addition of feature),* ***C*** *(functional modification of feature)* ***D*** *(editorial modification)*  Detailed explanations of the above categories can be found in 3GPP [TR 21.900](http://www.3gpp.org/ftp/Specs/html-info/21900.htm). | | | | | | | | *Use one of the following releases: Rel-8 (Release 8) Rel-9 (Release 9) Rel-10 (Release 10) Rel-11 (Release 11) … Rel-16 (Release 16) Rel-17 (Release 17) Rel-18 (Release 18) Rel-19 (Release 19)* | |
|  |  | | | | | | | | | |
| ***Reason for change:*** | | 1. Not only UE but also SET should be included in the Figure 4.1.1-1: LPP Configuration for Control- and User-Plane Positioning in E-UTRAN. 2. The wrong IE name is used in the Asn.1 “*additionalInformation*”. 3. The field description of CommonIEsError lacks the error cause “incorrectDataValue”. 4. The wrong IE name “deltaSFN” is used. 5. Typo in the field description *multiPrbNprs*. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Summary of change:*** | | 1. In clause 4.1.1 LPP Configuration  * Add “SET” in the figure.  1. In clause 6.4.2  * Correct the IE name in the ASN.1.  1. In clause 6.4.2  * Adding description for the error cause code “incorrectDataValue”.  1. In clause 6.5.1.5, 6.5.1.6, 6.5.1.7, 6.5.1.5, 6.5.5.2  * Correct the IE name.  1. In clause 6.5.1.7  * Correct the typo.   **Impact analysis**  Architecture options  SA, NSA  Impacted functionality:  Posiitoning  Inter-operability:  If only the network is implemented according to the CR and the UE is not, no interoperability problems are foreseen.  If only the UE is implemented according to the CR and the network is not, no interoperability problems are foreseen. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Consequences if not approved:*** | | For 1, UE role is missed in User-Plane Positioning.  For 2, the IEs in the description are not aligned with asn.1.  For 3/4/5, the other mistakes still are present in the spec. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Clauses affected:*** | | 4.1.1, 6.4.2, 6.5.1.5, 6.5.1.6, 6.5.1.7, 6.5.5.2 | | | | | | | | |
|  | |  | | | | | | | | |
|  | | **Y** | **N** |  | | | |  | | |
| ***Other specs*** | |  | **X** | Other core specifications | | | | TS/TR ... CR ... | | |
| ***affected:*** | |  | **X** | Test specifications | | | | TS/TR ... CR ... | | |
| ***(show related CRs)*** | |  | **X** | O&M Specifications | | | | TS/TR ... CR ... | | |
|  | |  | | | | | | | | |
| ***Other comments:*** | |  | | | | | | | | |
|  | |  | | | | | | | | |
| ***This CR's revision history:*** | | Revision of R2-2302626 | | | | | | | | |

*First of change*

4.1.1 LPP Configuration

LPP is used point-to-point between a location server (E-SMLC, LMF or SLP) and a target device (UE or SET) in order to position the target device using position-related measurements obtained by one or more reference sources. Figure 4.1.1-1 shows the configuration as applied to the control- and user-plane location solutions for E-UTRAN and NG-RAN (as defined in TS 36.305 [2], TS 38.305 [40], TS 23.273 [42] and TS 23.271 [3]).

NB-IoT is a non-backward compatible variant of E-UTRAN supporting a reduced set of functionalities. In this specification, procedures and messages specified for the UE equally apply to the UE in NB-IoT.

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**Figure 4.1.1-1: LPP Configuration for Control- and User-Plane Positioning in E-UTRAN or NG-RAN**

*Next change*

### 6.4.2 Common Positioning

#### – *CommonIEsRequestLocationInformation*

The *CommonIEsRequestLocationInformation* carries common IEs for a Request Location Information LPP message Type.

-- ASN1START

CommonIEsRequestLocationInformation ::= SEQUENCE {

locationInformationType LocationInformationType,

triggeredReporting TriggeredReportingCriteria OPTIONAL, -- Cond ECID

periodicalReporting PeriodicalReportingCriteria OPTIONAL, -- Need ON

additionalInformation AdditionalInformation OPTIONAL, -- Need ON

qos QoS OPTIONAL, -- Need ON

environment Environment OPTIONAL, -- Need ON

locationCoordinateTypes LocationCoordinateTypes OPTIONAL, -- Need ON

velocityTypes VelocityTypes OPTIONAL, -- Need ON

...,

[[

messageSizeLimitNB-r14 MessageSizeLimitNB-r14 OPTIONAL -- Need ON

]],

[[

segmentationInfo-r14 SegmentationInfo-r14 OPTIONAL -- Need ON

]]

}

LocationInformationType ::= ENUMERATED {

locationEstimateRequired,

locationMeasurementsRequired,

locationEstimatePreferred,

locationMeasurementsPreferred,

...

}

PeriodicalReportingCriteria ::= SEQUENCE {

reportingAmount ENUMERATED {

ra1, ra2, ra4, ra8, ra16, ra32,

ra64, ra-Infinity

} DEFAULT ra-Infinity,

reportingInterval ENUMERATED {

noPeriodicalReporting, ri0-25,

ri0-5, ri1, ri2, ri4, ri8, ri16, ri32, ri64

}

}

TriggeredReportingCriteria ::= SEQUENCE {

cellChange BOOLEAN,

reportingDuration ReportingDuration,

...

}

ReportingDuration ::= INTEGER (0..255)

AdditionalInformation ::= ENUMERATED {

onlyReturnInformationRequested,

mayReturnAdditionalInformation,

...

