**3GPP TSG- Meeting #**

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|  |
| --- |
| *CR-Form-v12.0* |
| **CHANGE REQUEST** |
|  |
|  |  | **CR** |  **0247** | **rev** | **1** | **Current version:** |  |  |
|  |
| *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 changeaffects:*** | UICC apps |  | ME | **X** | Radio Access Network | **X** | Core Network | **X** |

|  |
| --- |
|  |
| ***Title:***  | CR of TS 37.355 for introducing NavIC in LTE – core part |
|  |  |
| ***Source to WG:*** | Reliance Jio, CEWiT, Huawei, ISRO, MediaTek Inc., Qualcomm Incorporated, Saankhya Labs Private Limited, Tejas Networks Ltd. |
| ***Source to TSG:*** | R2 |
|  |  |
| ***Work item code:*** | LCS\_NAVIC-Core |  | ***Date:*** | 2020-02-28 |
|  |  |  |  |  |
| ***Category:*** | B |  | ***Release:*** |  |
|  | *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 canbe 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-12 (Release 12)**Rel-13 (Release 13)Rel-14 (Release 14)Rel-15 (Release 15)Rel-16 (Release 16)* |
|  |  |
| ***Reason for change:*** | Introduce the network-assisted NAVigation with Indian Constellation(NavIC) positioning method in LTE |
|  |  |
| ***Summary of change:*** | NavIC Navigation Satellite System position related information is introduced based on NavIC ICD. 1. ICD specification of NavIC is added in section 2 as reference.
2. The abbreviation of NavIC Navigation Satellite System is added in section 3.2
3. All impacted IEs have been pointed out and main parts have been changed for introducing NavIC in 6.5.2.
4. New Positioning System Information Block Type 2 added for NavIC in section 7.2

New Clock Model, Orbit Model, Almanac Model, UTC model update, Differential corrections and Ionospheric Model related IEs for NavIC are added in 6.5.2.- Migrated TS 36.355 CR to TS 37.355- GNSS-ClockModel, GNSS-OrbitModel, & GNSS-Almanac IEs updated to be in sync with CR for BDS B1C inclusion.- NavIC PosSIBType2 numbers updated as per outcome of PosSIB numbering harmonisation exercise. |
|  |  |
| ***Consequences if not approved:*** | Network-assisted NAVigation with Indian Constellation (NavIC) positioning method will not be supported in LTE. |
|  |  |
| ***Clauses affected:*** | 2, 3.2, 6.5.2, 7.2 |
|  |  |
|  | **Y** | **N** |  |  |
| ***Other specs*** | **X** |  |  Other core specifications  | TS 36.331, TS 36.305  |
| ***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 R2-2000153 |

----------------------------Start of change----------------------

# 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 36.305: "Stage 2 functional specification of User Equipment (UE) positioning in E-UTRAN".

[3] 3GPP TS 23.271: "Functional stage 2 description of Location Services (LCS)".

[4] IS-GPS-200, Revision D, Navstar GPS Space Segment/Navigation User Interfaces, March 7th, 2006.

[5] IS-GPS-705, Navstar GPS Space Segment/User Segment L5 Interfaces, September 22, 2005.

[6] IS-GPS-800, Navstar GPS Space Segment/User Segment L1C Interfaces, September 4, 2008.

[7] IS-QZSS, Quasi Zenith Satellite System Navigation Service Interface Specifications for QZSS, Ver.1.1, July 31, 2009.

[8] Galileo OS Signal in Space ICD (OS SIS ICD), Issue 1.2, February 2014, European Union.

[9] Global Navigation Satellite System GLONASS Interface Control Document, Version 5.1, 2008.

[10] Specification for the Wide Area Augmentation System (WAAS), US Department of Transportation, Federal Aviation Administration, DTFA01-96-C-00025, 2001.

[11] RTCM-SC104, RTCM Recommended Standards for Differential GNSS Service (v.2.3), August 20, 2001.

[12] 3GPP TS 36.331: "Evolved Universal Terrestrial Radio Access (E-UTRA); "Radio Resource Control (RRC); Protocol specification".

[13] 3GPP TS 25.331: "Radio Resource Control (RRC); Protocol Specification".

[14] 3GPP TS 44.031: "Location Services (LCS); Mobile Station (MS) - Serving Mobile Location Centre (SMLC) Radio Resource LCS Protocol (RRLP)".

[15] 3GPP TS 23.032: "Universal Geographical Area Description (GAD)".

[16] 3GPP TS 36.211: "Evolved Universal Terrestrial Radio Access (E-UTRA); Physical Channels and Modulation".

[17] 3GPP TS 36.214: "Evolved Universal Terrestrial Radio Access (E-UTRA); Physical layer – Measurements".

[18] 3GPP TS 36.133: "Evolved Universal Terrestrial Radio Access (E-UTRA); Requirements for support of radio resource management".

[19] 3GPP TS 23.003: "Numbering, addressing and identification".

[20] OMA-TS-LPPe-V1\_0, LPP Extensions Specification, Open Mobile Alliance.

[21] 3GPP TS 36.101: "Evolved Universal Terrestrial Radio Access (E-UTRA); User Equipment (UE) radio transmission and reception".

[22] ITU-T Recommendation X.691 (07/2002) "Information technology - ASN.1 encoding rules: Specification of Packed Encoding Rules (PER)" (Same as the ISO/IEC International Standard 8825-2).

[23] BDS-SIS-ICD-2.0: "BeiDou Navigation Satellite System Signal In Space Interface Control Document Open Service Signal (Version 2.0)", December 2013.

[24] ATIS-0500027: "Recommendations for Establishing Wide Scale Indoor Location Performance", May 2015.

[25] Bluetooth Special Interest Group: "Bluetooth Core Specification v4.2", December 2014.

[26] IEEE 802.11, Part 11: "Wireless LAN Medium Access Control (MAC) and Physical Layer (PHY) Specifications".

[27] IETF RFC 6225, "Dynamic Host Configuration Protocol Options for Coordinate-Based Location Configuration Information", July 2011.

[28] 3GPP TS 36.213: "Evolved Universal Terrestrial Radio Access (E-UTRA); Physical layer procedures".

[29] "Earth Gravitational Model 96 (EGM96)", National Geospatial-Intelligence Agency, NASA.

[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".

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

----------------------------the next change----------------------

## 3.2 Abbreviations

For the purposes of the present document, the following abbreviations apply.

ADR Accumulated Delta-Range

A‑GNSS Assisted‑GNSS

AP Access Point

ARFCN Absolute Radio Frequency Channel Number

ARP Antenna Reference Point

BDS BeiDou Navigation Satellite System

BIPM Bureau International des Poids et Mesures (International Bureau of Weights and Measures)

BSSID Basic Service Set Identifier

BTS Base Transceiver Station (GERAN)

CID Cell-ID (positioning method)

CNAV Civil Navigation

CRS Cell-specific Reference Signals

ECEF Earth-Centered, Earth-Fixed

ECGI Evolved Cell Global Identifier

ECI Earth-Centered-Inertial

E‑CID Enhanced Cell-ID (positioning method)

EGNOS European Geostationary Navigation Overlay Service

E-SMLC Enhanced Serving Mobile Location Centre

E-UTRA Evolved Universal Terrestrial Radio Access

E-UTRAN Evolved Universal Terrestrial Radio Access Network

EOP Earth Orientation Parameters

EPDU External Protocol Data Unit

FDMA Frequency Division Multiple Access

FEC Forward Error Correction

FKP (German) Flächen-Korrektur-Parameter (area correction parameter)

FTA Fine Time Assistance

GAGAN GPS Aided Geo Augmented Navigation

GLONASS GLObal'naya NAvigatsionnaya Sputnikovaya Sistema (Engl.: Global Navigation Satellite System)

GNSS Global Navigation Satellite System

GPS Global Positioning System

HA GNSS High-Accuracy GNSS (RTK, PPP)

ICD Interface Control Document

IGS International GNSS Service

IOD Issue of Data

IRNSS Indian Regional Navigation Satellite System

IS Interface Specification

LLA Latitude Longitude Altitude

LPP LTE Positioning Protocol

LPPa LTE Positioning Protocol Annex

LSB Least Significant Bit

MAC Master Auxiliary Concept

MBS Metropolitan Beacon System

MO-LR Mobile Originated Location Request

MSAS Multi-functional Satellite Augmentation System

MSB Most Significant Bit

msd mean solar day

MT-LR Mobile Terminated Location Request

NAV Navigation

NavIC NAVigation with Indian Constellation

NB-IoT NarrowBand Internet of Things

NCGI NR Cell Global Identifier

NICT National Institute of Information and Communications Technology

NI-LR Network Induced Location Request

NPRS Narrowband Positioning Reference Signals

NR NR Radio Access

NRSRP Narrowband Reference Signal Received Power

NRSRQ Narrowband Reference Signal Received Quality

NTSC National Time Service Center of Chinese Academy of Sciences

OSR Observation Space Representation

OTDOA Observed Time Difference Of Arrival

PDU Protocol Data Unit

PPP Precise Point Positioning

PRB Physical Resource Block

PRC Pseudo‑Range Correction

PRS Positioning Reference Signals

posSIB Positioning System Information Block

PZ-90 Parametry Zemli 1990 Goda – Parameters of the Earth Year 1990

QZS Quasi Zenith Satellite

QZSS Quasi-Zenith Satellite System

QZST Quasi-Zenith System Time

RF Radio Frequency

RRC Range‑Rate Correction

Radio Resource Control

RSRP Reference Signal Received Power

RSRQ Reference Signal Received Quality

RSTD Reference Signal Time Difference

RTK Real-Time Kinematic

RTT Round Trip Time

RU Russia

SBAS Space Based Augmentation System

SET SUPL Enabled Terminal

SFN System Frame Number

SLP SUPL Location Platform

SSID Service Set Identifier

SSR State Space Representation

SUPL Secure User Plane Location

SV Space Vehicle

TB Terrestrial Beacon

TBS Terrestrial Beacon System

TLM Telemetry

TOD Time Of Day

TOW Time Of Week

TP Transmission Point

UDRE User Differential Range Error

ULP User Plane Location Protocol

USNO US Naval Observatory

UT1 Universal Time No.1

UTC Coordinated Universal Time

WAAS Wide Area Augmentation System

WGS‑84 World Geodetic System 1984

WLAN Wireless Local Area Network

----------------------------the next change----------------------

#### 6.5.2.1 GNSS Assistance Data

#### – *GNSS-CommonAssistData*

The IE *GNSS-CommonAssistData* is used by the location server to provide assistance data which can be used for any GNSS (e.g., GPS, Galileo, GLONASS, BDS, NavIC, etc.).

-- ASN1START

GNSS-CommonAssistData ::= SEQUENCE {

 gnss-ReferenceTime GNSS-ReferenceTime OPTIONAL, -- Need ON

 gnss-ReferenceLocation GNSS-ReferenceLocation OPTIONAL, -- Need ON

 gnss-IonosphericModel GNSS-IonosphericModel OPTIONAL, -- Need ON

 gnss-EarthOrientationParameters GNSS-EarthOrientationParameters OPTIONAL, -- Need ON

 ...,

 [[

 gnss-RTK-ReferenceStationInfo-r15

 GNSS-RTK-ReferenceStationInfo-r15 OPTIONAL, -- Need ON

 gnss-RTK-CommonObservationInfo-r15

 GNSS-RTK-CommonObservationInfo-r15 OPTIONAL, -- Cond RTK

 gnss-RTK-AuxiliaryStationData-r15

 GNSS-RTK-AuxiliaryStationData-r15 OPTIONAL -- Need ON

 ]]

}

-- ASN1STOP

| Conditional presence | Explanation |
| --- | --- |
| *RTK* | The field is mandatory present if the IE *GNSS-RTK-Observations* is included in IE *GNSS‑GenericAssistData*; otherwise it is not present. |

#### – *GNSS-GenericAssistData*

The IE *GNSS-GenericAssistData* is used by the location server to provide assistance data for a specific GNSS (e.g., GPS, Galileo, GLONASS, BDS, NavIC, etc.). The specific GNSS for which the provided assistance data are applicable is indicated by the IE *GNSS‑ID* and (if applicable) by the IE *SBAS‑ID*. Assistance for up to 16 GNSSs can be provided.

-- ASN1START

GNSS-GenericAssistData ::= SEQUENCE (SIZE (1..16)) OF GNSS-GenericAssistDataElement

GNSS-GenericAssistDataElement ::= SEQUENCE {

 gnss-ID GNSS-ID,

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

 gnss-TimeModels GNSS-TimeModelList OPTIONAL, -- Need ON

 gnss-DifferentialCorrections GNSS-DifferentialCorrections OPTIONAL, -- Need ON

 gnss-NavigationModel GNSS-NavigationModel OPTIONAL, -- Need ON

 gnss-RealTimeIntegrity GNSS-RealTimeIntegrity OPTIONAL, -- Need ON

 gnss-DataBitAssistance GNSS-DataBitAssistance OPTIONAL, -- Need ON

 gnss-AcquisitionAssistance GNSS-AcquisitionAssistance OPTIONAL, -- Need ON

 gnss-Almanac GNSS-Almanac OPTIONAL, -- Need ON

 gnss-UTC-Model GNSS-UTC-Model OPTIONAL, -- Need ON

 gnss-AuxiliaryInformation GNSS-AuxiliaryInformation OPTIONAL, -- Need ON

 ...,

 [[

 bds-DifferentialCorrections-r12

 BDS-DifferentialCorrections-r12 OPTIONAL, -- Cond GNSS-ID-BDS

 bds-GridModel-r12 BDS-GridModelParameter-r12 OPTIONAL -- Cond GNSS-ID-BDS

 ]],

 [[

 gnss-RTK-Observations-r15 GNSS-RTK-Observations-r15 OPTIONAL, -- Need ON

 glo-RTK-BiasInformation-r15 GLO-RTK-BiasInformation-r15 OPTIONAL, -- Cond GNSS-ID-GLO

 gnss-RTK-MAC-CorrectionDifferences-r15

 GNSS-RTK-MAC-CorrectionDifferences-r15

 OPTIONAL, -- Need ON

 gnss-RTK-Residuals-r15 GNSS-RTK-Residuals-r15 OPTIONAL, -- Need ON

 gnss-RTK-FKP-Gradients-r15 GNSS-RTK-FKP-Gradients-r15 OPTIONAL, -- Need ON

 gnss-SSR-OrbitCorrections-r15

 GNSS-SSR-OrbitCorrections-r15 OPTIONAL, -- Need ON

 gnss-SSR-ClockCorrections-r15

 GNSS-SSR-ClockCorrections-r15 OPTIONAL, -- Need ON

 gnss-SSR-CodeBias-r15 GNSS-SSR-CodeBias-r15 OPTIONAL -- Need ON

 ]],

 [[

 navic-DifferentialCorrections-r16 NavIC-DifferentialCorrections-r16

 OPTIONAL, -- Cond GNSS-ID-NavIC

 navic-GridModel-r16 NavIC-GridModelParameter-r16

 OPTIONAL -- Cond GNSS-ID-NavIC

 ]]

}

-- ASN1STOP

| Conditional presence | Explanation |
| --- | --- |
| *GNSS‑ID‑SBAS* | The field is mandatory present if the *GNSS‑ID* = *sbas*; otherwise it is not present. |
| *GNSS‑ID‑BDS* | The field may be present if the *GNSS‑ID* = *bds*; otherwise it is not present. |
| *GNSS-ID-GLO* | The field may be present if the *GNSS ID* = *glonass*; otherwise it is not present. |
| *GNSS-ID-NAVIC* | The field may be present if the *GNSS‑ID* = *navic*; otherwise it is not present |

#### *– GNSS-PeriodicAssistData*

The IE *GNSS-PeriodicAssistData* is used by the location server to provide control parameters for a periodic assistance data delivery session (e.g., interval and duration) to the target device.

NOTE: Omission of a particular assistance data type field in IE *GNSS-PeriodicAssistData* means that the location server does not provide this assistance data type in a data transaction of a periodic assistance data delivery session, as described in clauses 5.2.1a and 5.2.2a. Inclusion of no assistance data type fields in IE *GNSS-PeriodicAssistData* means that a periodic assistance data delivery session is terminated.

-- ASN1START

GNSS-PeriodicAssistData-r15 ::= SEQUENCE {

 gnss-RTK-PeriodicObservations-r15 GNSS-PeriodicControlParam-r15 OPTIONAL, -- Need ON

 glo-RTK-PeriodicBiasInformation-r15 GNSS-PeriodicControlParam-r15 OPTIONAL, -- Need ON

 gnss-RTK-MAC-PeriodicCorrectionDifferences-r15

 GNSS-PeriodicControlParam-r15 OPTIONAL, -- Need ON

 gnss-RTK-PeriodicResiduals-r15 GNSS-PeriodicControlParam-r15 OPTIONAL, -- Need ON

 gnss-RTK-FKP-PeriodicGradients-r15 GNSS-PeriodicControlParam-r15 OPTIONAL, -- Need ON

 gnss-SSR-PeriodicOrbitCorrections-r15

 GNSS-PeriodicControlParam-r15 OPTIONAL, -- Need ON

 gnss-SSR-PeriodicClockCorrections-r15

 GNSS-PeriodicControlParam-r15 OPTIONAL, -- Need ON

 gnss-SSR-PeriodicCodeBias-r15 GNSS-PeriodicControlParam-r15 OPTIONAL, -- Need ON

 ...

}

-- ASN1STOP

#### 6.5.2.2 GNSS Assistance Data Elements

**< Unchanged parts are omitted >**

#### – *GNSS-SystemTime*

-- ASN1START

GNSS-SystemTime ::= SEQUENCE {

 gnss-TimeID GNSS-ID,

 gnss-DayNumber INTEGER (0..32767),

 gnss-TimeOfDay INTEGER (0..86399),

 gnss-TimeOfDayFrac-msec INTEGER (0..999) OPTIONAL, -- Need ON

 notificationOfLeapSecond BIT STRING (SIZE(2)) OPTIONAL, -- Cond gnss-TimeID-glonass

 gps-TOW-Assist GPS-TOW-Assist OPTIONAL, -- Cond gnss-TimeID-gps

 ...

