**3GPP TSG-RAN WG2 Meeting # 118-e *Draft* R2-2206841**

**Electronic, May 9th – 20th 2022**

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| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| *CR-Form-v12.2* | | | | | | | | |
| **CHANGE REQUEST** | | | | | | | | |
|  | | | | | | | | |
|  | **37.355** | **CR** | **0349** | **rev** | **1** | **Current version:** | **17.0.0** |  |
|  | | | | | | | | |
| *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)*.* | | | | | | | | |
|  | | | | | | | | |

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| ***Proposed change affects:*** | UICC apps |  | ME | **X** | Radio Access Network |  | Core Network | **X** |

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | | | | | | | | | | |
| ***Title:*** | NMEA GGA sentence info in high accuracy GNSS location estimates [HA-GNSS-NMEA] | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Source to WG:*** | ESA, Ericsson, Deutsche Telekom, T-Mobile USA, Swift Navigation, Hexagon, MediaTek Inc., u-blox | | | | | | | | | |
| ***Source to TSG:*** | R2 | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Work item code:*** | TEI17 | | | | |  | ***Date:*** | | | 2022-05-30 |
|  |  | | | |  | |  | | |  |
| ***Category:*** | B |  | | | | | ***Release:*** | | | Rel-17 |
|  | *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:*** | | Support for high accuracy GNSS was introduced in Rel 15 and has been enhanced in Rel 16 and 17. It was leveraged by NTRIP/RTCM distribution and representation, where NMEA GGA sentences are used to report high accuracy GNSS performance. The parts representing the location estimate and its uncertainty have already been represented in 3GPP LPP, but some parts are not yet represented – number of satellites used, dilution of precision, GNSS positioning fix quality indicator and age of used assistance data for HA GNSS – all attributes that are relevant for high accuracy GNSS devices to report to assess performance.  In cases when it is legitimate for LMF to obtain position estimates based on high accuracy GNSS from the device, it is typically as part of an offered service in a use case. With these additional fields from the de facto standard NMEA GGA, the LMF is more precise in analyzing the provided positioning service. DOP provides information about the geometry of the positioning problem in terms of how the used satellites are lined up, and it is highly relevant to analyze the provided positioning performance accordingly. If the position estimates that are self-assessed as less accurate by the device also are provided with a poor DOP, then the underlying reason for poor performance is better understood. Same thing if the number of used satellites is low. It is also possible for the operator to analyze the overall situation in a region based on crowd sourced data to identify parts of a service area where high accuracy GNSS is not alone providing sufficient performance, and thereby indicate a part of the service area where outdoor 5G positioning build-out could be considered.  The ability to maintain an integer or floating point ambiguity solution to the carrier measurements is also seen as an important quality and performance assessment that is an important and de factor standard performance metric | | | | | | | | |
|  | |  | | | | | | | | |
| ***Summary of change:*** | | Adding additional location source alternatives to *CommonIEsProvideLocationInformation* IE to represent the positioning fix quality indicator.  Adding HA-GNSS-Metric IE to the *GNSS-LocationInformation* IE to represent the remaining fields of the NMEA GGA sentence   * number of satellite vehicles used * dilution of precision * age of the most recent used assistance data for HA GNSS | | | | | | | | |
|  | |  | | | | | | | | |
| ***Consequences if not approved:*** | | The GNSS industry standard performance metrics in terms to NMEA GGA information cannot be reported – parameters that are important for LMF to disclose the positioning performance with the provided A-GNSS assistance data | | | | | | | | |
|  | |  | | | | | | | | |
| ***Clauses affected:*** | | 2, 6.4.2, 6.5.2.5, 6.5.2.6, 6.5.2.7, 6.5.2.8, 6.5.2.9 | | | | | | | | |
|  | |  | | | | | | | | |
|  | | **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:*** | |  | | | | | | | | |

START OF CHANGE

*[…]*

# 2 References

*[…]*

[30] RTCM Standard 10403.3: "Differential GNSS (Global Navigation Satellite Systems) Services" – Version 3, October 7, 2016.

[31] IGS ANTEX: "The Antenna Exchanged Format" – version 1.4, September 15, 2010.