}

QoS ::= SEQUENCE {

horizontalAccuracy HorizontalAccuracy OPTIONAL, -- Need ON

verticalCoordinateRequest BOOLEAN,

verticalAccuracy VerticalAccuracy OPTIONAL, -- Need ON

responseTime ResponseTime OPTIONAL, -- Need ON

velocityRequest BOOLEAN,

...,

[[ responseTimeNB-r14 ResponseTimeNB-r14 OPTIONAL -- Need ON

]],

[[ horizontalAccuracyExt-r15 HorizontalAccuracyExt-r15 OPTIONAL, -- Need ON

verticalAccuracyExt-r15 VerticalAccuracyExt-r15 OPTIONAL -- Need ON

]]

}

HorizontalAccuracy ::= SEQUENCE {

accuracy INTEGER(0..127),

confidence INTEGER(0..100),

...

}

VerticalAccuracy ::= SEQUENCE {

accuracy INTEGER(0..127),

confidence INTEGER(0..100),

...

}

HorizontalAccuracyExt-r15 ::= SEQUENCE {

accuracyExt-r15 INTEGER(0..255),

confidence-r15 INTEGER(0..100),

...

}

VerticalAccuracyExt-r15 ::= SEQUENCE {

accuracyExt-r15 INTEGER(0..255),

confidence-r15 INTEGER(0..100),

...

}

ResponseTime ::= SEQUENCE {

time INTEGER (1..128),

...,

[[ responseTimeEarlyFix-r12 INTEGER (1..128) OPTIONAL -- Need ON

]],

[[ unit-r15 ENUMERATED { ten-seconds, ... } OPTIONAL -- Need ON

]]

}

ResponseTimeNB-r14 ::= SEQUENCE {

timeNB-r14 INTEGER (1..512),

responseTimeEarlyFixNB-r14 INTEGER (1..512) OPTIONAL, -- Need ON

...,

[[ unitNB-r15 ENUMERATED { ten-seconds, ... } OPTIONAL -- Need ON

]]

}

Environment ::= ENUMERATED {

badArea,

notBadArea,

mixedArea,

...

}

MessageSizeLimitNB-r14 ::= SEQUENCE {

measurementLimit-r14 INTEGER (1..512) OPTIONAL, -- Need ON

...

}

-- ASN1STOP

| Conditional presence | Explanation |
| --- | --- |
| *ECID* | The field is optionally present, need ON, if E-CID or NR E-CID is requested. Otherwise it is not present. |