}

-- ASN1STOP

| Conditional presence | Explanation |
| --- | --- |
| *gnss-TimeID-glonass* | The field may be present if *gnss-TimeID*=`glonass′; otherwise it is not present. |
| *gnss-TimeID-gps* | The field may be present if *gnss-TimeID*=`gps′; otherwise it is not present. |

| *GNSS-SystemTime* field descriptions |
| --- |
| ***gnss-TimeID***This field specifies the GNSS for which the *GNSS-SystemTime* is provided. |
| ***gnss-DayNumber***This field specifies the sequential number of days (with day count starting at 0) from the origin of the GNSS System Time as follows: GPS, QZSS, SBAS – Days from January 6th 1980 00:00:00 UTC (USNO); Galileo – Days from Galileo System Time (GST) start epoch, defined as 13 seconds before midnight between 21st August and 22nd August 1999; i.e., GST was equal to 13 seconds at August 22nd 1999 00:00:00 UTC; GLONASS – Days from December 31st 1995 21:00:00 UTC (SU), which is local UTC Moscow January 1st 1996 00:00:00, defined as UTC(SU) + 3 hours in [9]; BDS – Days from January 1st 2006 00:00:00 UTC (NTSC). NavIC – Days from the NavIC System Time start epoch, defined as 13 seconds before midnight between 21st  August and 22nd August 1999; i.e., the NavIC System Time was equal to 00:00:00 at August 21st, 1999  23:55:47 UTC (BIPM). |
| ***gnss-TimeOfDay***This field specifies the integer number of seconds from the GNSS day change. |
| ***gnss-TimeOfDayFrac-msec***This field specifies the fractional part of the *gnssTimeOfDay* field in 1‑milli‑seconds resolution. The total GNSS TOD is *gnss-TimeOfDay + gnssTimeOfDayFrac-msec.* |
| ***notificationOfLeapSecond***This field specifies the notification of forthcoming leap second correction, as defined by parameter KP in [9, Table 4.7]. |
| ***gps-TOW-Assist***This field contains several fields in the Telemetry (TLM) Word and Handover Word (HOW) that are currently being broadcast by the respective GPS satellites. Combining this information with GPS TOW enables the target device to know the entire 1.2-second (60-bit) pattern of TLM and HOW that is transmitted at the start of each six-second NAV subframe by the particular GPS satellite. |

#### – *GPS-TOW-Assist*

-- ASN1START

GPS-TOW-Assist ::= SEQUENCE (SIZE(1..64)) OF GPS-TOW-AssistElement

GPS-TOW-AssistElement ::= SEQUENCE {

 satelliteID INTEGER (1..64),

 tlmWord INTEGER (0..16383),

 antiSpoof INTEGER (0..1),

 alert INTEGER (0..1),

 tlmRsvdBits INTEGER (0..3),

 ...

}

-- ASN1STOP

| *GPS-TOW-Assist* field descriptions |
| --- |
| ***satelliteID***This field identifies the satellite for which the *GPS-TOW-Assist* is applicable. This field is identical to the GPS PRN Signal No. defined in [4]. |
| ***tlmWord***This field contains a 14-bit value representing the Telemetry Message (TLM) being broadcast by the GPS satellite identified by the particular *satelliteID*, with the MSB occurring first in the satellite transmission, as defined in [4]. |
| ***antiSpoof***This field contains the Anti-Spoof flag that is being broadcast by the GPS satellite identified by *satelliteID*, as defined in [4]. |
| ***alert***This field contains the Alert flag that is being broadcast by the GPS satellite identified by *satelliteID*, as defined in [4]. |
| ***tlmRsvdBits***This field contains the two reserved bits in the TLM Word being broadcast by the GPS satellite identified by *satelliteID*, with the MSB occurring first in the satellite transmission, as defined in [4]. |

#### – *NetworkTime*

-- ASN1START

NetworkTime ::= SEQUENCE {

 secondsFromFrameStructureStart INTEGER(0..12533),

 fractionalSecondsFromFrameStructureStart INTEGER(0..3999999),

 frameDrift INTEGER (-64..63) OPTIONAL, -- Cond GNSSsynch

 cellID CHOICE {

 eUTRA SEQUENCE {

 physCellId INTEGER (0..503),

 cellGlobalIdEUTRA CellGlobalIdEUTRA-AndUTRA OPTIONAL, -- Need ON

 earfcn ARFCN-ValueEUTRA,

 ...,

 [[ earfcn-v9a0 ARFCN-ValueEUTRA-v9a0 OPTIONAL -- Cond EARFCN-max

 ]]

 },

 uTRA SEQUENCE {

 mode CHOICE {

 fdd SEQUENCE {

 primary-CPICH-Info INTEGER (0..511),

 ...

 },

 tdd SEQUENCE {

 cellParameters INTEGER (0..127),

 ...

 }

 },

 cellGlobalIdUTRA CellGlobalIdEUTRA-AndUTRA OPTIONAL, -- Need ON

 uarfcn ARFCN-ValueUTRA,

 ...

 },

 gSM SEQUENCE {

 bcchCarrier INTEGER (0..1023),

 bsic INTEGER (0..63),

 cellGlobalIdGERAN CellGlobalIdGERAN OPTIONAL, -- Need ON

 ...

 },

 ...,

 nBIoT-r14 SEQUENCE {

 nbPhysCellId-r14 INTEGER (0..503),

 nbCellGlobalId-r14 ECGI OPTIONAL, -- Need ON

 nbCarrierFreq-r14 CarrierFreq-NB-r14,

 ...

 },

 nr-r15 SEQUENCE {

 nrPhysCellId-r15 INTEGER (0..1007),

 nrCellGlobalID-r15 NCGI-r15 OPTIONAL, -- Need ON

 nrARFCN-r15 ARFCN-ValueNR-r15,

 ...

 }

 },

 ...

}

-- ASN1STOP

|  |  |
| --- | --- |
| Conditional presence | Explanation |
| *EARFCN-max* | The field is mandatory present if the corresponding *earfcn* (i.e. without suffix) is set to *maxEARFCN*. Otherwise the field is not present. |
| *GNSSsynch* | The field is present and set to 0 if *NetworkTime* is synchronized to *gnss-SystemTime*; otherwise the field is optionally present, need OR. |

| *NetworkTime*field descriptions |
| --- |
| ***secondsFromFrameStructureStart***This field specifies the number of seconds from the beginning of the longest frame structure in the corresponding air interface.In case of E-UTRA, the SFN cycle length is 10.24 seconds.In case of UTRA, the SFN cycle length is 40.96 seconds.In case of GSM, the hyperfame length is 12533.76 seconds.In case of NB-IoT, the Hyper-SFN cycle lengths is 10485.76 seconds.In case of NR, the SFN cycle length is 10.24 seconds. |
| ***fractionalSecondsFromFrameStructureStart***This field specifies the fractional part of the *secondsFromFrameStructureStart* in 250 ns resolution.The total time since the particular frame structure start is *secondsFromFrameStructureStart + fractionalSecondsFromFrameStructureStart* |
| ***frameDrift***This field specifies the drift rate of the GNSS‑network time relation with scale factor 2-30 seconds/second, in the range from ‑5.9605e-8 to +5.8673e-8 sec/sec. |
| ***cellID***This field specifies the cell for which the GNSS–network time relation is provided. |
| ***physCellId***This field specifies the physical cell identity of the reference cell (E-UTRA), as defined in TS 36.331 [12], for which the GNSS network time relation is provided. |
| ***cellGlobalIdEUTRA***This field specifies the Evolved Cell Global Identifier (ECGI), the globally unique identity of a cell in E-UTRA, of the reference cell for the GNSS‑network time relation, as defined in TS 36.331 [12]. |
| ***earfcn***This field specifies E-ARFCN of the reference cell for the GNSS‑network time relation (E-UTRA). In case the server includes *earfcn-v9a0*, the server shall set the corresponding *earfcn* (i.e. without suffix) to *maxEARFCN*. |
| ***primary-CPICH-Info***This field specifies the physical cell identity of the reference cell (UTRA) for the GNSS‑network time relation, as defined in TS 25.331 [13]. |
| ***cellParameters***This field specifies the physical cell identity of the reference cell (UTRA) for the GNSS‑network time relation, as defined in TS 25.331 [13]. |
| ***cellGlobalIdUTRA***The filed specifies the global UTRAN Cell Identifier, the globally unique identity of a cell in UTRA, of the reference cell for the GNSS‑network time relation, as defined in TS 25.331 [13]. |
| ***uarfcn***This field specifies ARFCN of the reference cell for the GNSS‑network time relation (UTRA). |
| ***bcchCarrier***This field specifies the absolute GSM RF channel number of the BCCH of the reference base station (GERAN) for the GNSS‑network time relation, as defined in TS 44.031 [14]. |
| ***bsic***This field specifies the Base Station Identity Code of the reference base station (GERAN) for the GNSS‑network time relation, as defined in TS 44.031 [14]. |
| ***cellGlobalIdGERAN***This field specifies the Cell Global Identification (CGI), the globally unique identity of a cell in GERAN, of the reference base station for the GNSS‑network time relation. |
| ***nbPhysCellId***This field specifies the narrowband physical layer cell identity of the NB-IoT reference cell, as defined in TS 36.331 [12], for which the GNSS network time relation is provided. |
| ***nbCellGlobalId***This field specifies the global cell identifier of the NB-IoT reference cell for which the GNSS‑network time relation is provided, as defined in TS 36.331 [12]. |
| ***nbCarrierFreq***This field specifies the carrier frequency of the NB-IoT reference cell for which the GNSS‑network time relation is provided. |
| ***nrPhysCellId***This field specifies the physical cell identity of the reference cell (NR), as defined in TS 38.331 [35], for which the GNSS network time relation is provided. |
| ***nrCellGlobalID***This field specifies the NR Cell Global Identifier (NCGI) of the reference cell (NR) for the GNSS‑network time relation, as defined in TS 38.331 [35]. |
| ***nrARFCN***This field specifies NR-ARFCN of the reference cell (NR) for the GNSS‑network time relation. |

#### – *GNSS-ReferenceLocation*

The IE *GNSS-ReferenceLocation* is used by the location server to provide the target device with a‑priori knowledge of its location in order to improve GNSS receiver performance. The IE *GNSS-ReferenceLocation* is provided in WGS‑84 reference system.

-- ASN1START

GNSS-ReferenceLocation ::= SEQUENCE {

 threeDlocation EllipsoidPointWithAltitudeAndUncertaintyEllipsoid,

 ...

}

-- ASN1STOP

#### – *GNSS-IonosphericModel*

The IE *GNSS-IonosphericModel* is used by the location server to provide parameters to model the propagation delay of the GNSS signals through the ionosphere. Proper use of these fields allows a single‑frequency GNSS receiver to remove parts of the ionospheric delay from the pseudorange measurements. Two Ionospheric Models are supported: The Klobuchar model as defined in [4], and the NeQuick model as defined in [8].

-- ASN1START

GNSS-IonosphericModel ::= SEQUENCE {

 klobucharModel KlobucharModelParameter OPTIONAL, -- Need ON

 neQuickModel NeQuickModelParameter OPTIONAL, -- Need ON

 ...

}

-- ASN1STOP

#### – *KlobucharModelParameter*

-- ASN1START

KlobucharModelParameter ::= SEQUENCE {

 dataID BIT STRING (SIZE (2)),

 alfa0 INTEGER (-128..127),

 alfa1 INTEGER (-128..127),

 alfa2 INTEGER (-128..127),

 alfa3 INTEGER (-128..127),

 beta0 INTEGER (-128..127),

 beta1 INTEGER (-128..127),

 beta2 INTEGER (-128..127),

 beta3 INTEGER (-128..127),

 ...

}

-- ASN1STOP

| *KlobucharModelParamater* field descriptions |
| --- |
| ***dataID***When *dataID* has the value ′11′ it indicates that the parameters have been generated by QZSS, and the parameters have been specialized and are applicable within the area defined in [7]. When *dataID* has the value ′01′ it indicates that the parameters have been generated by BDS, and UE shall use these parameters according to the description given in 5.2.4.7 in [23]. When the dataID has the value ′10′, it indicates that the parameters have been generated by the NavIC, and UE shall use these parameters according to the description given in [xx]. When *dataID* has the value ′00′ it indicates the parameters are applicable worldwide [4], [7].  |
| ***alpha0***This field specifies the 0 parameter of the Klobuchar model, as specified in [4], [23], [xx].Scale factor 2-30 seconds. |
| ***alpha1***This field specifies the 1 parameter of the Klobuchar model, as specified in [4], [23], [xx].Scale factor 2-27 seconds/semi-circle. |
| ***alpha2***This field specifies the 2 parameter of the Klobuchar model, as specified in [4], [23], [xx].Scale factor 2-24 seconds/semi-circle2. |
| ***alpha3***This field specifies the 3 parameter of the Klobuchar model, as specified in [4], [23], [xx].Scale factor 2-24 seconds/semi-circle3. |
| ***beta0***This field specifies the 0 parameter of the Klobuchar model, as specified in [4], [23], [xx].Scale factor 211 seconds. |
| ***beta1***This field specifies the 1 parameter of the Klobuchar model, as specified in [4], [23], [xx].Scale factor 214 seconds/semi-circle. |
| ***beta2***This field specifies the 2 parameter of the Klobuchar model, as specified in [4], [23], [xx].Scale factor 216 seconds/semi-circle2. |
| ***beta3***This field specifies the 3 parameter of the Klobuchar model, as specified in [4], [23], [xx].Scale factor 216 seconds/semi-circle3. |

**< Unchanged parts are omitted >**

#### – *GNSS-TimeModelList*

The IE *GNSS-TimeModelList* is used by the location server to provide the GNSS‑GNSS system time offset between the GNSS system time indicated by IE *GNSS‑ID* in IE *GNSS-GenericAssistDataElement* to the GNSS system time indicated by IE *gnss-TO-ID*. Several *GNSS-TimeModelElement* IEs can be included with different *gnss-TO-ID* fields. The location server should provide a *GNSS-TimeModelList* for the same *GNSS-ID* as the *gnss-TimeID* in IE *GNSS-SystemTime* in *GNSS-ReferenceTime* assistance. If the location server does not provide a *GNSS-TimeModelList* for the same *GNSS-ID* as the *gnss-TimeID* in IE *GNSS-SystemTime* in *GNSS-ReferenceTime* assistance the target device assumes *tA1* and *tA2* are equal to zero.

-- ASN1START

GNSS-TimeModelList ::= SEQUENCE (SIZE (1..15)) OF GNSS-TimeModelElement

GNSS-TimeModelElement ::= SEQUENCE {

 gnss-TimeModelRefTime INTEGER (0..65535),

 tA0 INTEGER (-67108864..67108863),

 tA1 INTEGER (-4096..4095) OPTIONAL, -- Need ON

 tA2 INTEGER (-64..63) OPTIONAL, -- Need ON

 gnss-TO-ID INTEGER (1..15),

 weekNumber INTEGER (0..8191) OPTIONAL, -- Need ON

 deltaT INTEGER (-128..127) OPTIONAL, -- Need ON

 ...

}

-- ASN1STOP

| *GNSS-TimeModelElement* field descriptions |
| --- |
| ***gnss-TimeModelRefTime***This field specifies the reference time of week for *GNSS-TimeModelElement* and it is given in GNSS specific system time.Scale factor 24 seconds. |
| ***tA0***This field specifies the bias coefficient of the *GNSS-TimeModelElement*.Scale factor 2-35 seconds. |
| ***tA1***This field specifies the drift coefficient of the *GNSS-TimeModelElement.*Scale factor of 2-51 seconds/second. |
| ***tA2***This field specifies the drift rate correction coefficient of the *GNSS-TimeModelElement.*Scale factor of 2-68 seconds/second2. |
| ***gnss-TO-ID***This field specifies the GNSS system time of the GNSS for which the *GNSS-TimeModelElement* is applicable. *GNSS-TimeModelElement* contains parameters to convert GNSS system time from the system indicated by *GNSS‑ID* to GNSS system time indicated by *gnss-TO-ID*. The conversion is defined in [4,5,6]. See table of gnss-TO-ID to Indication relation below. NOTE. |
| ***weekNumber***This field specifies the reference week of the *GNSS-TimeModelElement* given in GNSS specific system time. The location server should include this field, if *tA1* or *tA2* is included.Scale factor 1 week. |
| ***deltaT***This field specifies the integer number of seconds of the GNSS-GNSS time offset provided in the *GNSS-TimeModelElement.*Scale factor 1 second. |

gnss-TO-ID to Indication relation

|  |  |
| --- | --- |
| Value of *gnss-TO-ID* | Indication |
| 1 | GPS |
| 2 | Galileo |
| 3 | QZSS |
| 4 | GLONASS |
| 5 | BDS |
| 6 | NavIC |
| 7-15 | reserved |

NOTE: The time relationship between the system time indicated by *GNSS-ID* and system time indicated by *gnss‑TO-ID* is given by the following equation:

tGNSS = tE - ( A0GGTO + A1GGTO (tE - tGGTO + 604800 (WN - WNGGTO)) + A2GGTO (tE - tGGTO +
 604800 (WN - WNGGTO))2 )

where

tGNSS  is the system time of week for the GNSS indicated by *gnss-TO-ID*.
tE is the system time of week for the GNSS indicated by *GNSS-ID*.
WN is the week number of the GNSS system time indicated by *GNSS-ID* corresponding to the tE.
tGGTO is the system time of week for the time model data in the GNSS time indicated by *GNSS-ID* and given by the *gnss‑TimeModelRefTime* field.
WNGGTO is the week number for the time model data in the GNSS time indicated by *GNSS-ID* corresponding to the tGGTO and given by the *weekNumber* field.
A0GGTO is given by the *tA0* field.
A1GGTO is given by the *tA1* field.
A2GGTO is given by the *tA2* field.