[32] Federal Information Processing Standards Publication 197, "Specification for the ADVANCED ENCRYPTION STANDARD (AES)", November 26, 2001.

[33] NIST Special Publication 800-38A, "Recommendation for Block Cipher Modes of Operation Methods and Techniques", 2001.

[34] 3GPP TS 38.101-2: "NR; User Equipment (UE) radio transmission and reception; Part 2: Range 2 Standalone".

[35] 3GPP TS 38.331: "NR; Radio Resource Control (RRC); Protocol specification".

[36] 3GPP TS 38.215: "NR; Physical layer measurements".

[37] 3GPP TS 38.101-1: "NR; User Equipment (UE) radio transmission and reception; Part 1: Range 1 Standalone".

[38] IRNSS Signal-In-Space (SPS) Interface Control Document (ICD) for standard positioning service version 1.1, Aug 2017.

[39] BDS-SIS-ICD-B1C-1.0: "BeiDou Navigation Satellite System Signal In Space Interface Control Document Open Service Signal B1C (Version 1.0)", December, 2017.

[40] 3GPP TS 38.305: "NG Radio Access Network (NG-RAN); Stage 2 functional specification of User Equipment (UE) positioning in NG-RAN".

[41] 3GPP TS 38.211: "3rd Generation Partnership Project; Technical Specification Group Radio Access Network; NR; Physical channels and modulation".

[42] 3GPP TS 23.273: "5G System (5GS) Location Services (LCS); Stage 2".

[43] IS-QZSS-L6-001, Quasi-Zenith Satellite System Interface Specification – Centimetre Level Augmentation Service, Cabinet Office, November 5, 2018.

[44] 3GPP TR 38.901: "Technical Specification Group Radio Access Network; Study on channel model for frequencies from 0.5 to 100 GHz".

[45] 3GPP TS 38.214: "NR; Physical layer procedures for data".

[46] 3GPP TS 38.133: "NR; Requirements for support of radio resource management".

[47] 3GPP TS 38.300: "NR; NR and NG-RAN Overall Description; Stage 2".

[48] 3GPP TS 38.213: "NR; Physical layer procedures for control".

[49] BDS-SIS-ICD-B2a-1.0: "BeiDou Navigation Satellite System Signal In Space Interface Control Document Open Service Signal B2a (Version 1.0)", December, 2017.

[50] BDS-SIS-ICD-B3I-1.0: "BeiDou Navigation Satellite System Signal In Space Interface Control Document Open Service Signal B3I (Version 1.0)", December, 2017.

[xx] NMEA standard 0183, Version 4.11, November 2018.

*[…]*

### 6.4.2 Common Positioning

*[…]*

#### – *CommonIEsProvideLocationInformation*

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

-- ASN1START

CommonIEsProvideLocationInformation ::= SEQUENCE {

locationEstimate LocationCoordinates OPTIONAL,

velocityEstimate Velocity OPTIONAL,

locationError LocationError OPTIONAL,

...,

[[ earlyFixReport-r12 EarlyFixReport-r12 OPTIONAL

]],

[[ locationSource-r13 LocationSource-r13 OPTIONAL,

locationTimestamp-r13 UTCTime OPTIONAL

]],

[[

segmentationInfo-r14 SegmentationInfo-r14 OPTIONAL -- Cond Segmentation

]],

[[

integrityInfo-r17 IntegrityInfo-r17 OPTIONAL

]]

}

LocationCoordinates ::= CHOICE {

ellipsoidPoint Ellipsoid-Point,

ellipsoidPointWithUncertaintyCircle Ellipsoid-PointWithUncertaintyCircle,

ellipsoidPointWithUncertaintyEllipse EllipsoidPointWithUncertaintyEllipse,

polygon Polygon,

ellipsoidPointWithAltitude EllipsoidPointWithAltitude,

ellipsoidPointWithAltitudeAndUncertaintyEllipsoid

EllipsoidPointWithAltitudeAndUncertaintyEllipsoid,

ellipsoidArc EllipsoidArc,

...,

highAccuracyEllipsoidPointWithUncertaintyEllipse-v1510

HighAccuracyEllipsoidPointWithUncertaintyEllipse-r15,

highAccuracyEllipsoidPointWithAltitudeAndUncertaintyEllipsoid-v1510

HighAccuracyEllipsoidPointWithAltitudeAndUncertaintyEllipsoid-r15,

ha-EllipsoidPointWithScalableUncertaintyEllipse-v1680 HA-EllipsoidPointWithScalableUncertaintyEllipse-r16,