| *CommonIEsRequestLocationInformation* field descriptions |
| --- |
| ***locationInformationType***  This IE indicates whether the server requires a location estimate or measurements. For '*locationEstimateRequired*', the target device shall return a location estimate if possible, or indicate a location error if not possible. For '*locationMeasurementsRequired*', the target device shall return measurements if possible, or indicate a location error if not possible. For '*locationEstimatePreferred*', the target device shall return a location estimate if possible, but may also or instead return measurements for any requested position methods for which a location estimate is not possible. For '*locationMeasurementsPreferred*', the target device shall return location measurements if possible, but may also or instead return a location estimate for any requested position methods for which return of location measurements is not possible. |
| ***triggeredReporting***  This IE indicates that triggered reporting is requested and comprises the following subfields:  - ***cellChange***: If this field is set to TRUE, the target device provides requested location information each time the primary cell has changed.  - ***reportingDuration***: Maximum duration of triggered reporting in seconds. A value of zero is interpreted to mean an unlimited (i.e. "infinite") duration. The target device should continue triggered reporting for the *reportingDuration* or until an LPP *Abort* or *LPP Error* message is received.  The *triggeredReporting* field should not be included by the location server and shall be ignored by the target device if the *periodicalReporting* IE or *responseTime* IE or *responseTimeNB* IE is included in *CommonIEsRequestLocationInformation.* |
| ***periodicalReporting***  This IE indicates that periodic reporting is requested and comprises the following subfields:  - ***reportingAmount*** indicates the number of periodic location information reports requested. Enumerated values correspond to 1, 2, 4, 8, 16, 32, 64, or infinite/indefinite number of reports. If the *reportingAmount* is '*infinite/indefinite'*, the target device shou-ld continue periodic reporting until an LPP *Abort* message is received. The value '*ra1*' shall not be used by a sender.  - ***reportingInterval*** indicates the interval between location information reports and the response time requirement for the first location information report. Enumerated values ri0-25, ri0-5, ri1, ri2, ri4, ri8, ri16, ri32, ri64 correspond to reporting intervals of 1, 2, 4, 8, 10, 16, 20, 32, and 64 seconds, respectively. Measurement reports containing no measurements or no location estimate are required when a *reportingInterval* expires before a target device is able to obtain new measurements or obtain a new location estimate. The value '*noPeriodicalReporting*' shall not be used by a sender. |
| ***additionalInformation***  This IE indicates whether a target device is allowed to return additional information to that requested. If this IE indicates '*onlyReturnInformationRequested'* then the target device shall not return any additional information to that requested by the server. If this IE indicates '*mayReturnAdditionalInformation'* then the target device may return additional information to that requested by the server. If a location estimate is returned, any additional information is restricted to that associated with a location estimate (e.g. might include velocity if velocity was not requested but cannot include measurements). If measurements are returned, any additional information is restricted to additional measurements (e.g. might include E-CID measurements if A-GNSS measurements were requested but not E-CID measurements). |
| ***qos***  This IE indicates the quality of service and comprises a number of sub-fields. In the case of measurements, some of the sub-fields apply to the location estimate that could be obtained by the server from the measurements provided by the target device assuming that the measurements are the only sources of error. Fields are as follows:  - ***horizontalAccuracy*** indicates the maximum horizontal error in the location estimate at an indicated confidence level. The '*accuracy*' corresponds to the encoded uncertainty as defined in TS 23.032 [15] and '*confidence*' corresponds to confidence as defined in TS 23.032 [15].  - ***verticalCoordinateRequest*** indicates whether a vertical coordinate is required (TRUE) or not (FALSE)  - ***verticalAccuracy*** indicates the maximum vertical error in the location estimate at an indicated confidence level and is only applicable when a vertical coordinate is requested. The '*accuracy*' corresponds to the encoded uncertainty altitude as defined in TS 23.032 [15] and '*confidence*' corresponds to confidence as defined in TS 23.032 [15].  - ***responseTime***  - ***time*** indicates the maximum response time as measured between receipt of the *RequestLocationInformation* and transmission of a *ProvideLocationInformation*. If the *unit* field is absent, this is given as an integer number of seconds between 1 and 128. If the *unit* field is present, the maximum response time is given in units of 10-seconds, between 10 and 1280 seconds. If the *periodicalReporting* IE is included in *CommonIEsRequestLocationInformation*, this field should not be included by the location server and shall be ignored by the target device (if included).  - ***responseTimeEarlyFix*** indicates the maximum response time as measured between receipt of the *RequestLocationInformation* and transmission of a *ProvideLocationInformation* containing early location measurements or an early location estimate. If the *unit* field is absent, this is given as an integer number of seconds between 1 and 128. If the *unit* field is present, the maximum response time is given in units of 10-seconds, between 10 and 1280 seconds. When this IE is included, a target should send a *ProvideLocationInformation* (or more than one *ProvideLocationInformation* if location information will not fit into a single message) containing early location information according to the *responseTimeEarlyFix* IE and a subsequent *ProvideLocationInformation* (or more than one *ProvideLocationInformation* if location information will not fit into a single message) containing final location information according to the *time* IE. A target shallomit sending a *ProvideLocationInformation* if the early location information is not available at the expiration of the time value in the *responseTimeEarlyFix* IE. A server should set the *responseTimeEarlyFix* IE to a value less than that for the *time* IE. A target shall ignore the *responseTimeEarlyFix* IE if its value is not less than that for the *time* IE.  - ***unit*** indicates the unit of the *time* and *responseTimeEarlyFix* fields. Enumerated value '*ten-seconds*' corresponds to a resolution of 10 seconds. If this field is absent, the unit/resolution is 1 second.  - ***velocityRequest*** indicates whether velocity (or measurements related to velocity) is requested (TRUE) or not (FALSE).  - ***responseTimeNB*** If the *periodicalReporting* IE or *responseTime* IE is included in *CommonIEsRequestLocationInformation*, this field should not be included by the location server and shall be ignored by the target device (if included).  - ***timeNB*** indicates the maximum response time as measured between receipt of the *RequestLocationInformation* and transmission of a *ProvideLocationInformation*. If the *unit* field is absent, this is given as an integer number of seconds between 1 and 512. If the *unit* field is present, the maximum response time is given in units of 10-seconds, between 10 and 5120 seconds.  - ***responseTimeEarlyFixNB*** indicates the maximum response time as measured between receipt of the *RequestLocationInformation* and transmission of a *ProvideLocationInformation* containing early location measurements or an early location estimate. If the *unit* field is absent, this is given as an integer number of seconds between 1 and 512. If the *unit* field is present, the maximum response time is given in units of 10-seconds, between 10 and 5120 seconds. When this IE is included, a target should send a *ProvideLocationInformation* (or more than one *ProvideLocationInformation* if location information will not fit into a single message) containing early location information according to the *responseTimeEarlyFixNB* IE and a subsequent *ProvideLocationInformation* (or more than one *ProvideLocationInformation* if location information will not fit into a single message) containing final location information according to the *timeNB* IE. A target shall omit sending a *ProvideLocationInformation* if the early location information is not available at the expiration of the time value in the *responseTimeEarlyFixNB* IE. A server should set the *responseTimeEarlyFixNB* IE to a value less than that for the *timeNB* IE. A target shall ignore the *responseTimeEarlyFixNB* IE if its value is not less than that for the *timeNB* IE.  - ***unitNB*** indicates the unit of the *timeNB* and *responseTimeEarlyFixNB* fields. Enumerated value '*ten-second*' corresponds to a resolution of 10 seconds. If this field is absent, the unit/resolution is 1 second.  - ***horizontalAccuracyExt*** indicates the maximum horizontal error in the location estimate at an indicated confidence level. The '*accuracyExt*' corresponds to the encoded high accuracy uncertainty as defined in TS 23.032 [15] and 'confidence' corresponds to confidence as defined in TS 23.032 [15]. This field should not be included by the location server and shall be ignored by the target device if the *horizontalAccuracy* field is included in QoS.  - ***verticalAccuracyExt*** indicates the maximum vertical error in the location estimate at an indicated confidence level and is only applicable when a vertical coordinate is requested. The '*accuracyExt*' corresponds to the encoded high accuracy uncertainty as defined in TS 23.032 [15] and '*confidence*' corresponds to confidence as defined in TS 23.032 [15]. This field should not be included by the location server and shall be ignored by the target device if the *verticalAccuracy* field is included in QoS.  All QoS requirements shall be obtained by the target device to the degree possible but it is permitted to return a response that does not fulfill all QoS requirements if some were not attainable. The single exception is *time* and *timeNB* which shall always be fulfilled – even if that means not fulfilling other QoS requirements.  A target device supporting NB-IoT access shall support the *responseTimeNB* IE*.*  A target device supporting HA GNSS shall support the *HorizontalAccuracyExt*, *VerticalAccuracyEx*, and *unit* fields.  A target device supporting NB-IoT access and HA GNSS shall support the *unitNB* field. |
| ***environment***  This field provides the target device with information about expected multipath and non line of sight (NLOS) in the current area. The following values are defined:  - badArea: possibly heavy multipath and NLOS conditions (e.g. bad urban or urban).  - notBadArea: no or light multipath and usually LOS conditions (e.g. suburban or rural).  - mixedArea: environment that is mixed or not defined.  If this field is absent, a default value of 'mixedArea' applies. |
| ***locationCoordinateTypes***  This field provides a list of the types of location estimate that the target device may return when a location estimate is obtained by the target. |
| ***velocityTypes***  This fields provides a list of the types of velocity estimate that the target device may return when a velocity estimate is obtained by the target. |
| ***messageSizeLimitNB***  This field provides an octet limit on the amount of location information a target device can return.  - ***measurementLimit*** indicates the maximum amount of location information the target device should return in response to the *RequestLocationInformation* message received from the location server. The limit applies to the overall size of the LPP message at LPP level (LPP Provide Location Information), and is specified in steps of 100 octets. The message size limit is then given by the value provided in *measurementLimit* times 100 octets. |
| ***segmentationInfo***  This field indicates whether this *RequestLocationInformation* message is one of many segments, as specified in clause 4.3.5 |