If the *tA1*and *tA2*are not included in the *GNSS-TimeModelElement*, the target device assumes A1GGTO and A2GGTO are equal to zero.

 The GNSS system times in the IE *GNSS-TimeModelList* and used in the equation above are all given in Time of Week (TOW) and Week Number (WN) in the indicted GNSS specific system time. For conversion between TOW/WN and Day Number/Time of Day (*gnss-DayNumber*/*gnss-TimeOfDay*) a GNSS week consists of 7 days since the origin of the particular GNSS System time (with the week number count starting at 0), and a day consists of 86400 seconds.

#### – *GNSS-DifferentialCorrections*

The IE *GNSS-DifferentialCorrections* is used by the location server to provide differential GNSS corrections to the target device for a specific GNSS. Differential corrections can be provided for up to 3 signals per GNSS.

-- ASN1START

GNSS-DifferentialCorrections ::= SEQUENCE {

 dgnss-RefTime INTEGER (0..3599),

 dgnss-SgnTypeList DGNSS-SgnTypeList,

 ...

}

DGNSS-SgnTypeList ::= SEQUENCE (SIZE (1..3)) OF DGNSS-SgnTypeElement

DGNSS-SgnTypeElement ::= SEQUENCE {

 gnss-SignalID GNSS-SignalID,

 gnss-StatusHealth INTEGER (0..7),

 dgnss-SatList DGNSS-SatList,

 ...

}

DGNSS-SatList ::= SEQUENCE (SIZE (1..64)) OF DGNSS-CorrectionsElement

DGNSS-CorrectionsElement ::= SEQUENCE {

 svID SV-ID,

 iod BIT STRING (SIZE(11)),

 udre INTEGER (0..3),

 pseudoRangeCor INTEGER (-2047..2047),

 rangeRateCor INTEGER (-127..127),

 udreGrowthRate INTEGER (0..7) OPTIONAL, -- Need ON

 udreValidityTime INTEGER (0..7) OPTIONAL, -- Need ON

 ...

}

-- ASN1STOP

| *GNSS-DifferentialCorrections* field descriptions |
| --- |
| ***dgnss-RefTime***This field specifies the time for which the DGNSS corrections are valid, modulo 1 hour. *dgnss-RefTime* is given in GNSS specific system time.Scale factor 1‑second. |
| ***dgnss-SgnTypeList***This list includes differential correction data for different GNSS signal types, identified by *GNSS-SignalID*. |
| ***gnss-StatusHealth***This field specifies the status of the differential corrections. The values of this field and their respective meanings are defined as in table *gnss-StatusHealth* Value to Indication relation below.The first six values in this field indicate valid differential corrections. When using the values described below, the "UDRE Scale Factor" value is applied to the UDRE values contained in the element. The purpose is to indicate an estimate in the amount of error in the corrections.The value "110" indicates that the source of the differential corrections (e.g., reference station or external DGNSS network) is currently not being monitored. The value "111" indicates that the corrections provided by the source are invalid, as judged by the source.  |
| ***dgnss-SatList***This list includes differential correction data for different GNSS satellites, identified by *SV-ID*. |
| ***iod***This field specifies the Issue of Data field which contains the identity for the *GNSS-NavigationModel.* |
| ***udre***This field provides an estimate of the uncertainty (1-σ) in the corrections for the particular satellite. The value in this field shall be multiplied by the UDRE Scale Factor in the *gnss-StatusHealth* field to determine the final UDRE estimate for the particular satellite. The meanings of the values for this field are shown in the table *udre Value* to Indication relation below.  |
| ***pseudoRangeCor***This field specifies the correction to the pseudorange for the particular satellite at *dgnss-RefTime*, t0. The value of this field is given in meters and the scale factor is 0.32 meters in the range of ±655.04 meters. The method of calculating this field is described in [11].If the location server has received a request for GNSS assistance data from a target device which included a request for the GNSS Navigation Model and DGNSS, the location server shall determine, for each satellite, if the navigation model stored by the target device is still suitable for use with DGNSS corrections and if so and if DGNSS corrections are supported the location server should send DGNSS corrections without including the GNSS Navigation Model.The *iod* value sent for a satellite shall always be the IOD value that corresponds to the navigation model for which the pseudo-range corrections are applicable.The target device shall only use the *pseudoRangeCor*value when the IOD value received matches its available navigation model.Pseudo-range corrections are provided with respect to GNSS specific geodetic datum (e.g., PZ-90.02 if *GNSS‑ID* indicates GLONASS).Scale factor 0.32 meters. |
| ***rangeRateCor***This field specifies the rate-of-change of the pseudorange correction for the particular satellite, using the satellite ephemeris and clock corrections identified by the *iod* field. The value of this field is given in meters per second and the resolution is 0.032 meters/sec in the range of ±4.064 meters/sec. For some time t1> t0, the corrections for *iod* are estimated by PRC(t1,IOD) = PRC(t0, IOD) + RRC(t0,IOD)⋅(t1 - t0),and the target device uses this to correct the pseudorange it measures at t1, PRm(t1,IOD), by PR(t1, IOD) = PRm(t1, IOD) + PRC(t1, IOD) .The location server shall always send the RRC value that corresponds to the PRC value that it sends. The target device shall only use the RRC value when the *iod* value received matches its available navigation model.Scale factor 0.032 meters/second. |
| ***udreGrowthRate***This field provides an estimate of the growth rate of uncertainty (1-σ) in the corrections for the particular satellite identified by *SV-ID*. The estimated UDRE at time value specified in the *udreValidityTimet1* is calculated as follows: UDRE(*t0*+*t1*) = UDRE(*t0*) ×*udreGrowthRate ,*where *t0* is the DGNSS Reference Time *dgnss-RefTime*for which the corrections are valid, *t1* is the *udreValidityTime*field, UDRE(*t0*) is the value of the *udre* field, and *udreGrowthRate* field is the factor as shown in the table Value of *udreGrowthRate* to Indication relation below. |
| ***udreValidityTime***This field specifies the time when the *udreGrowthRate* field applies and is included if *udreGrowthRate* is included. The meaning of the values for this field is as shown in the table Value of *udreValidityTime*to Indication relation below. |

*gnss-StatusHealth* Value to Indication relation

|  |  |
| --- | --- |
| *gnss-StatusHealth Value* | Indication |
| 000 | UDRE Scale Factor = 1.0 |
| 001 | UDRE Scale Factor = 0.75 |
| 010 | UDRE Scale Factor = 0.5 |
| 011 | UDRE Scale Factor = 0.3 |
| 100 | UDRE Scale Factor = 0.2 |
| 101 | UDRE Scale Factor = 0.1 |
| 110 | Reference Station Transmission Not Monitored |
| 111 | Data is invalid - disregard |

*udre Value* to Indication relation

|  |  |
| --- | --- |
| *udre* Value | Indication |
| 00 | UDRE ≤ 1.0 m |
| 01 | 1.0 m < UDRE ≤ 4.0 m |
| 10 | 4.0 m < UDRE ≤ 8.0 m |
| 11 | 8.0 m < UDRE |

Value of *udreGrowthRate* to Indication relation

|  |  |
| --- | --- |
| **Value of *udreGrowthRate*** | **Indication** |
| 000 | 1.5 |
| 001 | 2 |
| 010 | 4 |
| 011 | 6 |
| 100 | 8 |
| 101 | 10 |
| 110 | 12 |
| 111 | 16 |

Value of *udreValidityTime*to Indication relation

|  |  |
| --- | --- |
| **Value of *udreValidityTime*** | **Indication****[seconds]** |
| 000 | 20 |
| 001 | 40 |
| 010 | 80 |
| 011 | 160 |
| 100 | 320 |
| 101 | 640 |
| 110 | 1280 |
| 111 | 2560 |

#### – *GNSS-NavigationModel*

The IE *GNSS-NavigationModel* is used by the location server to provide precise navigation data to the GNSS capable target device. In response to a request from a target device for GNSS Assistance Data, the location server shall determine whether to send the navigation model for a particular satellite to a target device based upon factors like the T-Toe limit specified by the target device and any request from the target device for DGNSS (see also *GNSS-DifferentialCorrections*). GNSS Orbit Model can be given in Keplerian parameters or as state vector in Earth-Centered Earth-Fixed coordinates, dependent on the *GNSS-ID* and the target device capabilities. The meaning of these parameters is defined in relevant ICDs of the particular GNSS and GNSS specific interpretations apply. For example, GPS and QZSS use the same model parameters but some parameters have a different interpretation [7].

-- ASN1START

GNSS-NavigationModel ::= SEQUENCE {

 nonBroadcastIndFlag INTEGER (0..1),

 gnss-SatelliteList GNSS-NavModelSatelliteList,

 ...

}

GNSS-NavModelSatelliteList ::= SEQUENCE (SIZE(1..64)) OF GNSS-NavModelSatelliteElement

GNSS-NavModelSatelliteElement ::= SEQUENCE {

 svID SV-ID,

 svHealth BIT STRING (SIZE(8)),

 iod BIT STRING (SIZE(11)),

 gnss-ClockModel GNSS-ClockModel,

 gnss-OrbitModel GNSS-OrbitModel,

 ...,

 [[ svHealthExt-v1240 BIT STRING (SIZE(4)) OPTIONAL -- Need ON

 ]]

}

GNSS-ClockModel ::= CHOICE {

 standardClockModelList StandardClockModelList, -- Model-1

 nav-ClockModel NAV-ClockModel, -- Model-2

 cnav-ClockModel CNAV-ClockModel, -- Model-3

 glonass-ClockModel GLONASS-ClockModel, -- Model-4

 sbas-ClockModel SBAS-ClockModel, -- Model-5

 ...,

 bds-ClockModel-r12 BDS-ClockModel-r12, -- Model-6

 navic-ClockModel-r16 NavIC-ClockModel-r16 -- Model-8

}

GNSS-OrbitModel ::= CHOICE {

 keplerianSet NavModelKeplerianSet, -- Model-1

 nav-KeplerianSet NavModelNAV-KeplerianSet, -- Model-2

 cnav-KeplerianSet NavModelCNAV-KeplerianSet, -- Model-3

 glonass-ECEF NavModel-GLONASS-ECEF, -- Model-4

 sbas-ECEF NavModel-SBAS-ECEF, -- Model-5

 ...,

 bds-KeplerianSet-r12 NavModel-BDS-KeplerianSet-r12, -- Model-6

 navic-KeplerianSet-r16 NavModel-NavIC-KeplerianSet-r16 -- Model-8

}

-- ASN1STOP

| *GNSS-NavigationModel* field descriptions |
| --- |
| ***nonBroadcastIndFlag***This field indicates if the *GNSS-NavigationModel* elements are not derived from satellite broadcast data or are given in a format not native to the GNSS. A value of 0 means the *GNSS-NavigationModel* data elements correspond to GNSS satellite broadcasted data; a value of 1 means the *GNSS-NavigationModel* data elements are not derived from satellite broadcast.  |
| ***gnss-SatelliteList***This list provides ephemeris and clock corrections for GNSS satellites indicated by *SV‑ID*. |
| ***svHealth***This field specifiesthe satellite's current health. The health values are GNSS system specific. The interpretation of *svHealth* depends on the *GNSS‑ID* and is as shown in table GNSS to svHealth Bit String(8) relation below. |
| ***Iod***This field specifies the Issue of Data and contains the identity for GNSS Navigation Model.In case of broadcasted GPS NAV ephemeris, the *iod* contains the IODC as described in [4].In case of broadcasted Modernized GPS ephemeris, the *iod* contains the 11-bit parameter toe as defined in [4, Table 30-I] [6, Table 3.5-1].In case of broadcasted SBAS ephemeris, the *iod* contains the 8 bits Issue of Data as defined in [10] Message Type 9.In case of broadcasted QZSS QZS-L1 ephemeris, the *iod* contains the IODC as described in [7].In case of broadcasted QZSS QZS-L1C/L2C/L5 ephemeris, the *iod* contains the 11-bit parameter toe as defined in [7].In case of broadcasted GLONASS ephemeris, the *iod* contains the parameter tb as defined in [9].In the case of broadcasted Galileo ephemeris, the *iod* contains the IOD index as described in [8].In the case of broadcasted BDS ephemeris, the *iod* contains 11 MSB bits of the toe as definedin [23].In the case of broadcasted NavIC ephemeris, the iod contains 11 MSB bits of the toe as defined in [xx].The interpretation of *iod* depends on the *GNSS‑ID* and is as shown in table GNSS to iod Bit String(11) relation below. |
| ***svHealthExt***This field specifiesthe satellite's additional current health. The health values are GNSS system specific. The interpretation of *svHealthExt* depends on the *GNSS‑ID* and is as shown in table GNSS to svHealthExt Bit String(4) relation below. |

GNSS to svHealth Bit String(8) relation

|  |  |
| --- | --- |
| GNSS | *svHealth* Bit String(8) |
| Bit 1(MSB) | Bit 2 | Bit 3 | Bit 4 | Bit 5 | Bit 6  | Bit 7 | Bit 8 (LSB) |
| GPS L1/CA(1) | SV Health [4] | '0'(reserved) | '0'(reserved) |
| Modernized GPS(2) | L1C Health[6] | L1 Health [4,5] | L2 Health[4,5] | L5 Health [4,5] | '0'(reserved) | '0'(reserved) | '0'(reserved) | '0'(reserved) |
| SBAS(3) | RangingOn (0),Off(1) [10] | Corrections On(0),Off(1) [10] | IntegrityOn(0),Off(1)[10] | '0'(reserved) | '0'(reserved) | '0'(reserved) | '0'(reserved) | '0'(reserved) |
| QZSS(4)QZS-L1 | SV Health [7] | '0'(reserved) | '0'(reserved) |
| QZSS(5)QZS‑L1C/L2C/L5 | L1C Health[7] | L1 Health[7] | L2 Health[7] | L5 Health[7] | '0'(reserved) | '0'(reserved) | '0'(reserved) | '0'(reserved) |
| GLONASS | Bn (MSB)[9, page 30] | FT [9, Table 4.4] | '0'(reserved) | '0'(reserved) | '0'(reserved) |
| Galileo[8, clause 5.1.9.3] | E5a Data Validity Status | E5b Data Validity Status | E1-B Data Validity Status | E5a Signal Health Status | '0'(reserved) | '0'(reserved) | '0'(reserved) |
| BDS[23] | B1I Health (SatH1) [23] | '0'(reserved) | '0'(reserved) | '0'(reserved) | '0'(reserved) | '0'(reserved) | '0'(reserved) | '0'(reserved) |
| NavIC | L5 health | ‘0’(reserved) | ‘0’(reserved) | ‘0’(reserved) | ‘0’(reserved) | ‘0’(reserved) | ‘0’(reserved) | ‘0’(reserved) |
| Note 1: If *GNSS‑ID* indicates 'gps', and GNSS Orbit Model-2 is included, this interpretation of *svHealth* applies.Note 2: If *GNSS‑ID* indicates 'gps', and GNSS Orbit Model-3 is included, this interpretation of *svHealth* applies.If a certain signal is not supported on the satellite indicated by *SV‑ID*, the corresponding health bit shall be set to '1' (i.e., signal can not be used).Note 3: *svHealth* in case of *GNSS‑ID* indicates 'sbas' includes the 5 LSBs of the Health included in GEO Almanac Message Parameters (Type 17) [10].Note 4: If *GNSS‑ID* indicates 'qzss', and GNSS Orbit Model-2 is included, this interpretation of *svHealth* applies.Note 5: If *GNSS‑ID* indicates 'qzss', and GNSS Orbit Model-3 is included, this interpretation of *svHealth* applies. |

GNSS to iod Bit String(11) relation

|  |  |
| --- | --- |
| GNSS | *iod* Bit String(11) |
| Bit 1(MSB) | Bit 2 | Bit 3 | Bit 4 | Bit 5 | Bit 6 | Bit 7 | Bit 8 | Bit 9 | Bit 10 | Bit 11(LSB) |
| GPS L1/CA | '0' | Issue of Data, Clock [4] |
| Modernized GPS | toe (seconds, scale factor 300, range 0 – 604500) [4,5,6] |
| SBAS | '0' | '0' | '0' | Issue of Data ([10], Message Type 9) |
| QZSS QZS-L1 | '0' | Issue of Data, Clock [7] |
| QZSSQZS-L1C/L2C/L5 | toe (seconds, scale factor 300, range 0 – 604500) [7] |
| GLONASS | '0' | '0' | '0' | '0' | tb (minutes, scale factor 15) [9] |
| Galileo | '0' | IODnav [8] |
| BDS | 11 MSB bits of toe (seconds, scale factor 512, range 0 – 604672) [23] |
| NavIC | 11 MSB bits of toe (seconds, scale factor 512) [xx] |

GNSS to svHealthExt Bit String(4) relation

|  |  |
| --- | --- |
| GNSS | *svHealthExt* Bit String(4) |
| Bit 1(MSB) | Bit 2 | Bit 3 | Bit 4(LSB) |
| Galileo [8, clause 5.1.9.3] | E5b Signal Health Status | E1-B Signal Health Status |

#### – *StandardClockModelList*

-- ASN1START

StandardClockModelList ::= SEQUENCE (SIZE(1..2)) OF StandardClockModelElement

StandardClockModelElement ::= SEQUENCE {

 stanClockToc INTEGER (0..16383),

 stanClockAF2 INTEGER (-32..31),

 stanClockAF1 INTEGER (-1048576..1048575),

 stanClockAF0 INTEGER (-1073741824..1073741823),

 stanClockTgd INTEGER (-512..511) OPTIONAL, -- Need ON

 sisa INTEGER (0..255),

 stanModelID INTEGER (0..1) OPTIONAL, -- Need ON

 ...