ha-EllipsoidPointWithAltitudeAndScalableUncertaintyEllipsoid-v1680

HA-EllipsoidPointWithAltitudeAndScalableUncertaintyEllipsoid-r16

}

Velocity ::= CHOICE {

horizontalVelocity HorizontalVelocity,

horizontalWithVerticalVelocity HorizontalWithVerticalVelocity,

horizontalVelocityWithUncertainty HorizontalVelocityWithUncertainty,

horizontalWithVerticalVelocityAndUncertainty

HorizontalWithVerticalVelocityAndUncertainty,

...

}

LocationError ::= SEQUENCE {

locationfailurecause LocationFailureCause,

...

}

LocationFailureCause ::= ENUMERATED {

undefined,

requestedMethodNotSupported,

positionMethodFailure,

periodicLocationMeasurementsNotAvailable,

...

}

EarlyFixReport-r12 ::= ENUMERATED {

noMoreMessages,

moreMessagesOnTheWay

}

LocationSource-r13 ::= BIT STRING { a-gnss (0),

wlan (1),

bt (2),

tbs (3),

sensor (4),

ha-gnss-v1510 (5),

motion-sensor-v1550 (6),

dl-tdoa-r16 (7),

dl-aod-r16 (8) } (SIZE(1..16))

IntegrityInfo-r17 ::= SEQUENCE {

horizontalProtectionLevel-r17 INTEGER (0..50000),

verticalProtectionLevel-r17 INTEGER (0..50000) OPTIONAL,

achievableTargetIntegrityRisk-r17 INTEGER (10..90) OPTIONAL, -- Need OP

...

}

-- ASN1STOP

| Conditional presence | Explanation |
| --- | --- |
| *Segmentation* | This field is optionally present, need OP, if *lpp-message-segmentation-req* has been received from the location server with bit 1 (*targetToServer*) set to value 1. The field shall be omitted if *lpp‑message‑segmentation-req* has not been received in this location session, or has been received with bit 1 (*targetToServer*) set to value 0. |

| *CommonIEsProvideLocationInformation* field descriptions |
| --- |
| ***locationEstimate***  This field provides a location estimate using one of the geographic shapes defined in TS 23.032 [15]. Coding of the values of the various fields internal to each geographic shape follow the rules in TS 23.032 [15]. The conditions for including this field are defined for the *locationInformationType* field in a Request Location Information message. |
| ***velocityEstimate***  This field provides a velocity estimate using one of the velocity shapes defined in TS 23.032 [15]. Coding of the values of the various fields internal to each velocity shape follow the rules in TS 23.032 [15]. |
| ***locationError***  This field shall be included if and only if a location estimate and measurements are not included in the LPP PDU. The field includes information concerning the reason for the lack of location information. The *LocationFailureCause* '*periodicLocationMeasurementsNotAvailable*' shall be used by the target device if periodic location reporting was requested, but no measurements or location estimate are available when *the reportingInterval* expired. |
| ***earlyFixReport***  This field shall be included if and only if the *ProvideLocationInformation* message contains early location measurements or an early location estimate. The target device shall set the values of this field as follows:  - noMoreMessages: This is the only or last *ProvideLocationInformation* message used to deliver the entire set of early location information.  - moreMessagesOnTheWay: This is one of multiple *ProvideLocationInformation* messages used to deliver the entire set of early location information (if early location information will not fit into a single message).  If this field is included, the IE *SegmentationInfo* shall not be included. |
| ***locationSource***  This field provides the source positioning technology for the location estimate.  NOTE 1: In this version of the specification, the entry 'tbs' is used only for TBS positioning based on MBS signals.  NOTE 2: The entry 'sensor' is used only for positioning technology that uses barometric pressure sensor. The entry 'motion-sensor' is used for positioning technology that uses sensor(s) to detect displacement and movement, e.g. accelerometers, gyros, magnetometers. |
| ***locationTimestamp***  This field provides the UTC time when the location estimate is valid and should take the form of *YYMMDDhhmmssZ*. |
| ***segmentationInfo***  This field indicates whether this *ProvideLocationInformation* message is one of many segments, as specified in clause 4.3.5 |
| ***integrityInfo***  This field provides the integrity result for the *locationEstimate.*  - ***horizontalProtectionLevel*** provides the Horizontal Protection Level (HPL) for the *locationEstimate* along the semi-major axis of the error ellipse. Scale factor 0.01 metre; range 0 – 500 metres.  - ***verticalProtectionLevel*** provides the Vertical Protection Level (VPL) for the *locationEstimate*. Scale factor 0.01 metre; range 0 – 500 metres.  - ***achievableTargetIntegrityRisk*** indicates the achievable Target Integrity Risk (TIR) for which the HPL and VPL are provided. The achievable TIR is given by *P*=10-0.1n [hour-1] where *n* is the value of *achievableTargetIntegrityRisk* and the range is 10-1 to 10-9 per hour. If this field is absent, the achievable TIR is the same as the *targetIntegrityRisk* in *IntegrityInformationRequest*. |