*Next change*

#### – *CommonIEsError*

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

-- ASN1START

CommonIEsError ::= SEQUENCE {

errorCause ENUMERATED {

undefined,

lppMessageHeaderError,

lppMessageBodyError,

epduError,

incorrectDataValue,

...,

lppSegmentationError-v1450

}

}

-- ASN1STOP

| *CommonIEsError* field descriptions |
| --- |
| *errorCause*  This IE defines the cause for an error. '*lppMessageHeaderError*', '*lppMessageBodyError*' and '*epduError*' is used if a receiver is able to detect a coding error in the LPP header (i.e., in the common fields), LPP message body or in an EPDU, respectively. ‘*incorrectDataValue*’ is used if a receiver receives an incorrect data value. '*lppSegmentationError*' is used if a receiver detects an error in LPP message segmentation. |

*Next change*

6.5.1.5 OTDOA Location Information Elements

– *OTDOA-SignalMeasurementInformation*

The IE *OTDOA-SignalMeasurementInformation* is used by the target device to provide RSTD measurements to the location server. The RSTD measurements are provided for a neighbour cell and the RSTD reference cell, both of which are provided in the IE *OTDOA-ProvideAssistanceData.* The RSTD reference cell may or may not be the same as the assistance data reference cell provided in *OTDOA-ReferenceCellInfo* or *OTDOA-ReferenceCellInfoNB*. If the target device stops reporting inter-frequency RSTD measurements, where the inter-frequency RSTD measurement is an OTDOA RSTD measurement with at least one cell on a frequency different from the serving cell frequency, the LPP layer shall inform lower layers that inter-frequency RSTD measurements are stopped.

NOTE 1: If there are more than 24 *NeighbourMeasurementElement* to be sent, the target device may send them in multiple *ProvideLocationInformation* messages, as described under clause 5.3.

NOTE 2: If NPRS/PRS antenna ports are quasi co-located, the target device provides a single RSTD measurement for the quasi co-located antenna ports of NPRS/PRS.

-- ASN1START

OTDOA-SignalMeasurementInformation ::= SEQUENCE {

systemFrameNumber BIT STRING (SIZE (10)),

physCellIdRef INTEGER (0..503),

cellGlobalIdRef ECGI OPTIONAL,

earfcnRef ARFCN-ValueEUTRA OPTIONAL, -- Cond NotSameAsRef0

referenceQuality OTDOA-MeasQuality OPTIONAL,

neighbourMeasurementList NeighbourMeasurementList,

...,

[[ earfcnRef-v9a0 ARFCN-ValueEUTRA-v9a0 OPTIONAL -- Cond NotSameAsRef1

]],

[[ tpIdRef-r14 INTEGER (0..4095) OPTIONAL, -- Cond ProvidedByServer0

prsIdRef-r14 INTEGER (0..4095) OPTIONAL, -- Cond ProvidedByServer1

additionalPathsRef-r14

AdditionalPathList-r14 OPTIONAL,

nprsIdRef-r14 INTEGER (0..4095) OPTIONAL, -- Cond ProvidedByServer2

carrierFreqOffsetNB-Ref-r14

CarrierFreqOffsetNB-r14 OPTIONAL, -- Cond NB-IoT

hyperSFN-r14 BIT STRING (SIZE (10)) OPTIONAL -- Cond H-SFN

]],

[[

motionTimeSource-r15 MotionTimeSource-r15 OPTIONAL

]]

}

NeighbourMeasurementList ::= SEQUENCE (SIZE(1..24)) OF NeighbourMeasurementElement

NeighbourMeasurementElement ::= SEQUENCE {

physCellIdNeighbour INTEGER (0..503),

cellGlobalIdNeighbour ECGI OPTIONAL,

earfcnNeighbour ARFCN-ValueEUTRA OPTIONAL, -- Cond NotSameAsRef2

rstd INTEGER (0..12711),

rstd-Quality OTDOA-MeasQuality,

...,

[[ earfcnNeighbour-v9a0 ARFCN-ValueEUTRA-v9a0 OPTIONAL -- Cond NotSameAsRef3

]],

[[ tpIdNeighbour-r14 INTEGER (0..4095) OPTIONAL, -- Cond ProvidedByServer0

prsIdNeighbour-r14 INTEGER (0..4095) OPTIONAL, -- Cond ProvidedByServer1

delta-rstd-r14 INTEGER (0..5) OPTIONAL,

additionalPathsNeighbour-r14

AdditionalPathList-r14 OPTIONAL,

nprsIdNeighbour-r14 INTEGER (0..4095) OPTIONAL, -- Cond ProvidedByServer2

carrierFreqOffsetNB-Neighbour-r14

CarrierFreqOffsetNB-r14 OPTIONAL -- Cond NB-IoT

]],

[[

delta-SFN-r15 INTEGER (-8192..8191) OPTIONAL

]]