}

-- ASN1STOP

| *StandardClockModelList* field descriptions |
| --- |
| ***standardClockModelList****gnss-ClockModel* Model-1 contains one or two clock model elements. If included, clock Model-1 shall be included once or twice depending on the target device capability.If the target device is supporting multiple Galileo signals, the location server shall include both F/Nav and I/Nav clock models in*gnss-ClockModel* if the location server assumes the target device to perform location information calculation using multiple signals. |
| ***stanClockToc***Parameter toc defined in [8].Scale factor 60 seconds. |
| ***stanClockAF2***Parameter af2 defined in [8].Scale factor 2-59 seconds/second2. |
| ***stanClockAF1***Parameter af1 defined in [8].Scale factor 2-46 seconds/second. |
| ***stanClockAF0***Parameter af0 defined in [8].Scale factor 2-34 seconds. |
| ***stanClockTgd***Parameter TGD, Broadcast Group Delay (BGD), defined in [8].Scale factor 2-32 seconds.This field is required if the target device supports only single frequency Galileo signal. |
| ***sisa***Signal-In-Space Accuracy (SISA), defined in [8] clause 5.1.11. |
| ***stanModelID***This field specifies the identity of the clock model according to the table Value of stanModelID to Identity relation below. This field is required if the location server includes both F/Nav and I/Nav Galileo clock models in *gnss-ClockModel.* |

Value of stanModelID to Identity relation

|  |  |
| --- | --- |
| Value of *stanModelID* | Identity |
| 0 | I/Nav (E1,E5b) |
| 1 | F/Nav (E1,E5a) |

#### – *NAV-ClockModel*

-- ASN1START

NAV-ClockModel ::= SEQUENCE {

 navToc INTEGER (0..37799),

 navaf2 INTEGER (-128..127),

 navaf1 INTEGER (-32768..32767),

 navaf0 INTEGER (-2097152..2097151),

 navTgd INTEGER (-128..127),

 ...

}

-- ASN1STOP

| *NAV-ClockModel* field descriptions |
| --- |
| ***navToc***Parameter toc, time of clock (seconds) [4,7]Scale factor 24 seconds. |
| ***navaf2***Parameter af2, clock correction polynomial coefficient (sec/sec2) [4,7].Scale factor 2-55 seconds/second2. |
| ***navaf1***Parameter af1, clock correction polynomial coefficient (sec/sec) [4,7].Scale factor 2-43 seconds/second. |
| ***navaf0***Parameter af0, clock correction polynomial coefficient (seconds) [4,7].Scale factor 2-31 seconds. |
| ***navTgd***Parameter TGD, group delay (seconds) [4,7].Scale factor 2-31 seconds. |

#### – *CNAV-ClockModel*

-- ASN1START

CNAV-ClockModel ::= SEQUENCE {

 cnavToc INTEGER (0..2015),

 cnavTop INTEGER (0..2015),

 cnavURA0 INTEGER (-16..15),

 cnavURA1 INTEGER (0..7),

 cnavURA2 INTEGER (0..7),

 cnavAf2 INTEGER (-512..511),

 cnavAf1 INTEGER (-524288..524287),

 cnavAf0 INTEGER (-33554432..33554431),

 cnavTgd INTEGER (-4096..4095),

 cnavISCl1cp INTEGER (-4096..4095) OPTIONAL, -- Need ON

 cnavISCl1cd INTEGER (-4096..4095) OPTIONAL, -- Need ON

 cnavISCl1ca INTEGER (-4096..4095) OPTIONAL, -- Need ON

 cnavISCl2c INTEGER (-4096..4095) OPTIONAL, -- Need ON

 cnavISCl5i5 INTEGER (-4096..4095) OPTIONAL, -- Need ON

 cnavISCl5q5 INTEGER (-4096..4095) OPTIONAL, -- Need ON

 ...

}

-- ASN1STOP

| *CNAV-ClockModel* field descriptions |
| --- |
| ***cnavToc***Parameter toc, clock data reference time of week (seconds) [4,5,6,7].Scale factor 300 seconds. |
| ***cnavTop***Parameter top, clock data predict time of week (seconds) [4,5,6,7].Scale factor 300 seconds |
| ***cnavURA0***Parameter URAoc Index, SV clock accuracy index (dimensionless) [4,5,6,7]. |
| ***cnavURA1***Parameter URAoc1 Index, SV clock accuracy change index (dimensionless) [4,5,6,7]. |
| ***cnavURA2***Parameter URAoc2 Index, SV clock accuracy change rate index (dimensionless) [4,5,6,7]. |
| ***cnavAf2***Parameter af2-n, SV clock drift rate correction coefficient (sec/sec2) [4,5,6,7].Scale factor 2-60 seconds/second2. |
| ***cnavAf1***Parameter af1-n, SV clock drift correction coefficient (sec/sec) [4,5,6,7].Scale factor 2-48 seconds/second. |
| ***cnavAf0***Parameter af0-n, SV clock bias correction coefficient (seconds) [4,5,6,7].Scale factor 2-35 seconds. |
| ***cnavTgd***Parameter TGD, Group delay correction (seconds) [4,5,6,7].Scale factor 2-35 seconds. |
| ***cnavISCl1cp***Parameter ISCL1CP, inter signal group delay correction (seconds) [6,7].Scale factor 2-35 seconds.The location server should include this field if the target device is GPS capable and supports the L1C signal. |
| ***cnavISCl1cd***Parameter ISCL1CD, inter signal group delay correction (seconds) [6,7].Scale factor 2-35 seconds.The location server should include this field if the target device is GPS capable and supports the L1C signal. |
| ***cnavISCl1ca***Parameter ISCL1C/A, inter signal group delay correction (seconds) [4,5,7].Scale factor 2-35 seconds.The location server should include this field if the target device is GPS capable and supports the L1CA signal. |
| ***cnavISCl2c***Parameter ISCL2C, inter signal group delay correction (seconds) [4,5,7].Scale factor 2-35 seconds.The location server should include this field if the target device is GPS capable and supports the L2C signal. |
| ***cnavISCl5i5***Parameter ISCL5I5, inter signal group delay correction (seconds) [5,7].Scale factor 2-35 seconds.The location server should include this field if the target device is GPS capable and supports the L5 signal. |
| ***cnavISCl5q5***Parameter ISCL5Q5, inter signal group delay correction (seconds) [5,7].Scale factor 2-35 seconds.The location server should include this field if the target device is GPS capable and supports the L5 signal. |

#### – *GLONASS-ClockModel*

-- ASN1START

GLONASS-ClockModel ::= SEQUENCE {

 gloTau INTEGER (-2097152..2097151),

 gloGamma INTEGER (-1024..1023),

 gloDeltaTau INTEGER (-16..15) OPTIONAL, -- Need ON

 ...

}

-- ASN1STOP

| *GLONASS-ClockModel* field descriptions |
| --- |
| ***gloTau***Parameter n(tb), satellite clock offset (seconds) [9].Scale factor 2-30 seconds. |
| ***gloGamma***Parameter n(tb), relative frequency offset from nominal value (dimensionless) [9].Scale factor 2-40. |
| ***gloDeltaTau***Parameter n, time difference between transmission in G2 and G1 (seconds) [9].Scale factor 2-30 seconds.The location server should include this parameter if the target device is dual frequency GLONASS receiver capable. |

#### – *SBAS-ClockModel*

-- ASN1START

SBAS-ClockModel ::= SEQUENCE {

 sbasTo INTEGER (0..5399),

 sbasAgfo INTEGER (-2048..2047),

 sbasAgf1 INTEGER (-128..127),

 ...

}

-- ASN1STOP

| *SBAS-ClockModel* field descriptions |
| --- |
| ***sbasTo***Parameter t0 [10].Scale factor 16 seconds. |
| ***sbasAgfo***Parameter aGfo [10].Scale factor 2-31 seconds. |
| ***sbasAgf1***Parameter aGf1 [10].Scale factor 2-40 seconds/second. |

#### – *BDS-ClockModel*

-- ASN1START

BDS-ClockModel-r12 ::= SEQUENCE {

 bdsAODC-r12 INTEGER (0..31),

 bdsToc-r12 INTEGER (0..131071),

 bdsA0-r12 INTEGER (-8388608..8388607),

 bdsA1-r12 INTEGER (-2097152..2097151),

 bdsA2-r12 INTEGER (-1024..1023),

 bdsTgd1-r12 INTEGER (-512..511),

 ...

}

-- ASN1STOP

| *BDS-ClockModel* field descriptions |
| --- |
| ***bdsAODC***Parameter Age of Data, Clock (AODC), see [23], Table 5-6. |
| ***bdsToc***Parameter Toc, Time of clock (seconds) [23].Scale factor 23 seconds. |
| ***bdsA0***Parameter a0, Clock correction polynomial coefficient (seconds) [23].Scale factor 2-33 seconds. |
| ***bdsA1***Parameter a1, Clock correction polynomial coefficient (sec/sec) [23].Scale factor 2-50 sec/sec. |
| ***bdsA2***Parameter a2, Clock correction polynomial coefficient (sec/sec2) [23].Scale factor 2-66 sec/sec2. |
| ***bdsTgd1***Parameter Equipment group delay differential TGD1 [23].Scale factor is 0.1 nanosecond. |

#### – *NavIC-ClockModel*

-- ASN1START

NavIC-ClockModel-r16 ::= SEQUENCE {

 navic-Toc-r16 INTEGER (0..65535),

 navic-af2-r16 INTEGER (-128..127),

 navic-af1-r16 INTEGER (-32768..32767),

 navic-af0-r16 INTEGER (-2097152..2097151),

 navic-Tgd-r16 INTEGER (-128..127),

 ...

}

-- ASN1STOP

| *NavIC-ClockModel* field descriptions |
| --- |
| ***navic-Toc***Parameter toc, time of clock (seconds) Table-11 Ref [xx]Scale factor 24 seconds. |
| ***navic-af2***Parameter af2, clock correction polynomial coefficient (sec/sec2) [xx].Scale factor 2-55 seconds/second2. |
| ***navic-af1***Parameter af1, clock correction polynomial coefficient (sec/sec) [xx]Scale factor 2-43 seconds/second. |
| ***navic-af0***Parameter af0, clock correction polynomial coefficient (seconds) [xx]Scale factor 2-31 seconds. |
| ***navic-Tgd***Parameter TGD, group delay (seconds) [xx]Scale factor 2-31 seconds. |

**< Unchanged parts are omitted >**

#### – *GNSS-RealTimeIntegrity*

The IE *GNSS-RealTimeIntegrity* is used by the location server to provide parameters that describe the real-time status of the GNSS constellations. *GNSS-RealTimeIntegrity* data communicates the health of the GNSS signals to the mobile in real‑time.

The location server shall always transmit the *GNSS-RealTimeIntegrity* with the current list of unhealthy signals (i.e., not only for signals/SVs currently visible at the reference location), for any GNSS positioning attempt and whenever GNSS assistance data are sent. If the number of bad signals is zero, then the *GNSS-RealTimeIntegrity* IE shall be omitted.

-- ASN1START

GNSS-RealTimeIntegrity ::= SEQUENCE {

 gnss-BadSignalList GNSS-BadSignalList,

 ...

}

GNSS-BadSignalList ::= SEQUENCE (SIZE(1..64)) OF BadSignalElement

BadSignalElement ::= SEQUENCE {

 badSVID SV-ID,

 badSignalID GNSS-SignalIDs OPTIONAL, -- Need OP

 ...

}

-- ASN1STOP

| *GNSS-RealTimeIntegrity* field descriptions |
| --- |
| ***gnss-BadSignalList***This field specifies a list of satellites with bad signal or signals.  |
| ***badSVID***This field specifies the GNSS *SV‑ID* of the satellite with bad signal or signals. |
| ***badSignalID***This field identifies the bad signal or signals of a satellite. This is represented by a bit string in *GNSS-SignalIDs*, with a one‑value at a bit position means the particular GNSS signal type of the SV is unhealthy; a zero‑value means healthy. Absence of this field means that all signals on the specific SV are bad.  |

#### – *GNSS-DataBitAssistance*

The IE *GNSS-DataBitAssistance* is used by the location server to provide data bit assistance data for specific satellite signals for data wipe-off. The data bits included in the assistance data depends on the GNSS and its signal.

-- ASN1START

GNSS-DataBitAssistance ::= SEQUENCE {

 gnss-TOD INTEGER (0..3599),

 gnss-TODfrac INTEGER (0..999) OPTIONAL, -- Need ON

 gnss-DataBitsSatList GNSS-DataBitsSatList,

 ...

}

GNSS-DataBitsSatList ::= SEQUENCE (SIZE(1..64))OF GNSS-DataBitsSatElement

GNSS-DataBitsSatElement ::= SEQUENCE {

 svID SV-ID,

 gnss-DataBitsSgnList GNSS-DataBitsSgnList,

 ...

}

GNSS-DataBitsSgnList ::= SEQUENCE (SIZE(1..8)) OF GNSS-DataBitsSgnElement

GNSS-DataBitsSgnElement ::= SEQUENCE {

 gnss-SignalType GNSS-SignalID,

 gnss-DataBits BIT STRING (SIZE (1..1024)),

 ...

}

-- ASN1STOP

| *GNSS-DataBitAssistance* field descriptions |
| --- |
| ***gnss-TOD***This field specifies the reference time of the first bit of the data in *GNSS-DataBitAssistance* in integer seconds in GNSS specific system time, modulo 1 hour.Scale factor 1 second. |
| ***gnss-TODfrac***This field specifies the fractional part of the *gnss-TOD* in 1‑milli‑second resolution.Scale factor 1 millisecond. The total GNSS TOD is *gnss-TOD* + *gnss-TODfrac.* |
| ***gnss-DataBitsSatList***This list specifies the data bits for a particular GNSS satellite *SV-ID* and signal *GNSS-SignalID*. |
| ***svID***This field specifies the GNSS *SV‑ID* of the satellite for which the *GNSS-DataBitAssistance* is given. |
| ***gnss-SignalType***This field identifies the GNSS signal type of the *GNSS-DataBitAssistance.* |
| ***gnss-DataBits***Data bits are contained in GNSS system and data type specific format.In case of GPS L1 C/A, it contains the NAV data modulation bits as defined in [4] .In case of Modernized GPS L1C, it contains the encoded and interleaved modulation symbols as defined in [6] clause 3.2.3.1. In case of Modernized GPS L2C, it contains either the NAV data modulation bits, the FEC encoded NAV data modulation symbols, or the FEC encoded CNAV data modulation symbols, dependent on the current signal configuration of this satellite as defined in [4, Table 3-III]. In case of Modernized GPS L5, it contains the FEC encoded CNAV data modulation symbols as defined in [5].In case of SBAS, it contains the FEC encoded data modulation symbols as defined in [10].In case of QZSS QZS-L1, it contains the NAV data modulation bits as defined in [7] clause 5.2. In case of QZSS QZS-L1C, it contains the encoded and interleaved modulation symbols as defined in [7] clause 5.3. In case of QZSS QZS-L2C, it contains the encoded modulation symbols as defined in [7] clause 5.5. In case of QZSS QZS-L5, it contains the encoded modulation symbols as defined in [7] clause 5.6.In case of GLONASS, it contains the 100 sps differentially Manchester encoded modulation symbols as defined in [9] clause 3.3.2.2.In case of Galileo, it contains the FEC encoded and interleaved modulation symbols. The logical levels 1 and 0 correspond to signal levels -1 and +1, respectively.In case of BDS, it contains the encoded and interleaved modulation symbols as defined in [23, clause 5.1.3].In case of the NavIC, it contains the FEC encoded and interleaved Navigation symbols as defined in [xx]. |

**< Unchanged parts are omitted >**

#### – *GNSS-Almanac*

The IE *GNSS-Almanac* is used by the location server to provide the coarse, long-term model of the satellite positions and clocks. The meaning of these parameters is defined in relevant ICDs of the particular GNSS and GNSS specific interpretations apply. For example, GPS and QZSS use the same model parameters but some parameters have a different interpretation [7]. *GNSS-Almanac* is useful for receiver tasks that require coarse accuracy, such as determining satellite visibility. The model is valid for up to a few weeks, typically. Since it is a long-term model, the field should be provided for all satellites available in the GNSS constellation (i.e., not only for SVs visible at the reference location and including SVs flagged as unhealthy in almanac). The *completeAlmanacProvided* field indicates whether or not the location server provided almanacs for the complete GNSS constellation.