NOTE: The Protection Level (PL) is a statistical upper-bound of the Positioning Error (PE) that ensures that, the probability per unit of time of the true error being greater than the AL and the PL being less than or equal to the AL, for longer than the TTA, is less than the required TIR, i.e., the PL satisfies the following inequality:   
*Prob per unit of time* [((*PE>AL*) & (*PL<=AL*)) *for longer than TTA*] *< required TIR*  
When the PL bounds the positioning error in the horizontal plane or on the vertical axis then it is called Horizontal Protection Level (HPL) or Vertical Protection Level (VPL) respectively.  
A specific equation for the PL is not specified as this is implementation-defined. For the PL to be considered valid, it must simply satisfy the inequality above.

*[…]*

6.5.2.5 GNSS Location Information

– *A-GNSS-ProvideLocationInformation*

The IE *A-GNSS-ProvideLocationInformation* is used by the target device to provide location measurements (e.g., pseudo‑ranges, location estimate, velocity) to the location server, together with time information. It may also be used to provide GNSS positioning specific error reason.

-- ASN1START

A-GNSS-ProvideLocationInformation ::= SEQUENCE {

gnss-SignalMeasurementInformation GNSS-SignalMeasurementInformation OPTIONAL,

gnss-LocationInformation GNSS-LocationInformation OPTIONAL,

gnss-Error A-GNSS-Error OPTIONAL,

...

}

-- ASN1STOP

6.5.2.6 GNSS Location Information Elements

*[…]*

– *GNSS-LocationInformation*

The IE *GNSS-LocationInformation* is included by the target device when location and optionally velocity information derived using GNSS or hybrid GNSS and other measurements is provided to the location server.

-- ASN1START

GNSS-LocationInformation ::= SEQUENCE {

measurementReferenceTime MeasurementReferenceTime,

agnss-List GNSS-ID-Bitmap,

... ,

[[

ha-GNSS-Metrics-r17 HA-GNSS-Metrics-r17 OPTIONAL

]]

}

-- ASN1STOP

| ***GNSS-LocationInformation* field descriptions** |
| --- |
| ***measurementReferenceTime***  This field specifies the GNSS system time for which the location estimate and optionally velocity are valid. It may also include GNSS-network time relationship, if requested by the location server and supported by the target device. |
| ***agnss-List***  This fieldprovides a list of satellite systems used by the target device to calculate the location estimate and velocity estimate, if included. This is represented by a bit string in *GNSS-ID-Bitmap*, with a one‑value at the bit position means the particular method has been used; a zero‑value means not used. |
| ***ha-GNSS-Metrics***  This fieldprovides high accuracy GNSS positioning metrics associated to the reported location estimate. |

– HA-GNSS-Metrics

The IE *HA-GNSS-Metrics* is included by the target device when high accuracy GNSS positioning metrics associated to a location estimate is provided to the location server. The parameters provided in IE HA-GNSS-Metrics are used as specified for sentence type GGA in [xx] and apply to all GNSSs and types of high accuracy GNSS assistance data.