}

AdditionalPathList-r14 ::= SEQUENCE (SIZE(1..maxPaths-r14)) OF AdditionalPath-r14

maxPaths-r14 INTEGER ::= 2

MotionTimeSource-r15 ::= SEQUENCE {

timeSource-r15 ENUMERATED {servingCell, referenceCell, gnss, mixed,

other, none, ...}

}

-- ASN1STOP

| **Conditional presence** | **Explanation** |
| --- | --- |
| *NotSameAsRef0* | The field is absent if the corresponding *earfcnRef-v9a0* is present. Otherwise, the target device shall include this field if the EARFCN of the RSTD reference cell is not the same as the EARFCN of the assistance data reference cell provided in the OTDOA assistance data. |
| *NotSameAsRef1* | The field is absent if the corresponding *earfcnRef* is present. Otherwise, the target device shall include this field if the EARFCN of the RSTD reference cell is not the same as the EARFCN of the assistance data reference cell provided in the OTDOA assistance data. |
| *NotSameAsRef2* | The field is absent if the corresponding *earfcnNeighbour-v9a0* is present. Otherwise, the target device shall include this field if the EARFCN of this neighbour cell is not the same as the *earfcnRef*for the RSTD reference cell. |
| *NotSameAsRef3* | The field is absent if the corresponding *earfcnNeighbour* is present. Otherwise, the target device shall include this field if the EARFCN of this neighbour cell is not the same as the *earfcnRef*for the RSTD reference cell. |
| *ProvidedByServer0* | The target device shall include this field if a *tpId* for this transmission point is included in the *OTDOA-ProvideAssistanceData.* Otherwise the field is absent. |
| *ProvidedByServer1* | The target device shall include this field if a *prsID* for this transmission point is included in the *OTDOA-ProvideAssistanceData.* Otherwise the field is absent. |
| *ProvidedByServer2* | The target device shall include this field if an *nprsID* for this cell is included in the *OTDOA-ProvideAssistanceData* and if this cell is a NB-IoT only cell (without associated LTE PRS cell)*.* Otherwise the field is absent. |
| *NB-IoT* | The target device shall include this field if the cell is a NB-IoT only cell (without associated LTE PRS cell). Otherwise the field is absent. |
| *H-SFN* | The target device shall include this field if it was able to determine a hyper SFN of the RSTD reference cell. |

| ***OTDOA-SignalMeasurementInformation* field descriptions** |
| --- |
| ***systemFrameNumber***  If the *delta-SFN* and *motionTimeSource* fields are not present, this field specifies the SFN of the RSTD reference cell containing the starting subframe of the PRS or NPRS positioning occasion if PRS or NPRS are available on the RSTD reference cell, or subframe of the CRS for RSTD measurements if PRS and NPRS are not available on the RSTD reference cell during which the most recent neighbour cell RSTD measurement was performed.  In the case of more than a single PRS configuration on the RSTD reference cell, the first PRS configuration is referenced.  If the *delta-SFN* and *motionTimeSource* fields are present, this field specifies the SFN of the RSTD reference cell when the TOA measurement for the RSTD reference cell has been made. |
| ***physCellIdRef***  This field specifies the physical cell identity of the RSTD reference cell. |
| ***cellGlobalIdRef***  This field specifies the ECGI, the globally unique identity of a cell in E-UTRA, of the RSTD reference cell. The target shall provide this IE if it knows the ECGI of the RSTD reference cell. |
| ***earfcnRef***  This field specifies the EARFCN of the RSTD reference cell. |
| ***referenceQuality***  This field specifies the target device′s best estimate of the quality of the TOA measurement from the RSTD reference cell, TSubframeRxRef, where TSubframeRxRef is the time of arrival of the signal from the RSTD reference cell.  When *delta-SFN* and *motionTimeSource* are both included, the target device shall not include measurement errors caused by motion of the target device in *referenceQuality* (e.g. the target device may assume the target device was stationary during OTDOA measurements). |
| ***neighbourMeasurementList***  This list contains the measured RSTD values for neighbour cells together with the RSTD reference cell, along with quality for each measurement. |
| ***tpIdRef***  This field specifies the transmission point ID of the RSTD reference cell. |
| ***prsIdRef***  This field specifies the PRS-ID of the first PRS configuration of the RSTD reference cell. |
| ***additionalPathsRef***  This field specifies one or more additional detected path timing values for the RSTD reference cell, relative to the path timing used for determining the *rstd* value. If this field was requested but is not included, it means the UE did not detect any additional path timing values. |
| ***nprsIdRef***  This field specifies the NPRS-ID of the RSTD reference cell. |
| ***carrierFreqOffsetNB-Ref***  This field specifies the offset of the NB-IoT channel number to EARFCN given by *earfcnRef* as defined in TS 36.101 [21]. |
| ***hyperSFN***  This field specifies the hyper SFN as defined in TS 36.331 [12] of the RSTD reference cell for the *systemFrameNumber*. |
| ***motionTimeSource***  This field provides reference information concerning the movement of the target device and comprises the following subfields:  - ***timeSource*** specifies the external time source to which UE time was locked during the OTDOA measurements. Enumerated value "mixed" indicates that UE time was locked to more than one external time source during OTDOA measurements (e.g. is applicable to a change in serving cell when the serving cell was used as a time source). The value "other" indicates some other external time source. The value "none" indicates that UE time was not locked to an external time source.  If this field is present, the target device shall also provide the IE *Sensor-MotionInformation* in IE *Sensor‑ProvideLocationInformation*. |
| ***physCellIdNeighbour***  This field specifies the physical cell identity of the neighbour cell for which the RSTDs are provided. |
| ***cellGlobalIdNeighbour***  This field specifies the ECGI, the globally unique identity of a cell in E-UTRA, of the neighbour cell for which the RSTDs are provided. The target device shall provide this IE if it was able to determine the ECGI of the neighbour cell at the time of measurement. |
| ***earfcnNeighbour***  This field specifies the EARFCN of the neighbour cell used for the RSTD measurements. |
| ***rstd***  This field specifies the relative timing difference between this neighbour cell and the RSTD reference cell, as defined in TS 36.214 [17]. Mapping of the measured quantity is defined as in TS 36.133 [18] clause 9.1.10.3. |
| ***rstd-Quality***  This field specifies the target device′s best estimate of the quality of the measured *rstd*.  When *delta-SFN* and *motionTimeSource* both included, the target device shall not include measurement errors caused by motion of the target device in *rstd-Quality* (e.g. the target device may assume the target device was stationary during OTDOA measurements). |
| ***tpIdNeighbour***  This field specifies the transmission point ID for the neighbour cell for which the RSTDs are provided. |
| ***prsIdNeighbour***  This field specifies the PRS-ID of the first PRS configuration of the neighbour cell for which the RSTDs are provided. |
| ***delta-rstd***  This field specifies the higher-resolution RSTD RSTD as defined in TS 36.133 [18] clause 9.1.10.4. Mapping of the measured quantity is defined as in TS 36.133 [18] clause 9.1.10.4. |
| ***additionalPathsNeighbour***  This field specifies one or more additional detected path timing values for the neighbour cell, relative to the path timing used for determining the *rstd* value. If this field was requested but is not included, it means the UE did not detect any additional path timing values. |
| ***nprsIdNeighbour***  This field specifies the NPRS-ID of the neighbour cell for which the RSTDs are provided. |
| ***carrierFreqOffsetNB-Neighbour***  This field specifies the offset of the NB-IoT channel number to EARFCN given by *earfcnNeighbour* as defined in TS 36.101 [21]. |
| ***delta-SFN***  This field provides information concerning the movement of the target device:  Together with *systemFrameNumber* specifies the *measurementSFN* of the RSTD reference cell when the TOA measurement for this neighbour cell has been made for determining the *rstd*. The *measurementSFN* is given by *systemFrameNumber* + *delta-SFN*. (The actual SFN is the *measurementSFN* modulo 1024.). The *measurementSFN* is used in IE *Sensor-MotionInformation* to provide movement information corresponding to the TOA measurement time.  If this field is present, the target device shall also provide the IE *Sensor-MotionInformation* in IE *Sensor‑ProvideLocationInformation*. |