-- ASN1START

GNSS-Almanac ::= SEQUENCE {

 weekNumber INTEGER (0..255) OPTIONAL, -- Need ON

 toa INTEGER (0..255) OPTIONAL, -- Need ON

 ioda INTEGER (0..3) OPTIONAL, -- Need ON

 completeAlmanacProvided BOOLEAN,

 gnss-AlmanacList GNSS-AlmanacList,

 ...,

 [[ toa-ext-v1240 INTEGER (256..1023) OPTIONAL, -- Need ON

 ioda-ext-v1240 INTEGER (4..15) OPTIONAL -- Need ON

 ]],

 [[

 weekNumber-ext-r16 INTEGER (256..8191) OPTIONAL, -- Need ON

 toa-ext2-r16 INTEGER (256..65535) OPTIONAL -- Need ON

 ]]

}

GNSS-AlmanacList ::= SEQUENCE (SIZE(1..64)) OF GNSS-AlmanacElement

GNSS-AlmanacElement ::= CHOICE {

 keplerianAlmanacSet AlmanacKeplerianSet, -- Model-1

 keplerianNAV-Almanac AlmanacNAV-KeplerianSet, -- Model-2

 keplerianReducedAlmanac AlmanacReducedKeplerianSet, -- Model-3

 keplerianMidiAlmanac AlmanacMidiAlmanacSet, -- Model-4

 keplerianGLONASS AlmanacGLONASS-AlmanacSet, -- Model-5

 ecef-SBAS-Almanac AlmanacECEF-SBAS-AlmanacSet,-- Model-6

 ...,

 keplerianBDS-Almanac-r12 AlmanacBDS-AlmanacSet-r12, -- Model-7

 keplerianNavIC-Almanac-r16 AlmanacNavIC-AlmanacSet-r16 -- Model-8

}

-- ASN1STOP

| *GNSS-Almanac* field descriptions |
| --- |
| ***weekNumber, weekNumber-ext***This field specifies the almanac reference week number in GNSS specific system time to which the almanac reference time *toa* is referenced, modulo 256 weeks. Either weekNumber or weekNumber-ext is required for non-GLONASS GNSS.Note, in case of Galileo, the almanac reference week number WNa natively contains only the 2 LSB's [8], clause 5.1.10].In case of NavIC, the almanac reference week number is defined in [xx]. |
| ***toa, toa-ext, toa-ext2***In case of *GNSS-ID* does not indicate Galileo or NavIC, this field specifies the almanac reference time given in GNSS specific system time, in units of seconds with a scale factor of 212.*toa* is required for non-GLONASS GNSS when the toa-ext2 is not present.In case of *GNSS-ID* does indicate Galileo, this field specifies the almanac reference time given in GNSS specific system time, in units of seconds with a scale factor of 600 seconds. Either *toa* or *toa-ext* is required for Galileo GNSS.In case of GNSS-ID indicate NavIC, this field specifies the almanac reference time given in GNSS specific system time, in units of seconds with a scale factor of 16 seconds[xx]. Either toa or toa-ext2 is required for NavIC GNSS. |
| ***ioda, ioda-ext***This field specifies the issue of data*.* Either *ioda* or *ioda-ext* is required for Galileo GNSS. |
| ***completeAlmanacProvided***If set to TRUE, the *gnss-AlmanacList* contains almanacs for the complete GNSS constellation indicated by *GNSS‑ID*.  |
| ***gnss-AlmanacList***This list contains the almanac model for each GNSS satellite in the GNSS constellation. |

**< Unchanged parts are omitted >**

#### – *AlmanacNavIC-AlmanacSet*

-- ASN1START

AlmanacNavIC-AlmanacSet-r16 ::= SEQUENCE {

 svID-r16 SV-ID,

 navic-AlmToa-r16 INTEGER (0..65535) OPTIONAL, -- Cond NotSameForAllSV

 navic-AlmE-r16 INTEGER (0..65535),

 navic-AlmOMEGADOT-r16 INTEGER (-32768..32767),

 navic-AlmSqrtA-r16 INTEGER (0..16777215),

 navic-AlmOMEGAo-r16 INTEGER (-8388608..8388607),

 navic-AlmOmega-r16 INTEGER (-8388608..8388607),

 navic-AlmMo-r16 INTEGER (-8388608..8388607),

 navic-Almaf0-r16 INTEGER (-1024..1023),

 navic-Almaf1-r16 INTEGER (-1024..1023),

 ...

}

-- ASN1STOP

| Conditional presence | Explanation |
| --- | --- |
| *NotSameForAllSV* | This field may be present if the toa is not the same for all SVs; otherwise it is not present and the toa is provided in *GNSS-Almanac*. |

| *AlmanacNavIC-AlmanacSet*field descriptions |
| --- |
| ***svID***This field identifies the satellite for which the Almanac model is given |
| ***navic-AlmToa***This field provides the time of almanac setScale factor 16sec. |
| ***navic-AlmE***Parameter e, eccentricity, dimensionless Scale factor 2-21. |
| ***navic-AlmOMEGADOT***Parameter , rate of right ascension, semi-circles/sec Scale factor 2-38 semi-circles/second |
| ***navic-AlmSqrtA***Parameter , square root of the semi-major axis, meters1/2Scale factor 2-11 meters1/2. |
| ***navic-AlmOMEGAo***Parameter 0, longitude of ascending node of orbit plane at weekly epoch, semi-circles Scale factor 2-23 semi-circles. |
| ***navic-AlmOmega***Parameter ω, argument of perigee semi-circles Scale factor 2-23 semi-circles. |
| ***navic-AlmMo***Parameter M0, mean anomaly at reference time semi-circles Scale factor 2-23 semi-circles. |
| ***navic-Almaf0***Parameter af0, apparent satellite clock correction seconds Scale factor 2-20 seconds. |
| ***navic-Almaf1***Parameter af1, apparent satellite clock correction sec/secScale factor 2-38 semi-circles seconds/second. |

#### – *GNSS-UTC-Model*

The IE *GNSS-UTC-Model* is used by the location server to provide several sets of parameters needed to relate GNSS system time to Universal Time Coordinate (UTC), as defined in [4], [5], [6], [7], [8], [9], [10], [23], [xx].

The UTC time standard, UTC(k), is GNSS specific. E.g., if *GNSS-ID* indicates GPS, *GNSS-UTC-Model* contains a set of parameters needed to relate GPS system time to UTC(USNO); if *GNSS-ID* indicates QZSS, *GNSS-UTC-Model* contains a set of parameters needed to relate QZST to UTC(NICT); if *GNSS-ID* indicates GLONASS, *GNSS-UTC-Model* contains a set of parameters needed to relate GLONASS system time to UTC(RU); if *GNSS-ID* indicates SBAS, *GNSS-UTC-Model* contains a set of parameters needed to relate SBAS network time for the SBAS indicated by *SBAS-ID* to the UTC standard defined by the UTC Standard ID; if *GNSS-ID* indicates BDS, *GNSS-UTC-Model* contains a set of parameters needed to relate BDS system time to UTC (NTSC), if the GNSS-ID indicates the NavIC, the GNSS-UTC-Model contains a set of parameters needed to relate the NavIC system time to the UTC (BIPM).

-- ASN1START

GNSS-UTC-Model ::= CHOICE {

 utcModel1 UTC-ModelSet1, -- Model-1

 utcModel2 UTC-ModelSet2, -- Model-2

 utcModel3 UTC-ModelSet3, -- Model-3

 utcModel4 UTC-ModelSet4, -- Model-4

 ...,

 utcModel5-r12 UTC-ModelSet5-r12 -- Model-5

}

-- ASN1STOP

**< Unchanged parts are omitted >**

#### – *UTC-ModelSet2*

-- ASN1START

UTC-ModelSet2 ::= SEQUENCE {

 utcA0 INTEGER (-32768..32767),

 utcA1 INTEGER (-4096..4095),

 utcA2 INTEGER (-64..63),

 utcDeltaTls INTEGER (-128..127),

 utcTot INTEGER (0..65535),

 utcWNot INTEGER (0..8191),

 utcWNlsf INTEGER (0..255),

 utcDN BIT STRING (SIZE(4)),

 utcDeltaTlsf INTEGER (-128..127),

 ...,

 [[

 utcWNlsf-ext-r16 INTEGER (256..8191) OPTIONAL -- Need ON

 ]]

}

-- ASN1STOP

| *UTC-ModelSet2* field descriptions |
| --- |
| ***utcA0***Parameter A0-n, bias coefficient of GNSS time scale relative to UTC time scale (seconds) [4,5,6,7, xx].Scale factor 2-35 seconds. |
| ***utcA1***Parameter A1-n, drift coefficient of GNSS time scale relative to UTC time scale (sec/sec) [4,5,6,7, xx].Scale factor 2-51 seconds/second. |
| ***utcA2***Parameter A2-n, drift rate correction coefficient of GNSS time scale relative to UTC time scale (sec/sec2) [4,5,6,7, xx].Scale factor 2-68 seconds/second2. |
| ***utcDeltaTls***Parameter ΔtLS, current or past leap second count (seconds) [4,5,6,7, xx].Scale factor 1 second. |
| ***utcTot***Parameter tot, time data reference time of week (seconds) [4,5,6,7, xx].Scale factor 24 seconds. |
| ***utcWNot***Parameter WNot, time data reference week number (weeks) [4,5,6,7, xx].Scale factor 1 week. |
| ***UtcWNlsf, utcWNlsf-ext***Parameter WNLSF, leap second reference week number (weeks) [4,5,6,7, xx].If the field utcWNlsf-ext is present, the field utcWNlsf shall be ignored by the receiver.Scale factor 1 week. |
| ***utcDN***Parameter DN, leap second reference day number (days) [4,5,6,7, xx].Scale factor 1 day. |
| ***utcDeltaTlsf***Parameter ΔtLSF, current or future leap second count (seconds) [4,5,6,7, xx].Scale factor 1 second. |

**< Unchanged parts are omitted >**

#### – *NavIC-DifferentialCorrections*

The IE *NavIC-DifferentialCorrections* parameters provide users with sets of correction terms that apply to the clock and ephemeris data transmitted by other satellites in the AutoNav mode as defined in [xx] under clause 6.2.6.

-- ASN1START

NavIC-DifferentialCorrections-r16 ::= SEQUENCE {

 navic-RefTOWC-r16 INTEGER (0..50400),

 navic-CorrectionListAutoNav-r16 NavIC-CorrectionListAutoNav-r16,

 ...

}

NavIC-CorrectionListAutoNav-r16 ::= SEQUENCE (SIZE (1..64)) OF NavIC-CorrectionElementAutoNav-r16

NavIC-CorrectionElementAutoNav-r16 ::= SEQUENCE {

 svID SV-ID,

 navic-Tod-r16 INTEGER (0..65535),

 navic-iodec-r16 INTEGER (0..255),

 navic-UDRAI-r16 INTEGER (-16..15),

 navic-UDRArateI-r16 INTEGER (-16..15),

 navic-EDC-r16 NavIC-EDC-r16,

 navic-CDC-r16 NavIC-CDC-r16,

 ...

}

NavIC-EDC-r16 ::= SEQUENCE {

 navic-AlphaEDC-r16 INTEGER (-8192..8191),

 navic-BetaEDC-r16 INTEGER (-8192..8191),

 navic-GammaEDC-r16 INTEGER (-16384..16383),

 navic-AoIcorrection-r16 INTEGER (-2048..2047),

 navic-AoRAcorrection-r16 INTEGER (-2048..2047),

 navic-SemiMajorcorrection-r16 INTEGER (-2048..2047),

 ...

}

NavIC-CDC-r16 ::= SEQUENCE {

 navic-ClockBiasCorrection-r16 INTEGER (-4096..4095),

 navic-ClockDriftCorrection-r16 INTEGER (-128..127),

 ...

}

-- ASN1STOP

| *NavIC-DifferentialCorrections* field descriptions |
| --- |
| ***navic-RefTOWC***The transmission timing of the navigation message provided through the Time of Week Count (TOWC) corresponding to the given set of grid ionospheric parameters. It indicates the number of 12 second counts represented in 17 bits. The TOW count value ranges from 1 to 50400 to cover one entire week. The Time of Week (TOW) in seconds is obtained by multiplying TOWC with 12 as defined in [xx], clause 5.7. |
| ***navic-Tod***This field indicates the NavIC Time of Differential Correction in seconds.Scale factor 16 seconds |
| ***navic-iodec***This field indicates Issue of Data Ephemeris and Clock which provides the user with a convenient means of detecting any change in the ephemeris and clock parameters as described under clause 6.2.1.3 in [xx] |
| ***navic-UDRAI***This field indicates the index for the User Differential Range Accuracy (in meters) value which enables users to estimate the accuracy obtained after differential corrections are applied as described under clause 6.2.6 in [xx] |
| ***navic-UDRArateI***This field indicates the index for the change rate of User Differential Range Accuracy (meters/sec)value which enables users to estimate the accuracy obtained after differential corrections are applied as described under clause 6.2.6 in [xx] |
| ***navic-AlphaEDC***This field indicates the Alpha correction to Ephemeris parameter (Δα), which is one of the six keplerian elements defining the ephemeris differential corrections (EDC) for NavIC as defined under clause 6.1.3.5 in [xx].Scale factor 2–34 |
| ***navic-BetaEDC***This field indicates Beta correction to Ephemeris parameter (Δβ), which is one of the six keplerian elements defining the ephemeris differential corrections (EDC) for NavIC as defined under clause 6.1.3.5 in [xx].Scale factor 2–34 |
| ***navic-GammaEDC***This field indicates the Gamma correction to Ephemeris parameter (Δγ), which is one of the six keplerian elements defining the ephemeris differential corrections (EDC) for NavIC as defined under clause 6.1.3.5 in [xx].Scale factor 2–32 semi-circles. |
| ***navic-AoIcorrection***This field indicates the Angle of inclination correction (Δi), which is one of the six keplerian elements defining the ephemeris differential corrections (EDC) for NavIC as defined under clause 6.1.3.5 in [xx].Scale factor 2–32 semi-circles. |
| ***navic-AoRAcorrection***This field indicates the Angle of right ascension correction (ΔΩ), which is one of the six keplerian elements defining the ephemeris differential corrections (EDC) for the NavIC as defined under clause 6.1.3.5 in [xx].Scale factor 2–32 semi-circles. |
| ***navic-SemiMajorcorrection***This field indicates the Semi-major correction (ΔA), which is one of the six keplerian elements defining the ephemeris differential corrections (EDC) for the NavIC as defined under clause 6.1.3.5 in [xx].Scale factor 2–9 meters. |
| ***navic-ClockBiasCorrection***This field indicates correction to the satellite clock bias coefficient (δaf0), which is one of the two Satellite clock differential corrections (CDC) containing corrections to the NavIC satellite clock polynomial coefficients as defined under clause 6.1.3.5 in [xx].Scale factor 2–35 seconds. |
| ***navic-ClockDriftCorrection***This field indicates correction to the satellite clock drift coefficient (δaf1), which is one of the two Satellite clock differential corrections (CDC) containing corrections to the NavIC satellite clock polynomial coefficients as defined under clause 6.1.3.5 in [xx].Scale factor 2–51 sec / sec. |

#### – *NavIC-GridModelParameter*

-- ASN1START

NavIC-GridModelParameter-r16 ::= SEQUENCE {

 navic-RefTOWC-r16 INTEGER (0..50400),

 regionMasked-r16 INTEGER (0..1023),

 regionIgpList-r16 RegionIgpList-r16,

 ...

}

RegionIgpList-r16 ::= SEQUENCE (SIZE (1..16)) OF RegionIgpElement-r16

RegionIgpElement-r16 ::= SEQUENCE {

 regionID-r16 INTEGER (0..15),

 givei1-r16 INTEGER (0..15),

 givd1-r16 INTEGER (0..511),

 givei2-r16 INTEGER (0..15),

 givd2-r16 INTEGER (0..511),

 givei3-r16 INTEGER (0..15),

 givd3-r16 INTEGER (0..511),

 givei4-r16 INTEGER (0..15),

 givd4-r16 INTEGER (0..511),

 givei5-r16 INTEGER (0..15),

 givd5-r16 INTEGER (0..511),

 givei6-r16 INTEGER (0..15),

 givd6-r16 INTEGER (0..511),

 givei7-r16 INTEGER (0..15),

 givd7-r16 INTEGER (0..511),

 givei8-r16 INTEGER (0..15),

 givd8-r16 INTEGER (0..511),

 givei9-r16 INTEGER (0..15),

 givd9-r16 INTEGER (0..511),

 givei10-r16 INTEGER (0..15),

 givd10-r16 INTEGER (0..511),

 givei11-r16 INTEGER (0..15),

 givd11-r16 INTEGER (0..511),

 givei12-r16 INTEGER (0..15),

 givd12-r16 INTEGER (0..511),

 givei13-r16 INTEGER (0..15),

 givd13-r16 INTEGER (0..511),

 givei14-r16 INTEGER (0..15),

 givd14-r16 INTEGER (0..511),

 givei15-r16 INTEGER (0..15),

 givd15-r16 INTEGER (0..511),

 ...

}

-- ASN1STOP

| *NavIC-GridModelParameter* field descriptions |
| --- |
| ***navic-RefTOWC***The transmission timing of the navigation message provided through the Time of Week Count (TOWC) corresponding to the given set of grid ionospheric parameters. It indicates the number of 12 second counts represented in 17 bits. The TOW count value ranges from 1 to 50400 to cover one entire week. The Time of Week (TOW) in seconds is obtained bymultiplying TOWC with 12 as defined in [xx], clause 5.7. |
| ***regionMasked***Total 90 Ionospheric Grid Points(IGP) are defined in [xx] section 6.2.3 table 25. 15 IGP points are grouped into a single region. The region masked indicates the total number of regions for which the corrections are provided. For the current service area of the IRNSS, regions masked are 6. |
| ***regionIgpList***This list provides the set of IGPs corresponding to each region. Up to 6 instances (0 to 5) are used in this version of the specification. The values 6 to 15 are reserved for future use. |
| ***regionID***regionID along with index of the IGPS point corresponding gives the location of IGPS point as defined in [xx], table 25, section 6.2.3. |
| ***givei1, give2, .. , give15***This field indicates the Grid Ionospheric Vertical Error Index (GIVEI) which is used to describe the delay correction accuracy at ionospheric grid point indicated by the *igp-ID*, the mapping between GIVEI and GIVE is defined in [xx], section 6.2.2 and table 27. |
| ***givd1, givd2, … , givd15***This field indicates the Grid Ionospheric Vertical Delay (GIVD) as defined in [xx], clause 5.3.3.8.1, i.e. the vertical delay at the corresponding Ionospheric Grid points (IGPs) indicated by *igp-ID*. The scale factor is 0.125 meter. |

**< Unchanged parts are omitted >**

#### *– GNSS-RTK-MAC-CorrectionDifferences*

The IE *GNSS-RTK-MAC-CorrectionDifferences* is used by the location server to provide dispersive (ionospheric) and non-dispersive (geometric) correction difference components for up to 32 pairs of Auxiliary and Master Reference Stations. The Master Reference Station coordinates are provided in IE *GNSS-RTK-ReferenceStationInfo* and the Auxiliary Station coordinates are provided in IE *GNSS-RTK-AuxiliaryStationData*.

The parameters provided in IE *GNSS-RTK-MAC-CorrectionDifferences* are used as specified for message type 1017 and 1039 in [30] and apply to all GNSS.