-- ASN1START

HA-GNSS-Metrics-r17 ::= SEQUENCE {

nrOfUsedSatellites-r17 INTEGER (0..64),

hdopi-r17 INTEGER (1..256) OPTIONAL,

pdopi-r17 INTEGER (1..256) OPTIONAL,

age-r17 INTEGER (0..99) OPTIONAL,

fixType-r17 ENUMERATED (carrier-phase-float,

carrier-phase-fix, ...},

...

}

-- ASN1STOP

| ***HA-GNSS-Metrics*** |
| --- |
| ***nrOfUsedSatellites***  This field specifies number of used GNSS satellites for the location estimate provided by the target device. |
| ***hdopi***  This field specifies the horizontal dilution of precision for the location estimate, scale factor 0.1. |
| ***pdopi***  This field specifies the 3D position dilution of precision, scale factor 0.1. |
| ***age***  This field, if supported by the device, specifies the age of the most recent used assistance data for high accuracy GNSS, scale factor 0.1 second. |
| ***fixType***  This field specifies the positioning fix type, based on the positioning fix quality indicators RTK float and RTK fix of [xx]. Specifically   * *carrier-phase-float* - converged carrier phase integer ambiguity resolution * *carrier-phase-fix* - converging carrier phase floating point ambiguity resolution |

6.5.2.7 GNSS Location Information Request

– *A-GNSS-RequestLocationInformation*

The IE *A-GNSS-RequestLocationInformation* is used by the location server to request location information from the target device using GNSS.

-- ASN1START

A-GNSS-RequestLocationInformation ::= SEQUENCE {

gnss-PositioningInstructions GNSS-PositioningInstructions,

...

}

-- ASN1STOP

6.5.2.8 GNSS Location Information Request Elements

– *GNSS-PositioningInstructions*

The IE *GNSS-PositioningInstructions* is used to provide GNSS measurement instructions.

-- ASN1START

GNSS-PositioningInstructions ::= SEQUENCE {

gnss-Methods GNSS-ID-Bitmap,

fineTimeAssistanceMeasReq BOOLEAN,

adrMeasReq BOOLEAN,

multiFreqMeasReq BOOLEAN,

assistanceAvailability BOOLEAN,

...,

[[

ha-GNSS-Req-r15 ENUMERATED { true } OPTIONAL -- Cond UEB

]] ,

[[

ha-GNSS-MetricsReq-r17 ENUMERATED { true } OPTIONAL -- Cond UEB

]]

}

-- ASN1STOP

| **Conditional presence** | **Explanation** |
| --- | --- |
| *UEB* | The field is optionally present, need OP, if the *locationInformationType* is set to *locationEstimateRequired, locationEstimatePreferred, or* *locationMeasurementsPreferred*; oltherwise it is not present. |

| ***GNSS-PositioningInstructions* field descriptions** |
| --- |
| ***gnssMethods***  This field indicates the satellite systems allowed by the location server. This is represented by a bit string in *GNSS-ID-Bitmap*, with a one‑value at the bit position means the particular GNSS is allowed; a zero‑value means not allowed. The target device shall not request assistance data or report or obtain measurements for systems that are not indicated in this bit map. At least one of the bits in this bit map shall be set to value one. |
| ***fineTimeAssistanceMeasReq***  This field indicates whether the target device is requested to report GNSS-network time association. TRUE means requested. |
| ***adrMeasReq***  This field indicates whether the target device is requested to include ADR measurements in *GNSS-MeasurementList* IE or not. TRUE means requested. |
| ***multiFreqMeasReq***  This field indicates whether the target device is requested to report measurements on multiple supported GNSS signal types in *GNSS-MeasurementList* IE or not. TRUE means requested. |
| ***assistanceAvailability***  This field indicates whether the target device may request additional GNSS assistance data from the server. TRUE means allowed and FALSE means not allowed. |
| ***ha-GNSS-Req***  This field, if present, indicates that any location estimate provided by the target device should be obtained using high accuracy RTK/PPP methods. |
| ***ha-GNSS-MetricsReq***  This field, if present, indicates that any location estimate provided by the target device should be reported with high accuracy GNSS positioning metrics. |