*Next change*

6.5.1.6 OTDOA Location Information Request

– *OTDOA-RequestLocationInformation*

The IE *OTDOA-RequestLocationInformation* is used by the location server to request OTDOA location measurements from a target device. Details of the required measurements (e.g. details of assistance data reference cell and neighbour cells) are conveyed in the *OTDOA-ProvideAssistanceData* IE in a separate Provide Assistance Data message.

-- ASN1START

OTDOA-RequestLocationInformation ::= SEQUENCE {

assistanceAvailability BOOLEAN,

...,

[[

multipathRSTD-r14 ENUMERATED { requested } OPTIONAL, -- Need ON

maxNoOfRSTDmeas-r14 INTEGER (1..32) OPTIONAL -- Need ON

]],

[[

motionMeasurements-r15 ENUMERATED { requested } OPTIONAL -- Need ON

]]

}

-- ASN1STOP

| ***OTDOA-RequestLocationInformation* field descriptions** |
| --- |
| ***assistanceAvailability***  This field indicates whether the target device may request additional OTDOA assistance data from the server. TRUE means allowed and FALSE means not allowed. |
| ***multipathRSTD***  This field, if present, indicates that the target device is requested to report additional detected path timing information per RSTD reference and neighbour cell. |
| ***maxNoOfRSTDmeas***  This field, if present, indicates the maximum number of *NeighbourMeasurementElement* fields (i.e., RSTD measurements) the target device can provide in *OTDOA-SignalMeasurementInformation*. |
| ***motionMeasurements***  This field, if present, indicates that the target device is requested to report the motion measurements (*delta-SFN* and *motionTimeSource*) in *OTDOA‑SignalMeasurementInformation* as well as the IE *Sensor-MotionInformation* in IE *Sensor‑ProvideLocationInformation*. |

*Next change*

6.5.1.7 OTDOA Capability Information

– *OTDOA-ProvideCapabilities*

The IE *OTDOA-ProvideCapabilities* is used by the target device to indicate its capability to support OTDOA and to provide its OTDOA positioning capabilities to the location server.

-- ASN1START

OTDOA-ProvideCapabilities ::= SEQUENCE {

otdoa-Mode BIT STRING { ue-assisted (0),

ue-assisted-NB-r14 (1),

ue-assisted-NB-TDD-r15 (2) } (SIZE (1..8)),

...,

supportedBandListEUTRA SEQUENCE (SIZE (1..maxBands)) OF SupportedBandEUTRA OPTIONAL,

supportedBandListEUTRA-v9a0 SEQUENCE (SIZE (1..maxBands)) OF SupportedBandEUTRA-v9a0

OPTIONAL,

interFreqRSTDmeasurement-r10 ENUMERATED { supported } OPTIONAL,

additionalNeighbourCellInfoList-r10 ENUMERATED { supported } OPTIONAL,

prs-id-r14 ENUMERATED { supported } OPTIONAL,

tp-separation-via-muting-r14 ENUMERATED { supported } OPTIONAL,

additional-prs-config-r14 ENUMERATED { supported } OPTIONAL,

prs-based-tbs-r14 ENUMERATED { supported } OPTIONAL,

additionalPathsReport-r14 ENUMERATED { supported } OPTIONAL,

densePrsConfig-r14 ENUMERATED { supported } OPTIONAL,

maxSupportedPrsBandwidth-r14 ENUMERATED { n6, n15, n25, n50, n75, n100, ...} OPTIONAL,

prsOccGroup-r14 ENUMERATED { supported } OPTIONAL,

prsFrequencyHopping-r14 ENUMERATED { supported } OPTIONAL,

maxSupportedPrsConfigs-r14 ENUMERATED { c2, c3 } OPTIONAL,

periodicalReporting-r14 ENUMERATED { supported } OPTIONAL,

multiPrbNprs-r14 ENUMERATED { supported } OPTIONAL,

idleStateForMeasurements-r14 ENUMERATED { required } OPTIONAL,

numberOfRXantennas-r14 ENUMERATED { rx1, ... } OPTIONAL,

motionMeasurements-r15 ENUMERATED { supported } OPTIONAL,

interRAT-RSTDmeasurement-r15 ENUMERATED { supported } OPTIONAL

}

maxBands INTEGER ::= 64

SupportedBandEUTRA ::= SEQUENCE {

bandEUTRA INTEGER (1..maxFBI)