-- ASN1START

GNSS-RTK-MAC-CorrectionDifferences-r15 ::= SEQUENCE {

 networkID-r15 GNSS-NetworkID-r15,

 subNetworkID-r15 GNSS-SubNetworkID-r15 OPTIONAL, -- Need ON

 master-ReferenceStationID-r15 GNSS-ReferenceStationID-r15,

 l1-r15 GNSS-FrequencyID-r15 OPTIONAL, -- Need OP

 l2-r15 GNSS-FrequencyID-r15 OPTIONAL, -- Need OP

 rtkCorrectionDifferencesList-r15 RTK-CorrectionDifferencesList-r15,

 ...

}

RTK-CorrectionDifferencesList-r15 ::= SEQUENCE (SIZE (1..32)) OF

 RTK-CorrectionDifferencesElement-r15

RTK-CorrectionDifferencesElement-r15 ::= SEQUENCE {

 epochTime-r15 GNSS-SystemTime,

 auxiliary-referenceStationID-r15 GNSS-ReferenceStationID-r15,

 geometric-ionospheric-corrections-differences-r15

 Geometric-Ionospheric-Corrections-Differences-r15,

 ...

}

Geometric-Ionospheric-Corrections-Differences-r15 ::= SEQUENCE (SIZE(1..64)) OF

 Geometric-Ionospheric-Corrections-Differences-Element-r15

Geometric-Ionospheric-Corrections-Differences-Element-r15 ::= SEQUENCE {

 svID-r15 SV-ID,

 ambiguityStatusFlag-r15 INTEGER (0..3),

 non-synch-count-r15 INTEGER (0..7),

 geometricCarrierPhaseCorrectionDifference-r15 INTEGER (-65536..65535),

 iod-r15 BIT STRING (SIZE(11)),

 ionosphericCarrierPhaseCorrectionDifference-r15 INTEGER (-65536..65535),

 ...

}

-- ASN1STOP

| *GNSS-RTK-MAC-CorrectionDifferences* field descriptions |
| --- |
| ***networkID***This field provides the network ID.  |
| ***subNetworkID***This field identifies the subnetwork of a network identified by *networkID*.  |
| ***master-ReferenceStationID***This field specifies the station ID of the Master Reference Station. |
| ***l1, l2***These fields specify the dual-frequency combination of L1 and L2 link/frequencies for which the *rtkCorrectionDifferencesList* is provided. If the fields are absent, the default interpretation in table 'L1/L2 default interpretation' applies. |
| ***rtkCorrectionDifferencesList***This field provides the correction differences for Auxiliary-Master Reference Station pairs. |
| ***epochTime***This field specifies the epoch time of observations used to derive the correction differences. The *gnss-TimeID* in *GNSS‑SystemTime* shall be the same as the *GNSS-ID* in IE *GNSS-GenericAssistDataElement*. |
| ***auxiliary-referenceStationID***This field specifies the station ID of the Auxiliary Reference Station. |
| ***svID***This field specifies the satellite for which the data is provided. |
| ***ambiguityStatusFlag***This field provides the ambiguity status. 'L1' below corresponds to the link indicated by the *l1* field; 'L2' below corresponds to the link indicated by the *l2* field.0 - Reserved for future use (artificial observations)1 - Correct Integer Ambiguity Level for L1 and L22 - Correct Integer Ambiguity Level for L1-L2 widelane3 - Uncertain Integer Ambiguity Level. Only a likely guess is used. |
| ***non-synch-count***This field provides the count of unrecoverable cycle slips. Whenever an unrecoverable cycle slip occurs this count shall be increased. The counter shall not be increased more than once per minute. Data for satellites with cycle slips more frequent than once per minute should not be provided. |
| ***geometricCarrierPhaseCorrectionDifference***This field provides the Geometric Carrier Phase Correction Difference (GCPCD), which is the Correction Difference for the geometric part (troposphere and orbits) calculated based on integer leveled L1 and L2 correction differences (L1CD and L2CD).L1CD, L2CD, and ICPCD are presented in meters. 'L1' below corresponds to the link indicated by the *l1* field; 'L2' below corresponds to the link indicated by the *l2* field.Scale factor 0.5 milli-meter; range ±32.767 meters. |
| ***iod***This field specifies the IOD value of the broadcast ephemeris used for calculation of Correction Differences (see IE *GNSS-NavigationModel*).  |
| ***ionosphericCarrierPhaseCorrectionDifference***This field provides the Ionospheric Carrier Phase Correction Difference (ICPCD), which is the Correction Difference for the ionospheric part calculated based on integer leveled L1 and L2 correction differences (L1CD and L2CD).L1CD, L2CD, and ICPCD are presented in meters. 'L1' below corresponds to the link indicated by the *l1* field; 'L2' below corresponds to the link indicated by the *l2* field.Scale factor 0.5 milli-meter; range ±32.767 meters. |

L1/L2 default interpretation

|  |  |  |
| --- | --- | --- |
| GNSS | *l1* | *l2* |
| GPS | L1 | L2 |
| SBAS | L1 | L5 |
| QZSS | L1 | L2 |
| Galileo | E1 | E5a |
| GLONASS | G1 | G2 |
| BDS | B1 | B2 |

**< Unchanged parts are omitted >**

#### 6.5.2.3 GNSS Assistance Data Request

#### – *A-GNSS-RequestAssistanceData*

The IE *A-GNSS-RequestAssistanceData* is used by the target device to request GNSS assistance data from a location server.

**< Unchanged parts are omitted >**

#### – *GNSS-GenericAssistDataReq*

The IE *GNSS-GenericAssistDataReq* is used by the target device to request assistance data from a location server for one or more specific GNSS (e.g., GPS, Galileo, GLONASS, BDS, etc.). The specific GNSS for which the assistance data are requested is indicated by the IE *GNSS‑ID* and (if applicable) by the IE *SBAS‑ID*. Assistance for up to 16 GNSSs can be requested.

-- ASN1START

GNSS-GenericAssistDataReq ::= SEQUENCE (SIZE (1..16)) OF GNSS-GenericAssistDataReqElement

GNSS-GenericAssistDataReqElement ::= SEQUENCE {

 gnss-ID GNSS-ID,

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

 gnss-TimeModelsReq GNSS-TimeModelListReq OPTIONAL, -- Cond TimeModReq

 gnss-DifferentialCorrectionsReq GNSS-DifferentialCorrectionsReq OPTIONAL, -- Cond DGNSS-Req

 gnss-NavigationModelReq GNSS-NavigationModelReq OPTIONAL, -- Cond NavModReq

 gnss-RealTimeIntegrityReq GNSS-RealTimeIntegrityReq OPTIONAL, -- Cond RTIReq

 gnss-DataBitAssistanceReq GNSS-DataBitAssistanceReq OPTIONAL, -- Cond DataBitsReq

 gnss-AcquisitionAssistanceReq GNSS-AcquisitionAssistanceReq OPTIONAL, -- Cond AcquAssistReq

 gnss-AlmanacReq GNSS-AlmanacReq OPTIONAL, -- Cond AlmanacReq

 gnss-UTCModelReq GNSS-UTC-ModelReq OPTIONAL, -- Cond UTCModReq

 gnss-AuxiliaryInformationReq GNSS-AuxiliaryInformationReq OPTIONAL, -- Cond AuxInfoReq

 ...,

 [[

 bds-DifferentialCorrectionsReq-r12

 BDS-DifferentialCorrectionsReq-r12

 OPTIONAL, -- Cond DBDS-Req

 bds-GridModelReq-r12 BDS-GridModelReq-r12 OPTIONAL -- Cond BDS-GridModReq

 ]],

 [[

 gnss-RTK-ObservationsReq-r15

 GNSS-RTK-ObservationsReq-r15 OPTIONAL, -- Cond RTK-OSR-Req

 glo-RTK-BiasInformationReq-r15

 GLO-RTK-BiasInformationReq-r15 OPTIONAL, -- Cond GLO-CPB-Req

 gnss-RTK-MAC-CorrectionDifferencesReq-r15

 GNSS-RTK-MAC-CorrectionDifferencesReq-r15

 OPTIONAL, -- Cond MAC-Req

 gnss-RTK-ResidualsReq-r15 GNSS-RTK-ResidualsReq-r15 OPTIONAL, -- Cond Res-Req

 gnss-RTK-FKP-GradientsReq-r15

 GNSS-RTK-FKP-GradientsReq-r15 OPTIONAL, -- Cond FKP-Req

 gnss-SSR-OrbitCorrectionsReq-r15

 GNSS-SSR-OrbitCorrectionsReq-r15

 OPTIONAL, -- Cond OC-Req

 gnss-SSR-ClockCorrectionsReq-r15

 GNSS-SSR-ClockCorrectionsReq-r15

 OPTIONAL, -- Cond CC-Req

 gnss-SSR-CodeBiasReq-r15 GNSS-SSR-CodeBiasReq-r15 OPTIONAL -- Cond CB-Req

 ]],

 [[

 navic-DifferentialCorrectionsReq-r16

 NavIC-DifferentialCorrectionsReq-r16

 OPTIONAL, -- Cond DNavIC-Req

 navic-GridModelReq-r16 NavIC-GridModelReq-r16 OPTIONAL -- Cond NavIC-GridModReq

 ]]

}

-- ASN1STOP

| Conditional presence | Explanation |
| --- | --- |
| *GNSS‑ID‑SBAS* | The field is mandatory present if the *GNSS‑ID* = *sbas*; otherwise it is not present. |
| *TimeModReq* | The field is mandatory present if the target device requests *GNSS-TimeModelList*; otherwise it is not present. |
| *DGNSS-Req* | The field is mandatory present if the target device requests *GNSS-DifferentialCorrections*; otherwise it is not present. |
| *NavModReq* | The field is mandatory present if the target device requests *GNSS-NavigationModel*; otherwise it is not present. |
| *RTIReq* | The field is mandatory present if the target device requests *GNSS-RealTimeIntegrity*; otherwise it is not present. |
| *DataBitsReq* | The field is mandatory present if the target device requests *GNSS-DataBitAssistance*; otherwise it is not present. |
| *AcquAssistReq* | The field is mandatory present if the target device requests *GNSS-AcquisitionAssistance*; otherwise it is not present. |
| *AlmanacReq* | The field is mandatory present if the target device requests *GNSS-Almanac*; otherwise it is not present. |
| *UTCModReq* | The field is mandatory present if the target device requests *GNSS-UTCModel*; otherwise it is not present. |
| *AuxInfoReq* | The field is mandatory present if the target device requests *GNSS-AuxiliaryInformation*; otherwise it is not present. |
| *DBDS-Req* | The field is mandatory present if the target device requests *BDS-DifferentialCorrections*; otherwise it is not present. This field may only be present if *gnss-ID* indicates 'bds'. |
| *BDS-GridModReq* | The field is mandatory present if the target device requests *BDS-GridModel*; otherwise it is not present. This field may only be present if *gnss-ID* indicates 'bds'. |
| *RTK-OSR-Req* | The field is mandatory present if the target device requests *GNSS-RTK-Observations*; otherwise it is not present. |
| *GLO-CPB-Req* | The field is mandatory present if the target device requests *GLO-RTK-BiasInformation*; otherwise it is not present. |
| *MAC-Req* | The field is mandatory present if the target device requests *GNSS‑RTK‑MAC‑CorrectionDifferences*; otherwise it is not present. |
| *Res-Req* | The field is mandatory present if the target device requests *GNSS-RTK-Residuals*; otherwise it is not present. |
| *FKP-Req* | The field is mandatory present if the target device requests *GNSS-RTK-FKP-Gradients*; otherwise it is not present. |
| *OC-Req* | The field is mandatory present if the target device requests *GNSS-SSR-OrbitCorrections*; otherwise it is not present. |
| *CC-Req* | The field is mandatory present if the target device requests *GNSS-SSR-ClockCorrections*; otherwise it is not present. |
| *CB-Req* | The field is mandatory present if the target device requests *GNSS-SSR-CodeBias*; otherwise it is not present. |
| *DNavIC-Req* | The field is mandatory present if the target device requests the *NavIC-DifferentialCorrections*; otherwise it is not present. This field may only be present if the *gnss-ID* indicates ‘navic’. |
| *NavIC-GridModReq* | The field is mandatory present if the target device requests *NavIC-GridModel*; otherwise it is not present. This field may only be present if the *gnss-ID* indicates ‘navic’. |

**< Unchanged parts are omitted >**

#### 6.5.2.4 GNSS Assistance Data Request Elements

**< Unchanged parts are omitted >**

#### – *GNSS-NavigationModelReq*

The IE *GNSS-NavigationModelReq*is used by the target device to request the *GNSS-NavigationModel* assistance from the location server.

-- ASN1START

GNSS-NavigationModelReq ::= CHOICE {

 storedNavList StoredNavListInfo,

 reqNavList ReqNavListInfo,

 ...

}

StoredNavListInfo ::= SEQUENCE {

 gnss-WeekOrDay INTEGER (0..4095),

 gnss-Toe INTEGER (0..255),

 t-toeLimit INTEGER (0..15),

 satListRelatedDataList SatListRelatedDataList OPTIONAL,

 ...

}

SatListRelatedDataList ::= SEQUENCE (SIZE (1..64)) OF SatListRelatedDataElement

SatListRelatedDataElement ::= SEQUENCE {

 svID SV-ID,

 iod BIT STRING (SIZE(11)),

 clockModelID INTEGER (1..8) OPTIONAL,

orbitModelID INTEGER (1..8) OPTIONAL,

 ...

}

ReqNavListInfo ::= SEQUENCE {

 svReqList BIT STRING (SIZE (64)),

 clockModelID-PrefList SEQUENCE (SIZE (1..8)) OF INTEGER (1..8) OPTIONAL,

 orbitModelID-PrefList SEQUENCE (SIZE (1..8)) OF INTEGER (1..8) OPTIONAL,

 addNavparamReq BOOLEAN OPTIONAL, -- Cond orbitModelID-2

 ...

}

-- ASN1STOP

| Conditional presence | Explanation |
| --- | --- |
| *orbitModelID-2* | The field is mandatory present if *orbitModelID-PrefList* is absent or includes a Model-ID = '2'; otherwise it is not present. |

| *GNSS-NavigationModelReq*field descriptions |
| --- |
| ***storedNavList***This list provides information to the location server about which *GNSS-NavigationModel* data the target device has currently stored for the particular GNSS indicated by *GNSS-ID*.  |
| ***reqNavList***This list provides information to the location server which *GNSS-NavigationModel* data are requested by the target device. |
| ***gnss-WeekOrDay***If *GNSS-ID* does not indicate 'glonass', this field defines the GNSS Week number of the assistance currently held by the target device.If *GNSS-ID* is set to 'glonass', this field defines the calendar number of day within the four-year interval starting from 1st of January in a leap year, as defined by the parameter NT in [9] of the assistance currently held by the target device. |
| ***gnss-Toe***If *GNSS-ID* does not indicate 'glonass', this field defines the GNSS time of ephemeris in hours of the latest ephemeris set contained by the target device.If *GNSS-ID* is set to 'glonass', this field defines the time of ephemeris in units of 15 minutes of the latest ephemeris set contained by the target device (range 0 to 95 representing time values between 0 and 1425 minutes). In this case, values 96 to 255 shall not be used by the sender. |
| ***t-toeLimit***If *GNSS-ID* does not indicate 'glonass', this IE defines the ephemeris age tolerance of the target device in units of hours.If *GNSS-ID* is set to 'glonass', this IE defines the ephemeris age tolerance of the target device in units of 30 minutes.  |
| ***satListRelatedDataList***This list defines the clock and orbit models currently held by the target device for each SV. This field is not included if the target device does not have any stored clock and orbit models for any SV. |
| ***svID***This field identifies the particular GNSS satellite. |
| ***iod***This field identifies the issue of data currently held by the target device. |
| ***clockModelID, orbitModelID***These fields define the clock and orbit model number currently held by the target device. If these fields are absent, the default interpretation of the table GNSS-ID to clockModelID & orbitModelID relation below applies.  |
| ***svReqList***This field defines the SV for which the navigation model assistance is requested. Each bit position in this BIT STRING represents a *SV-ID*. Bit 0 represents *SV-ID*=0 and bit 63 represents *SV-ID*=63. A one-value at a bit position means the navigation model data for the corresponding *SV-ID* is requested, a zero-value means not requested. |
| ***clockModelIDPrefList, orbitModelID-PrefList***These fields define the Model-IDs of the clock and orbit models that the target device wishes to obtain in the order of preference. The first Model-ID in the list is the most preferred model, the second Model-ID the second most preferred, etc. If these fields are absent, the default interpretation of the table GNSS-ID to clockModelID-PrefList & orbitModelIDPrefList relation below applies.  |
| ***addNavparamReq***This field specifies whether the location server is requested to include the *addNAVparam* fields in *GNSS-NavigationModel* IE (*NavModel-NAVKeplerianSet* field) or not. TRUE means requested.  |

GNSS-ID to clockModelID & orbitModelID relation

|  |  |  |
| --- | --- | --- |
| *GNSS-ID* | *clockModelID* | *orbitModelID* |
| gps | 2 | 2 |
| sbas | 5 | 5 |
| qzss | 2 | 2 |
| galileo | 1 | 1 |
| glonass | 4 | 4 |
| bds | 6 | 6 |
| navic | 8 | 8 |

GNSS-ID to clockModelID-PrefList & orbitModelID-PrefList relation

|  |  |  |
| --- | --- | --- |
| *GNSS-ID* | *clockModelID-PrefList* | *orbitModelID-PrefList* |
| gps | Model-2 | Model-2 |
| sbas | Model-5 | Model-5 |
| qzss | Model-2 | Model-2 |
| galileo | Model-1 | Model-1 |
| glonass | Model-4 | Model-4 |
| bds | Model-6 | Model-6 |
| navic | Model-8 | Model-8 |

#### – *GNSS-RealTimeIntegrityReq*

The IE *GNSS-RealTimeIntegrityReq*is used by the target device to request the *GNSS-RealTimeIntegrity*assistancefrom the location server.

-- ASN1START

GNSS-RealTimeIntegrityReq ::= SEQUENCE {

 ...