6.5.2.9 GNSS Capability Information

– *A-GNSS-ProvideCapabilities*

The IE *A-GNSS-Provide-Capabilities* is used by the target device to indicate its capability to support A-GNSS and to provide its A-GNSS location capabilities (e.g., GNSSs and assistance data supported) to the location server.

-- ASN1START

A-GNSS-ProvideCapabilities ::= SEQUENCE {

gnss-SupportList GNSS-SupportList OPTIONAL,

assistanceDataSupportList AssistanceDataSupportList OPTIONAL,

locationCoordinateTypes LocationCoordinateTypes OPTIONAL,

velocityTypes VelocityTypes OPTIONAL,

...,

[[ periodicalReportingNotSupported-r14

PositioningModes OPTIONAL,

idleStateForMeasurements-r14

ENUMERATED { required } OPTIONAL

]],

[[ periodicAssistanceData-r15

BIT STRING { solicited (0),

unsolicited (1) } (SIZE (1..8)) OPTIONAL

]]

}

GNSS-SupportList ::= SEQUENCE (SIZE(1..16)) OF GNSS-SupportElement

GNSS-SupportElement ::= SEQUENCE {

gnss-ID GNSS-ID,

sbas-IDs SBAS-IDs OPTIONAL, -- Cond GNSS-ID-SBAS

agnss-Modes PositioningModes,

gnss-Signals GNSS-SignalIDs,

fta-MeasSupport SEQUENCE {

cellTime AccessTypes,

mode PositioningModes,

...

} OPTIONAL, -- Cond fta

adr-Support BOOLEAN,

velocityMeasurementSupport BOOLEAN,

...,

[[

adrEnhancementsSupport-r15 ENUMERATED { true } OPTIONAL,

ha-gnss-Modes-r15 PositioningModes OPTIONAL

]] ,

[[

ha-gnss-MetricsSupport-r17 ENUMERATED { true } OPTIONAL

]]

}

AssistanceDataSupportList ::= SEQUENCE {

gnss-CommonAssistanceDataSupport GNSS-CommonAssistanceDataSupport,

gnss-GenericAssistanceDataSupport GNSS-GenericAssistanceDataSupport,

...

}

-- ASN1STOP

| **Conditional presence** | **Explanation** |
| --- | --- |
| *GNSS‑ID‑SBAS* | The field is mandatory present if the *GNSS‑ID* = *sbas*; otherwise it is not present. |
| *fta* | The field is mandatory present if the target device supports the reporting of fine time assistance measurements; otherwise it is not present. |