}

SupportedBandEUTRA-v9a0 ::= SEQUENCE {

bandEUTRA-v9a0 INTEGER (maxFBI-Plus1..maxFBI2) OPTIONAL

}

maxFBI INTEGER ::= 64 -- Maximum value of frequency band indicator

maxFBI-Plus1 INTEGER ::= 65 -- lowest value extended FBI range

maxFBI2 INTEGER ::= 256 -- highest value extended FBI range

-- ASN1STOP

| ***OTDOA-ProvideCapabilities* field descriptions** |
| --- |
| ***otdoa-Mode***  This field specifies the OTDOA mode(s) supported by the target device. This is represented by a bit string, with a one value at the bit position means the particular OTDOA mode is supported; a zero value means not supported. A zero-value in all bit positions in the bit string means OTDOA positioning method is not supported by the target device.  ue-assisted: Bit 0 indicates that the target device supports UE-assisted OTDOA and LTE PRS.  ue-assisted-NB: Bit 1 indicates that the target device supports UE-assisted OTDOA and NB-IoT NPRS.  ue-assisted-NB-TDD: Bit 2 indicates that the target device supports UE-assisted OTDOA and NB-IoT NPRS for TDD. |
| ***SupportedBandEUTRA***  This field specifies the frequency bands for which the target device supports RSTD measurements. One entry corresponding to each supported E-UTRA band as defined in TS 36.101 [21]. In the case the target device includes *bandEUTRA-v9a0*, the target device shall set the corresponding entry of *bandEUTRA* (i.e. without suffix) to *maxFBI*. |
| ***interFreqRSTDmeasurement***  This field, if present, indicates that the target device supports inter-frequency RSTD measurements within and between the frequency bands indicated in *SupportedBandEUTRA*. |
| ***additionalNeighbourCellInfoList***  This field, if present, indicates that the target device supports up to 3×24 *OTDOA-NeighbourCellInfoElement* in *OTDOA‑NeighbourCellInfoList* in *OTDOA-ProvideAssistanceData* without any restriction for the *earfcn* in each *OTDOA-NeighbourCellInfoElement* as specified in clause 6.5.1.2. |
| ***prs-id***  This field, if present, indicates that the target device supports PRS generation based on the PRS-ID as specified in TS 36.211 [16] and support for TP-ID in *OTDOA-ReferenceCellInfo* and *OTDOA-NeighbourCellInfoList*. |
| ***tp-separation-via-muting***  This field, if present, indicates that the target device supports RSTD measurements for cells which have associated transmission points (e.g., Remote Radio Heads) within the cell coverage and where these associated transmission points have the same physical cell identity as the associated cell, and where these transmission points are identified via a different muting pattern. The field also indicates support for TP-ID in *OTDOA-ReferenceCellInfo* and *OTDOA‑NeighbourCellInfoList*. |
| ***additional-prs-config***  This field, if present, indicates that the target device supports additional PRS configurations. The additional PRS configuration in *PRS-Info* IE comprise:  - support for *prs-ConfigurationIndex* > 2399; - support for NPRS values in addition to 1, 2, 4 and 6 (*add-numDL-Frames in PRS-Info);*  - support for muting bit string lengths > 16 bits. |
| ***prs-based-tbs***  This field, if present, indicates that the target device supports RSTD measurements for PRS-only TPs. |
| ***additionalPathsReport***  This field, if present, indicates that the target device supports reporting of timing information for additional detected paths for RSTD reference and each neighbour cell. |
| ***densePrsConfig***  This field, if present, indicates that the target device supports a subset of the additional PRS configurations associated with capability *additional-prs-config* which comprises:  - support for *prs-ConfigurationIndex* > 2404;  - support for NPRS values of 10, 20, 40, 80 and 160 (in addition to 1, 2, 4 and 6).  In the case *additional-prs-config* is present, this field is not present. |
| ***maxSupportedPrsBandwidth***  This field, if present, indicates the maximum PRS bandwidth supported by the target device. Enumerated value n6 corresponds to 6 resource blocks, n15 to 15 resource blocks and so on. If this field is not present, the target device is assumed to support the PRS bandwidth associated with the target device type, which for LTE devices including Cat-M1/M2 is 100 resource blocks and for NB-IoT devices is 1 resource block. |
| ***prsOccGroup***  This field, if present, indicates that the target device supports PRS occasion groups, which implies that each bit of a configured muting pattern applies per PRS occasion group. |
| ***prsFrequencyHopping***  This field, if present, indicates that the target device supports PRS occasion frequency hopping, as specified in TS 36.211 [16]. |
| ***maxSupportedPrsConfigs***  This field, if present, indicates that the target device supports multiple PRS configurations per cell. Enumerated value c2 indicates support for up to 2 configurations; c3 indicates support for up to 3 configurations. |
| ***periodicalReporting***  This field, if present, indicates that the target device supports *periodicalReporting* of RSTD measurements*.* If this field is absent, the location server may assume that the target device does not support *periodicalReporting* in *CommonIEsRequestLocationInformation*. |
| ***multiPrbNprs***  This field, if present, indicates that the target device supports NPRS configuration in more than one resource block (i.e., *maxCarrier* in *PRS-Info-NB* greater than 1). |
| ***idleStateForMeasurements***  This field, if present, indicates that the target device requires idle state to perform RSTD measurements. |
| ***numberOfRXantennas***  This field is not applicable to NB-IoT devices.  This field, if present, indicates the number of UE downlink receive antennas for RSTD measurements (see TS 36.133 [18]). Enumerated value rx1 indicates a single antenna receiver. If this field is absent, the target device is assumed to support two RX antennas for RSTD measurements. |
| ***motionMeasurements***  This field, if present, indicates that the target device supports reporting of motion measurements (*delta-SFN* and *motionTimeSource*) in *OTDOA‑SignalMeasurementInformation*. The presence of this field implies presence of *sensor-MotionInformationSup* in IE *Sensor‑ProvideCapabilities*. |
| ***interRAT-RSTDmeasurement***  This field, if present, indicates that the target device supports inter-RAT RSTD measurements (TS 38.215 [36]); i.e., E-UTRA RSTD measurements when the target device is served by an NR cell. |

*Next change*

#### 6.5.5.2 Sensor Location Information Elements

#### – *Sensor-MotionInformation*

The IE *Sensor-MotionInformation* is used by the target device to provide UE movement information to the location server. The movement information comprises an ordered series of points. This information may be obtained by the target device using one or more motion sensors.