}

-- ASN1STOP

#### – *GNSS-DataBitAssistanceReq*

The IE *GNSS-DataBitAssistanceReq*is used by the target device to request the *GNSS-DataBitAssistance*assistancefrom the location server.

-- ASN1START

GNSS-DataBitAssistanceReq ::= SEQUENCE {

 gnss-TOD-Req INTEGER (0..3599),

 gnss-TOD-FracReq INTEGER (0..999) OPTIONAL,

 dataBitInterval INTEGER (0..15),

 gnss-SignalType GNSS-SignalIDs,

 gnss-DataBitsReq GNSS-DataBitsReqSatList OPTIONAL,

 ...

}

GNSS-DataBitsReqSatList ::= SEQUENCE (SIZE(1..64)) OF GNSS-DataBitsReqSatElement

GNSS-DataBitsReqSatElement ::= SEQUENCE {

 svID SV-ID,

 ...

}

-- ASN1STOP

| *GNSS-DataBitAssistanceReq*field descriptions |
| --- |
| ***gnss-TOD-Req***This field specifies the reference time for the first data bit requested in GNSS specific system time, modulo 1 hour.Scale factor 1 second. |
| ***gnss-TOD-FracReq***This field specifies the fractional part of *gnss-TOD-Req* in 1-milli‑second resolution.Scale factor 1 millisecond. |
| ***dataBitInterval***This field specifies the time length for which the Data Bit Assistance is requested. The *GNSS-DataBitAssistance* shall be relative to the time interval (*gnss-TOD-Req*, *gnss-TOD-Req* + *dataBitInterval*).The *dataBitIntervalr*, expressed in seconds, is mapped to a binary number K with the following formula: *r* =0.1 × 2 KValue K=15 means that the time interval is not specified. |
| ***gnss-SignalType***This field specifies the GNSS Signal(s) for which the *GNSS-DataBitAssistance* are requested. A one‑value at a bit position means *GNSS-DataBitAssistance* for the specific signal is requested; a zero‑value means not requested.  |
| ***gnss-DataBitsReq***This list contains the SV-IDs for which the *GNSS-DataBitAssistance* is requested. |

#### – *GNSS-AcquisitionAssistanceReq*

The IE *GNSS-AcquisitionAssistanceReq*is used by the target device to request the *GNSS-AcquisitionAssistance*assistancefrom the location server.

-- ASN1START

GNSS-AcquisitionAssistanceReq ::= SEQUENCE {

 gnss-SignalID-Req GNSS-SignalID,

 ...

}

-- ASN1STOP

| *GNSS-AcquisitionAssistanceReq*field descriptions |
| --- |
| ***gnss-SignalID-Req***This field specifies the GNSS signal type for which *GNSSAcquisitionAssistance* is requested. |

#### – *GNSS-AlmanacReq*

The IE *GNSS-AlmanacReq*is used by the target device to request the *GNSS-Almanac*assistancefrom the location server.

-- ASN1START

GNSS-AlmanacReq ::= SEQUENCE {

 modelID INTEGER(1..8) OPTIONAL,

 ...

}

-- ASN1STOP

| *GNSS-AlmanacReq*field descriptions |
| --- |
| ***modelID***This field specifies the Almanac Model ID requested. If this field is absent, the default interpretation as in the table GNSS-ID to modelID relation below applies. |

GNSS-ID to modelID relation

|  |  |
| --- | --- |
| *GNSS-ID* | *modelID* |
| gps | 2 |
| sbas | 6 |
| qzss | 2 |
| galileo | 1 |
| glonass | 5 |
| bds | 7 |
| navic | 8 |

#### – *GNSS-UTC-ModelReq*

The IE *GNSS-UTC-ModelReq*is used by the target device to request the *GNSS-UTC-Model*assistancefrom the location server.

-- ASN1START

GNSS-UTC-ModelReq ::= SEQUENCE {

 modelID INTEGER(1..8) OPTIONAL,

 ...

}

-- ASN1STOP

| *GNSS-UTC-ModelReq*field descriptions |
| --- |
| ***modelID***This field specifies the *GNSS-UTCModel* set requested. If this field is absent, the default interpretation as in the table GNSS-ID to modelID relation below applies. |

GNSS-ID to modelID relation

|  |  |
| --- | --- |
| *GNSS-ID* | *modelID* |
| gps | 1 |
| sbas | 4 |
| qzss | 1 |
| galileo | 1 |
| glonass | 3 |
| bds | 5 |
| navic | 2 |

**< Unchanged parts are omitted >**

#### – *NavIC-DifferentialCorrectionsReq*

The IE *NavIC-DifferentialCorrectionsReq* is used by the target device to request the NavIC*-DifferentialCorrections* assistance from the location server.

-- ASN1START

NavIC-DifferentialCorrectionsReq-r16 ::= SEQUENCE {

 dgnss-SignalsReq-r16 GNSS-SignalIDs-r16,

 ...

}

-- ASN1STOP

| *NavIC-DifferentialCorrectionsReq*field descriptions |
| --- |
| ***dgnss-SignalsReq***This field specifies the NavIC Signal(s) for which the *NavIC-DifferentialCorrections* are requested. A one‑value at a bit position means the NavIC differential corrections for the specific signal are requested; a zero‑value means not requested. The target device shall set a maximum of three bits to value 'one'. |

#### – *NavIC-GridModelReq*

The IE *NavIC-GridModelReq* is used by the target device to request the *NavIC-GridModel* assistance from the location server.

-- ASN1START

NavIC-GridModelReq-r16 ::= SEQUENCE {

 ...

}

-- ASN1STOP

**< Unchanged parts are omitted >**

#### 6.5.2.10 GNSS Capability Information Elements

#### – *GNSS-CommonAssistanceDataSupport*

The IE *GNSS-CommonAssistanceDataSupport* is used by the target device to provide information on supported GNSS common assistance data types to the location server.

**< Unchanged parts are omitted >**

#### – *GNSS-GenericAssistanceDataSupport*

The IE *GNSS-GenericAssistanceDataSupport*is used by the target device to provide information on supported GNSS generic assistance data types to the location server for each supported GNSS.

-- ASN1START

GNSS-GenericAssistanceDataSupport ::=

 SEQUENCE (SIZE (1..16)) OF GNSS-GenericAssistDataSupportElement

GNSS-GenericAssistDataSupportElement ::= SEQUENCE {

 gnss-ID GNSS-ID,

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

 gnss-TimeModelsSupport GNSS-TimeModelListSupport

 OPTIONAL, -- Cond TimeModSup

 gnss-DifferentialCorrectionsSupport GNSS-DifferentialCorrectionsSupport

 OPTIONAL, -- Cond DGNSS-Sup

 gnss-NavigationModelSupport GNSS-NavigationModelSupport

 OPTIONAL, -- Cond NavModSup

 gnss-RealTimeIntegritySupport GNSS-RealTimeIntegritySupport

 OPTIONAL, -- Cond RTISup

 gnss-DataBitAssistanceSupport GNSS-DataBitAssistanceSupport

 OPTIONAL, -- Cond DataBitsSup

 gnss-AcquisitionAssistanceSupport GNSS-AcquisitionAssistanceSupport

 OPTIONAL, -- Cond AcquAssistSup

 gnss-AlmanacSupport GNSS-AlmanacSupport

 OPTIONAL, -- Cond AlmanacSup

 gnss-UTC-ModelSupport GNSS-UTC-ModelSupport

 OPTIONAL, -- Cond UTCModSup

 gnss-AuxiliaryInformationSupport GNSS-AuxiliaryInformationSupport

 OPTIONAL, -- Cond AuxInfoSup

 ...,

 [[

 bds-DifferentialCorrectionsSupport-r12

 BDS-DifferentialCorrectionsSupport-r12

 OPTIONAL, -- Cond DBDS-Sup

 bds-GridModelSupport-r12 BDS-GridModelSupport-r12

 OPTIONAL -- Cond BDS-GridModSup

 ]],

 [[

 gnss-RTK-ObservationsSupport-r15

 GNSS-RTK-ObservationsSupport-r15

 OPTIONAL, -- Cond RTK-OSR-Sup

 glo-RTK-BiasInformationSupport-r15

 GLO-RTK-BiasInformationSupport-r15

 OPTIONAL, -- Cond GLO-CPB-Sup

 gnss-RTK-MAC-CorrectionDifferencesSupport-r15

 GNSS-RTK-MAC-CorrectionDifferencesSupport-r15

 OPTIONAL, -- Cond MAC-Sup

 gnss-RTK-ResidualsSupport-r15 GNSS-RTK-ResidualsSupport-r15

 OPTIONAL, -- Cond Res-Sup

 gnss-RTK-FKP-GradientsSupport-r15

 GNSS-RTK-FKP-GradientsSupport-r15

 OPTIONAL, -- Cond FKP-Sup

 gnss-SSR-OrbitCorrectionsSupport-r15

 GNSS-SSR-OrbitCorrectionsSupport-r15

 OPTIONAL, -- Cond OC-Sup

 gnss-SSR-ClockCorrectionsSupport-r15

 GNSS-SSR-ClockCorrectionsSupport-r15

 OPTIONAL, -- Cond CC-Sup

 gnss-SSR-CodeBiasSupport-r15 GNSS-SSR-CodeBiasSupport-r15

 OPTIONAL -- Cond CB-Sup

 ]],

 [[

 navic-DifferentialCorrectionsSupport-r16

 NavIC-DifferentialCorrectionsSupport-r16

 OPTIONAL, -- Cond DNavIC-Sup

 navic-GridModelSupport-r16 NavIC-GridModelSupport-r16

 OPTIONAL -- Cond NavIC-GridModSup

 ]]

}

-- ASN1STOP

| Conditional presence | Explanation |
| --- | --- |
| *GNSS‑ID‑SBAS* | The field is mandatory present if the *GNSS‑ID* = *sbas*; otherwise it is not present. |
| *TimeModSup* | The field is mandatory present if the target device supports *GNSS-TimeModelList*; otherwise it is not present. |
| *DGNSS-Sup* | The field is mandatory present if the target device supports *GNSS-DifferentialCorrections*; otherwise it is not present. |
| *NavModSup* | The field is mandatory present if the target device supports *GNSS-NavigationModel*; otherwise it is not present. |
| *RTISup* | The field is mandatory present if the target device supports *GNSS-RealTimeIntegrity*; otherwise it is not present. |
| *DataBitsSup* | The field is mandatory present if the target device supports *GNSS-DataBitAssistance*; otherwise it is not present. |
| *AcquAssistSup* | The field is mandatory present if the target device supports *GNSS-AcquisitionAssistance*; otherwise it is not present. |
| *AlmanacSup* | The field is mandatory present if the target device supports *GNSS-Almanac*; otherwise it is not present. |
| *UTCModSup* | The field is mandatory present if the target device supports *GNSS-UTC-Model*; otherwise it is not present. |
| *AuxInfoSup* | The field is mandatory present if the target device supports *GNSS-AuxiliaryInformation*; otherwise it is not present. |
| *DBDS-Sup* | The field is mandatory present if the target device supports *BDS-DifferentialCorrections*; otherwise it is not present. This field may only be present if *gnss-ID* indicates 'bds'. |
| *BDS-GridModSup* | The field is mandatory present if the target device supports *BDS-GridModel*; otherwise it is not present. This field may only be present if *gnss-ID* indicates 'bds'. |
| *RTK-OSR-Sup* | The field is mandatory present if the target device supports *GNSS-RTK-Observations*; otherwise it is not present. Note, support for *GNSS-RTK-Observations* implies support for *GNSS-RTK-CommonObservationInfo* as well. |
| *GLO-CPB-Sup* | The field is mandatory present if the target device supports *GLO‑RTK‑BiasInformation*; otherwise it is not present. This field may only be present if *gnss-ID* indicates 'glonass'. |
| *MAC-Sup* | The field is mandatory present if the target device supports *GNSS‑RTK‑MAC‑CorrectionDifferences*; otherwise it is not present. |
| *Res-Sup* | The field is mandatory present if the target device supports *GNSS‑RTK‑Residuals*; otherwise it is not present. |
| *FKP-Sup* | The field is mandatory present if the target device supports *GNSS‑RTK‑FKP‑Gradients*; otherwise it is not present. |
| *OC-Sup* | The field is mandatory present if the target device supports *GNSS‑SSR‑OrbitCorrections*; otherwise it is not present. |
| *CC-Sup* | The field is mandatory present if the target device supports *GNSS‑SSR‑ClockCorrections*; otherwise it is not present. |
| *CB-Sup* | The field is mandatory present if the target device supports *GNSS‑SSR‑CodeBias*; otherwise it is not present. |
| *DNavIC-Sup* | The field is mandatory present if the target device supports the *NavIC-DifferentialCorrections*; otherwise it is not present. This field may only be present if the *gnss-ID* indicates ‘navic’. |
| *NavIC-GridModSup* | The field is mandatory present if the target device supports the *NavIC-GridModel*; otherwise it is not present. This field may only be present if the *gnss-ID* indicates ‘navic’. |

**< Unchanged parts are omitted >**

#### – *NavIC-DifferentialCorrectionsSupport*

-- ASN1START

NavIC-DifferentialCorrectionsSupport-r16 ::= SEQUENCE {

 gnssSignalIDs GNSS-SignalIDs,

 ...

}

-- ASN1STOP

| *NavIC-DifferentialCorrectionsSupport* field descriptions |
| --- |
| ***gnssSignalIDs***This field specifies the NavIC signal types for which differential corrections are supported by the target device. This is represented by a bit string in *GNSS-SignalIDs*, with a one‑value at the bit position means differential corrections for the particular NavIC signal type is supported; a zero‑value means not supported. |

#### – *NavIC-GridModelSupport*

-- ASN1START

NavIC-GridModelSupport-r16 ::= SEQUENCE {

 ...

}

-- ASN1STOP

**< Unchanged parts are omitted >**

#### – *GNSS-NavigationModelSupport*

-- ASN1START

GNSS-NavigationModelSupport ::= SEQUENCE {

 clockModel BIT STRING { model-1 (0),

 model-2 (1),

 model-3 (2),

 model-4 (3),

 model-5 (4),

 model-6 (5),

 model-8-r16 (7) } (SIZE (1..8)) OPTIONAL,

 orbitModel BIT STRING { model-1 (0),

 model-2 (1),

 model-3 (2),

 model-4 (3),

 model-5 (4),

 model-6 (5),

 model-8-r16 (7) } (SIZE (1..8)) OPTIONAL,

 ...

}

-- ASN1STOP

| *GNSS-NavigationModelSupport* field descriptions |
| --- |
| ***clockModel***This field specifies the *gnss-ClockModel* choice(s) in *GNSS-NavigationModel* IE 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 clock model is supported; a zero‑value means not supported.If the target device supports GPS and *GNSS-NavigationModel* assistance, it shall support *clockModel* Model-2.If the target device supports SBAS and *GNSS-NavigationModel* assistance, it shall support *clockModel* Model-5.If the target device supports QZSS and *GNSS-NavigationModel* assistance, it shall support *clockModel* Model-2.If the target device supports Galileo and *GNSS-NavigationModel* assistance, it shall support *clockModel* Model-1.If the target device supports GLONASS and *GNSS-NavigationModel* assistance, it shall support *clockModel* Model-4.If the target device supports BDS and *GNSS-NavigationModel* assistance, it shall support *clockModel* Model-6.If the target device supports NavIC and *GNSS-NavigationModel* assistance, it shall support *clockModel* Model-8.If this field is absent, the target device supports the mandatory (native) *clockModel* choice only as listed above for the GNSS indicated by *GNSS‑ID*.  |
| ***orbitModel***This field specifies the *gnss-OrbitModel* choice(s) in *GNSS-NavigationModel* IE 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 orbit model is supported; a zero‑value means not supported.If the target device supports GPS and *GNSS-NavigationModel* assistance, it shall support *orbitModel* Model-2.If the target device supports SBAS and *GNSS-NavigationModel* assistance, it shall support *orbitModel* Model-5.If the target device supports QZSS and *GNSS-NavigationModel* assistance, it shall support *orbitModel* Model-2.If the target device supports Galileo and *GNSS-NavigationModel* assistance, it shall support*orbitModel* Model-1.If the target device supports GLONASS and *GNSS-NavigationModel* assistance, it shall support *orbitModel* Model-4.If the target device supports BDS and *GNSS-NavigationModel* assistance, it shall support *orbitModel* Model-6.If the target device supports NavIC and *GNSS-NavigationModel* assistance, it shall support *orbitModel* Model-8.If this field is absent, the target device supports the mandatory (native) *orbitModel* choice only as listed above for the GNSS indicated by *GNSS‑ID*. |

#### 6.5.2.13 Common GNSS Information Elements

#### – *GNSS-FrequencyID*

The IE *GNSS-FrequencyID* is used to indicate a specific GNSS link/frequency. The interpretation of *GNSS‑FrequencyID*depends on the *GNSS‑ID.*

-- ASN1START

GNSS-FrequencyID-r15 ::= SEQUENCE {

 gnss-FrequencyID-r15 INTEGER (0 .. 7),

 ...