| ***A-GNSS-ProvideCapabilities* field descriptions** |
| --- |
| ***gnss-SupportList***  This field specifies the list of GNSS supported by the target device and the target device capabilities associated with each of the supported GNSS. This field shall be present if the *gnss-SupportListReq* in the A-GNSS *-RequestCapabilities* IE is set to TRUE and if the target device supports the A-GNSS positioning method. If the IE *A-GNSS-Provide-Capabilities* is provided unsolicited, this field shall be included if the target device supports the assisted GNSS positioning method. |
| ***gnss-ID***  This field specifies the GNSS supported by the target device for which the capabilities in *GNSS-SupportElement* are provided. |
| ***sbas-IDs***  This field specifies the SBAS(s) supported by the target device. This is represented by a bit string, with a one‑value at the bit position means the particular SBAS is supported; a zero‑value means not supported. |
| ***agnss-Modes***  This field specifies the GNSS mode(s) supported by the target device for the GNSS indicated by *gnss-ID*. This is represented by a bit string, with a one‑value at the bit position means the particular GNSS mode is supported; a zero‑value means not supported. |
| ***gnss-Signals***  This field specifies the GNSS signal(s) supported by the target device for the GNSS indicated by *gnss-ID*. This is represented by a bit string, with a one‑value at the bit position means the particular GNSS signal type is supported; a zero‑value means not supported. |
| ***fta-MeasSupport***  This field specifies that the target device is capable of performing fine time assistance measurements (i.e., GNSS‑cellular time association reporting). The *cellTime* field specifies for which cellular network(s) this capability is supported. This is represented by a bit string, with a one‑value at the bit position means FTA measurements for the specific cellular network time is supported; a zero‑value means not supported. The *mode* field specifies for which GNSS mode(s) FTA measurements are supported by the target device. This is represented by a bit string, with a one‑value at the bit position means FTA measurements for the GNSS mode is supported; a zero‑value means not supported. |
| ***adr-Support***  This field specifies whether the target device supports ADR measurement reporting. TRUE means supported. |
| ***velocityMeasurementSupport***  This field specifies whether the target device supports measurement reporting related to velocity. TRUE means supported. |
| ***assistanceDataSupportList***  This list defines the assistance data and assistance data choices supported by the target device. This field shall be present if the *assistanceDataSupportListReq* in the A-GNSS*-RequestCapabilities* IE is set to TRUE and if the target device supports GNSS assistance data. If the IE *A-GNSS-Provide-Capabilities* is provided unsolicited, this field shall be included if the target device supports any GNSS assistance data. |
| ***locationCoordinateTypes***  This parameter identifies the geographical location coordinate types that a target device supports for GNSS. TRUE indicates that a location coordinate type is supported and FALSE that it is not. This field shall be present if the *locationVelocityTypesReq* in the A-GNSS*-RequestCapabilities* IE is set to TRUE and if the target device supports UE-based or standalone GNSS positioning method. If the IE *A-GNSS-Provide-Capabilities* is provided unsolicited, this field shall be included if the target device supports UE-based or standalone GNSS positioning method. |
| ***velocityTypes***  This parameter identifies the velocity types that a target device supports for GNSS. TRUE indicates that a velocity type is supported and FALSE that it is not. FALSE for all velocity types indicates that velocity reporting is not supported. This field shall be present if the *locationVelocityTypesReq* in the A-GNSS*-RequestCapabilities* IE is set to TRUE and if the target device supports UE-based or standalone GNSS positioning method. If the IE *A-GNSS-Provide-Capabilities* is provided unsolicited, this field shall be included if the target device supports UE-based or standalone GNSS positioning method. |
| ***periodicalReportingNotSupported***  This field, if present, specifies the positioning modes for which the target device does not support *periodicalReporting.* This is represented by a bit string, with a one‑value at the bit position means *periodicalReporting* for the positioning mode is not supported; a zero‑value means supported. If this field is absent, the location server may assume that the target device supports *periodicalReporting* in *CommonIEsRequestLocationInformation* for each supported positioning mode. |
| ***idleStateForMeasurements***  This field, if present, indicates that the target device requires idle state to perform GNSS measurements. |
| ***periodicAssistanceData***  This field identifies the periodic assistance data delivery procedures supported by the target device. This is represented by a bit string, with a one value at the bit position means the periodic assistance data delivery procedure is supported; a zero value means not supported. Bit 0 (solicited) represents the procedure according to clause 5.2.1a; bit (1) (unsolicited) represents the procedure according to clause 5.2.2a. |
| ***adrEnhancementsSupport***  This field, if present, indicates that the target device supports the fields *adrMSB*, *adrSign*, *adrRMSerror*, and *delta‑codePhase* in IE *GNSS-MeasurementList*.  This field may only be present if *adr-Support* is set to TRUE, and shall be absent if *adr-Support* is set to FALSE. |
| ***ha-gnss-Modes***  This field specifies the High-Accuracy GNSS mode(s) supported by the target device for the GNSS indicated by *gnss‑ID*. This is represented by a bit string, with a one‑value at the bit position means the particular GNSS mode is supported; a zero‑value means not supported. |
| ***ha-gnss-MetricsSupport***  This field specifies that high accuracy GNSS positioning metrics are supported by the target device. |

END OF CHANGE