-- ASN1START

Sensor-MotionInformation-r15 ::= SEQUENCE {

refTime-r15 DisplacementTimeStamp-r15,

displacementInfoList-r15 DisplacementInfoList-r15,

...

}

DisplacementInfoList-r15 ::= SEQUENCE (SIZE (1..128)) OF DisplacementInfoListElement-r15

DisplacementInfoListElement-r15 ::= SEQUENCE {

deltaTimeStamp-r15 DeltaTime-r15,

displacement-r15 Displacement-r15 OPTIONAL,

...

}

DisplacementTimeStamp-r15 ::= CHOICE {

utcTime-r15 UTC-Time-r15,

gnssTime-r15 MeasurementReferenceTime,

systemFrameNumber-r15 SFN-r15,

measurementSFN-r15 INTEGER(-8192..9214),

...

}

DeltaTime-r15 ::= CHOICE {

deltaTimeSec-r15 INTEGER (1..16384),

deltaTimeSFN-r15 INTEGER (1..4096),

...

}

SFN-r15 ::= SEQUENCE {

sfn-r15 BIT STRING (SIZE (10)),

hyperSFN-r15 BIT STRING (SIZE (10)) OPTIONAL,

...

}

Displacement-r15 ::= SEQUENCE {

bearing-r15 INTEGER (0..3599),

bearingUncConfidence-r15 INTEGER (0..100) OPTIONAL,

bearingRef-r15 ENUMERATED { geographicNorth, magneticNorth, local },

horizontalDistance-r15 INTEGER (0..8191),

horizontalDistanceUnc-r15 INTEGER (0..255) OPTIONAL,

horizontalUncConfidence-r15 INTEGER (0..100) OPTIONAL,

verticalDirection-r15 ENUMERATED{upward, downward} OPTIONAL,

verticalDistance-r15 INTEGER(0..8191) OPTIONAL,

verticalDistanceUnc-r15 INTEGER (0..255) OPTIONAL,

verticalUncConfidence-r15 INTEGER (0..100) OPTIONAL,

...

}

UTC-Time-r15 ::= SEQUENCE {

utcTime-r15 UTCTime,

utcTime-ms-r15 INTEGER (0..999),

...

}

-- ASN1STOP

| *Sensor-MotionInformation* field descriptions |
| --- |
| ***refTime***  This field provides the reference time *t0* associated with the starting position of the first displacement in the displacement list. |
| ***displacementInfoList***  This field provides an ordered series of direction and distance travelled by the target device and comprises the following subfields:  - ***deltaTimeStamp*** specifies the time between *tn-1* and *tn*, were *n* corresonds to the order of entry in the *DispacementInfoList* (*n*=0 correspond to the time provided in *refTime*).  - ***displacement*** provides the direction and distance travelled between time *tn-1* and *tn*. |
| ***utcTime***  This field provides the time stamp of the *refTime* in UTC time and comprises the following subfields:  - *utcTime* in the form of YYMMDDhhmmssZ.  - *utcTime-ms* specifies the fractional part of the UTC time in ms resolution. |
| ***gnssTime***  This field provides the time stamp of the *refTime* in GNSS time. |
| ***systemFrameNumber***  This field provides the time stamp of the *refTime* in serving cell SFN time. |
| ***measurementSFN***  This field provides the time stamp of the *refTime* in form of the measurement SFN as defined in *delta-SFN* in IE *OTDOA-SignalMeasurementInformation*. This field may be included when OTDOA measurements are included. |
| ***deltaTimeSec***  This field provides the time between *tn-1* and *tn* in units of milliseconds. |
| ***deltaTimeSFN***  This field provides the time between *tn-1* and *tn* in units of system frame numbers. |
| ***bearing***  This field specifies the direction (heading) of the horizontal displacement measured clockwise from *bearingRef*.  Scale factor 0.1 degree. |
| ***bearingRef***  This field specifies the reference direction for the *bearing*. Enumerated value '*geographicNorth*' indicates that the *bearing* is measured clockwise from the Geographic North; '*magneticNorth*' indicates that the *bearing* is measured clockwise from the Magnetic North; '*local*' indicates that the *bearing* is measured clockwise from an arbitrary (undefined) reference direction. |
| ***horizontalDistance***  This field specifies the horizonal distance travelled between time *tn-1* and *tn*.  Scale factor 1 cm. |
| ***horizontalDistanceUnc, horizontalUncConfidence***  This field specifies the horizontal uncertainty of the displacement (corresponding to *tn*). *horizontalDistanceUnc* correspond to the encoded high accuracy uncertainty as defined in TS 23.032 [15]*. horizontalUncConfidence* corresponds to confidence as defined in TS 23.032 [15]. |
| ***verticalDistance***  This field specifies the vertical distance travelled between time *tn-1* and *tn*.  Scale factor 1 cm. |
| ***verticalDistanceUnc, verticalUncConfidence***  This field specifies the vertical uncertainty of the displacement (corresponding to *tn*). *verticalDistanceUnc* correspond to the encoded high accuracy uncertainty as defined in TS 23.032 [15]. *verticalUncConfidence* corresponds to confidence as defined in TS 23.032 [15]. |

*End of change*