}

-- ASN1STOP

| *GNSS-FrequencyID* field descriptions |
| --- |
| ***gnss-FrequencyID***This field specifies a particular GNSS link/frequency. The interpretation of *gnss-FrequencyID* depends on the *GNSS‑ID* and is as shown in the table Value & Explanation relation below. |

Value & Explanation relation

|  |  |  |
| --- | --- | --- |
| System | Value | Explanation |
| Link | Centre Frequency[MHz] |
| GPS | 0 | L1 | 1575.42 |
| 1 | L2 | 1227.60 |
| 2 | L5 | 1176.45 |
| 3-7 | reserved |
| SBAS | 0 | L1 | 1575.42 |
| 1 | L5 | 1176.45 |
| 2-7 | reserved |
| QZSS | 0 | L1 | 1575.42 |
| 1 | L2 | 1227.60 |
| 2 | L5 | 1176.45 |
| 3-7 | Reserved |
| GLONASSk = -7..13 | 0 | G1 | 1602+k×0.5625 |
| 1 | G2 | 1246+k×0.4375 |
| 2 | G3 | 1202.025 |
| 3-7 | Reserved |
| Galileo | 0 | E1 | 1575.420 |
| 1 | E6 | 1278.750 |
| 2 | E5a | 1176.450 |
| 3 | E5b | 1207.140 |
| 4 | E5 | 1191.795 |
|  | 5-7 | reserved |
| BDS | 0 | B1 (Phase II) | 1561.098 |
| 1 | B1 (Phase III) | 1575.420 |
| 2 | B2 | 1207.140 |
|  | 3 | B3 | 1268.520 |
|  | 4-7 | reserved |
| NavIC | 0 | L5 | 1176.450 |
|  | 1-7 | reserved |

#### – *GNSS-ID*

The IE *GNSS-ID* is used to indicate a specific GNSS.

-- ASN1START

GNSS-ID ::= SEQUENCE {

 gnss-id ENUMERATED{ gps, sbas, qzss, galileo, glonass, ..., bds, navic-v16xy },

 ...

}

-- ASN1STOP

#### – *GNSS-ID-Bitmap*

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

-- ASN1START

GNSS-ID-Bitmap ::= SEQUENCE {

 gnss-ids BIT STRING { gps (0),

 sbas (1),

 qzss (2),

 galileo (3),

 glonass (4),

 bds (5),

 navic-v16xy (6) } (SIZE (1..16)),

 ...

}

-- ASN1STOP

| *GNSS-ID-Bitmap* field descriptions |
| --- |
| ***gnss‑ids***This field specifies the GNSS(s). This is represented by a bit string, with a one‑value at the bit position means the particular GNSS is addressed; a zero‑value means not addressed. |

#### – *GNSS-Link-CombinationsList*

-- ASN1START

GNSS-Link-CombinationsList-r15 ::= SEQUENCE (SIZE(1..8)) OF GNSS-Link-Combinations-r15

GNSS-Link-Combinations-r15 ::= SEQUENCE {

 l1-r15 GNSS-FrequencyID-r15,

 l2-r15 GNSS-FrequencyID-r15,

 ...

}

-- ASN1STOP

#### – *GNSS-NavListInfo*

-- ASN1START

GNSS-NavListInfo-r15 ::= SEQUENCE (SIZE (1..64)) OF SatListElement-r15

SatListElement-r15 ::= SEQUENCE {

 svID-r15 SV-ID,

 iod-r15 BIT STRING (SIZE(11)),

 ...

}

-- ASN1STOP

#### – *GNSS-NetworkID*

The IE *GNSS-NetworkID* defines the reference network and the source of the particular set of reference stations and their observation information. This IE is used for MAC Network RTK as described in [30].

-- ASN1START

GNSS-NetworkID-r15 ::= SEQUENCE {

 networkID-r15 INTEGER (0..255),

 ...

}

-- ASN1STOP

#### – *GNSS-PeriodicControlParam*

The IE *GNSS-PeriodicControlParam* is used to specify control parameters for a periodic assistance data delivery.

-- ASN1START

GNSS-PeriodicControlParam-r15 ::= SEQUENCE {

 deliveryAmount-r15 INTEGER (1..32),

 deliveryInterval-r15 INTEGER (1..64),

 ...

}

-- ASN1STOP

| *GNSS-PeriodicControlParam* field descriptions |
| --- |
| ***deliveryAmount***This field specifies the number of periodic assistance data deliveries. Integer values *N*=1…31 correspond to an amount of 2*N*. Integer value *N*=32 indicates an 'infinite/indefinite' amount, which means that the assistance data delivery should continue until a LPP *Abort* message is received.  |
| ***deliveryInterval***This field specifies the interval between assistance data deliveries in seconds.  |

#### – *GNSS-ReferenceStationID*

The IE *GNSS-ReferenceStationID* is used to identify a specific GNSS Reference Station.

-- ASN1START

GNSS-ReferenceStationID-r15 ::= SEQUENCE {

 referenceStationID-r15 INTEGER (0..65535),

 providerName-r15 VisibleString (SIZE (1..32)) OPTIONAL,

 ...

}

-- ASN1STOP

| *GNSS-ReferenceStationID* field descriptions |
| --- |
| ***referenceStationID***This field provides the reference station identity.  |
| ***providerName***This field is associated to a GNSS correction data provider to ensure that the *referenceStationID*'s are unique from a target device perspective. |

#### – *GNSS-SignalID*

The IE *GNSS-SignalID* is used to indicate a specific GNSS signal type. The interpretation of *GNSS-SignalID*depends on the *GNSS‑ID.*

-- ASN1START

GNSS-SignalID ::= SEQUENCE {

 gnss-SignalID INTEGER (0 .. 7),

 ...,

 [[

 gnss-SignalID-Ext-r15 INTEGER (8..23) OPTIONAL

 ]]

}

-- ASN1STOP

| *GNSS-SignalID* field descriptions |
| --- |
| ***gnss-SignalID, gnss-SignalID-Ext***This field specifies a particular GNSS signal. The interpretation of *gnss-SignalID* and *gnss-SignalID-Ext* depends on the *GNSS‑ID* and is as shown in the table System to Value & Explanation relation below.If the field *gnss-SignalID-Ext* is present, the *gnss-SignalID* should be set to value 7 and shall be ignored by the receiver. |

System to Value & Explanation relation

|  |  |  |
| --- | --- | --- |
| System | Value | Explanation |
| GPS | 0 | GPS L1 C/A |
| 1 | GPS L1C |
| 2 | GPS L2C |
| 3 | GPS L5 |
| 4 | GPS L1 P |
| 5 | GPS L1 Z-tracking |
| 6 | GPS L2 C/A |
| 7 | GPS L2 P |
| 8 | GPS L2 Z-tracking |
| 9 | GPS L2 L2C(M) |
| 10 | GPS L2 L2C(L) |
| 11 | GPS L2 L2C(M+L) |
| 12 | GPS L5 I |
| 13 | GPS L5 Q |
| 14 | GPS L5 I+Q |
| 15 | GPS L1 L1C(D) |
| 16 | GPS L1 L1C(P) |
| 17 | GPS L1 L1C(D+P) |
| 18-23 | Reserved |
| SBAS | 0 | L1 C/A |
| 1 | L5 I |
| 2 | L5 Q |
| 3 | L5 I+Q |
| 4-7 | Reserved |
| QZSS | 0 | QZS-L1 C/A |
| 1 | QZS-L1C |
| 2 | QZS-L2C |
| 3 | QZS-L5 |
| 4 | QZS-LEX S |
| 5 | QZS-LEX L |
| 6 | QZS-LEX S+L |
| 7 | QZS-L2 L2C(M) |
| 8 | QZS-L2 L2C(L) |
| 9 | QZS-L2 L2C(M+L) |
| 10 | QZS-L5 I |
| 11 | QZS-L5 Q |
| 12 | QZS-L5 I+Q |
| 13 | QZS L1 L1C(D) |
| 14 | QZS L1 L1C(P) |
| 15 | QZS L1 L1C(D+P) |
| 16-23 | Reserved |
| GLONASS | 0 | GLONASS G1 C/A |
| 1 | GLONASS G2 C/A |
| 2 | GLONASS G3  |
| 3 | GLONASS G1 P |
| 4 | GLONASS G2 P |
| 5-23 | Reserved |
| Galileo | 0 | Galileo E1 |
| 1 | Galileo E5A |
| 2 | Galileo E5B |
| 3 | Galileo E6 |
| 4 | Galileo E5A + E5B |
| 5 | Galileo E1 C No data |
| 6 | Galileo E1 A |
| 7 | Galileo E1 B I/NAV OS/CS/SoL |
| 8 | Galileo E1 B+C |
| 9 | Galileo E1 A+B+C |
| 10 | Galileo E6 C |
| 11 | Galileo E6 A |
| 12 | Galileo E6 B |
| 13 | Galileo E6 B+C |
| 14 | Galileo E6 A+B+C |
| 15 | Galileo E5B I |
| 16 | Galileo E5B Q |
| 17 | Galileo E5B I+Q |
| 18 | Galileo E5(A+B) I |
| 19 | Galileo E5(A+B) Q |
| 20 | Galileo E5(A+B) I+Q |
| 21 | Galileo E5A I |
| 22 | Galileo E5A Q |
| 23 | Galileo E5A I+Q |
| BDS | 0 | B1 I |
| 1 | B1 Q |
| 2 | B1 I+Q |
| 3 | B3 I |
| 4 | B3 Q |
| 5 | B3 I+Q |
| 6 | B2 I |
| 7 | B2 Q |
| 8 | B2 I+Q |
| 9-23 | Reserved |
| NavIC | 0 | NavIC L5 SPS |
| 1-23 | Reserved |

#### – *GNSS-SignalIDs*

The IE *GNSSSignal‑IDs* is used to indicate several GNSS signals using a bit map. The interpretation of *GNSSSignal‑IDs* depends on the *GNSS‑ID.*

-- ASN1START

GNSS-SignalIDs ::= SEQUENCE {

 gnss-SignalIDs BIT STRING (SIZE(8)),

 ...,

 [[

 gnss-SignalIDs-Ext-r15 BIT STRING (SIZE(16)) OPTIONAL

 ]]

}

-- ASN1STOP

| *GNSS-SignalIDs* field descriptions |
| --- |
| ***gnss-SignalIDs, gnss-SignalIDs-Ext***This field specifies one or several GNSS signals using a bit map. A one‑value at the bit position means the particular signal is addressed; a zero‑value at the particular bit position means the signal is not addressed. The interpretation of the bit map in *gnssSignalIDs* and *gnss-SignalIDs-Ext* depends on the *GNSS‑ID* and is shown in the table below.Unfilled table entries indicate no assignment and shall be set to zero. |

interpretation of the bit map in *gnssSignalIDs*

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| GNSS  | Bit 1(MSB) | Bit 2 | Bit 3 | Bit 4 | Bit 5 | Bit 6 | Bit 7 | Bit 8(LSB) |
| GPS | L1 C/A | L1C | L2C | L5 | L1P | L1 Z | L2 C/A | L2 P |
| SBAS | L1 C/A |  L5 I | L5 Q | L5 I+Q |  |  |  |  |
| QZSS | QZS-L1 C/A | QZS-L1C | QZS-L2C | QZS-L5 | LEX S | LEX L | LEX S+L | L2C(M) |
| GLONASS | G1 C/A | G2 C/A | G3 | G1 P | G2 P |  |  |  |
| Galileo | E1 | E5a | E5b | E6 | E5a+E5b | E1 C No Data | E1 A | E1 B I/NAV OS/CS/SoL |
| BDS | B1 I | B1 Q | B1 I+Q | B3 I | B3 Q | B3 I+Q | B2 I | B2 Q |
| NavIC | L5 SPS |  |  |  |  |  |  |  |

interpretation of the bit map in *gnssSignalIDs-Ext*

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| GNSS  | Bit 1(MSB) | Bit 2 | Bit 3 | Bit 4 | Bit 5 | Bit 6 | Bit 7 | Bit 8 |
| GPS | L2 Z | L2C(M) | L2C(L) | L2C(M+L) | L5 I | L5 Q | L5 I+Q | L1C(D) |
| SBAS |  |  |  |  |  |  |  |  |
| QZSS | L2C(L) | L2C(M+L) | L5 I | L5 Q | L5 I+Q | L1C(D) | L1C(P) | L1C(D+P) |
| GLONASS |  |  |  |  |  |  |  |  |
| Galileo | E1 B+C | E1 A+B+C | E6C | E6A | E6B | E6 B+C | E6 A+B+C | E5B I |
| BDS | B2 I+Q |  |  |  |  |  |  |  |
| NavIC |  |  |  |  |  |  |  |  |

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| GNSS  | Bit 9 | Bit 10 | Bit 11 | Bit 12 | Bit 13 | Bit 14 | Bit 15 | Bit 16(LSB) |
| GPS | L1C(P) | L1C(D+P) |  |  |  |  |  |  |
| SBAS |  |  |  |  |  |  |  |  |
| QZSS |  |  |  |  |  |  |  |  |
| GLONASS |  |  |  |  |  |  |  |  |
| Galileo | E5B Q | E5B I+Q | E5(A+B) I | E5(A+B) Q | E5(A+B) I+Q | E5A I | E5A Q | E5A I+Q |
| BDS |  |  |  |  |  |  |  |  |
| NavIC |  |  |  |  |  |  |  |  |

#### – *GNSS-SubNetworkID*

The IE *GNSS-SubNetworkID* defines the subnetwork of a network identified by *GNSS-NetworkID*. This IE is used for MAC Network RTK as described in [30].

-- ASN1START

GNSS-SubNetworkID-r15 ::= SEQUENCE {

 subNetworkID-r15 INTEGER (0..15),

 ...

}

-- ASN1STOP

#### – *SBAS-ID*

The IE *SBAS‑ID* is used to indicate a specific SBAS.

-- ASN1START

SBAS-ID ::= SEQUENCE {

 sbas-id ENUMERATED { waas, egnos, msas, gagan, ...},

 ...

}

-- ASN1STOP

#### – *SBAS-IDs*

The IE *SBAS‑IDs* is used to indicate several SBASs using a bit map.

-- ASN1START

SBAS-IDs ::= SEQUENCE {

 sbas-IDs BIT STRING { waas (0),

 egnos (1),

 msas (2),

 gagan (3) } (SIZE (1..8)),

 ...

}

-- ASN1STOP

| *SBAS‑IDs* field descriptions |
| --- |
| ***sbas-IDs***This field specifies one or several SBAS(s) using a bit map. A one‑value at the bit position means the particular SBAS is addressed; a zero‑value at the particular bit position means the SBAS is not addressed.  |

#### – *SV-ID*

The IE *SV‑ID* is used to indicate a specific GNSS satellite. The interpretation of *SV‑ID* depends on the *GNSS‑ID.*

-- ASN1START

SV-ID ::= SEQUENCE {

 satellite-id INTEGER(0..63),

 ...

}

-- ASN1STOP

| *SV‑ID* field descriptions |
| --- |
| ***satellite‑id***This field specifies a particular satellite within a specific GNSS. The interpretation of *satellite‑id* depends on the *GNSS‑ID* see the table below. |

interpretation of *satellite‑id*

|  |  |  |
| --- | --- | --- |
| System | Value of *satellite‑id* | Interpretation of *satellite‑id* |
| GPS | '0' – '62''63' | Satellite PRN Signal No. 1 to 63Reserved |
| SBAS | '0' – '38''39' – '63' | Satellite PRN Signal No. 120 to 158Reserved |
| QZSS | '0' – '4''5 – '63' | Satellite PRN Signal No. 193 to 197Reserved |
| GLONASS | '0' – '23''24 – '63' | Slot Number 1 to 24Reserved |
| Galileo | '0' – '35''36' – '63' | Code No. 1 to 36Reserved |
| BDS | '0' – '36''37' – '63' | Satellite ranging code number signal No.1 to 37 [23]Reserved |
| NavIC | ‘0’ – ‘13’‘14’–‘63’ | Satellite PRN Signal No. 1 to 14 Reserved |

----------------------------the next change----------------------

## 7.2 Mapping of *posSibType* to assistance data element

The supported *posSibType*'s are specified in Table 7.2-1. The GNSS Common and Generic Assistance Data IEs are defined in clause 6.5.2.2. The OTDOA Assistance Data IEs are defined in clause 7.4.2.

Table 7.2-1: Mapping of posSibType to assistanceDataElement

|  |  |  |
| --- | --- | --- |
|  | *posSibType* [12] | *assistanceDataElement* |
| GNSS Common Assistance Data (clause 6.5.2.2) | *posSibType1-1* | *GNSS-ReferenceTime* |
| *posSibType1-2* | *GNSS-ReferenceLocation* |
| *posSibType1-3* | *GNSS-IonosphericModel* |
| *posSibType1-4* | *GNSS-EarthOrientationParameters* |
| *posSibType1-5* | *GNSS-RTK-ReferenceStationInfo* |
| *posSibType1-6* | *GNSS-RTK-CommonObservationInfo* |
| *posSibType1-7* | *GNSS-RTK-AuxiliaryStationData* |
| GNSS Generic Assistance Data (clause 6.5.2.2) | *posSibType2-1* | *GNSS-TimeModelList* |
| *posSibType2-2* | *GNSS-DifferentialCorrections* |
| *posSibType2-3* | *GNSS-NavigationModel* |
| *posSibType2-4* | *GNSS-RealTimeIntegrity* |
| *posSibType2-5* | *GNSS-DataBitAssistance* |
| *posSibType2-6* | *GNSS-AcquisitionAssistance* |
| *posSibType2-7* | *GNSS-Almanac* |
| *posSibType2-8* | *GNSS-UTC-Model* |
| *posSibType2-9* | *GNSS-AuxiliaryInformation* |
| *posSibType2-10* | *BDS-DifferentialCorrections* |
| *posSibType2-11* | *BDS-GridModelParameter* |
| *posSibType2-12* | *GNSS-RTK-Observations* |
| *posSibType2-13* | *GLO-RTK-BiasInformation* |
| *posSibType2-14* | *GNSS-RTK-MAC-CorrectionDifferences* |
| *posSibType2-15* | *GNSS-RTK-Residuals* |
| *posSibType2-16* | *GNSS-RTK-FKP-Gradients* |
| *posSibType2-17* | *GNSS-SSR-OrbitCorrections* |
| *posSibType2-18* | *GNSS-SSR-ClockCorrections* |
| *posSibType2-19* | *GNSS-SSR-CodeBias* |
| *posSibType2-24* | *NavIC-DifferentialCorrections* |
| *posSibType2-25* | *NavIC-GridModelParameter* |
| OTDOA Assistance Data (clause 7.4.2) | *posSibType3-1* | *OTDOA-UE-Assisted* |

----------------------------End of change----------------------