**3GPP TSG-RAN2 Meeting # 109-e *R2-2000239***

**Electronic meeting, Feb.24th – Mar.6th 2020**

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| *CR-Form-v12.0* |
| **CHANGE REQUEST** |
|  |
|  | **37.355** | **CR** | **0248** | **rev** | **-** | **Current version:** | **15.0.0** |  |
|  |
| *For* [***HE******LP***](http://www.3gpp.org/3G_Specs/CRs.htm#_blank)*on using this form: comprehensive instructions can be found at* [*http://www.3gpp.org/Change-Requests*](http://www.3gpp.org/Change-Requests)*.* |
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| ***Proposed change affects:*** | UICC apps |  | ME | **x** | Radio Access Network |  | Core Network | **x** |

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|  |
| ***Title:***  | Introduction of B1C signal in BDS system in A-GNSS |
|  |  |
| ***Source to WG:*** | CATT, CAICT, CMCC, China Telecom, China Unicom, Huawei, ZTE Corporation, MediaTek Inc. |
| ***Source to TSG:*** | R2 |
|  |  |
| ***Work item code:*** | TEI16 |  | ***Date:*** | 2020-1-7 |
|  |  |  |  |  |
| ***Category:*** | **B** |  | ***Release:*** | Rel-16 |
|  | *Use one of the following categories:****F*** *(correction)****A*** *(mirror corresponding to a change in an earlier release)****B*** *(addition of feature),* ***C*** *(functional modification of feature)****D*** *(editorial modification)*Detailed explanations of the above categories 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 global B1C signal in the network-assisted BDS System, as part of A-GNSS positioning methods in LTE and NR. BDS system won’t support global navigation services without B1C signal. |
|  |  |
| ***Summary of change:*** | 1. ICD specification of B1C signal in BDS B1C is added in section 2 as reference.
2. All impacted IEs have been pointed out and main parts have been changed for introducing B1C signal in section 6.5.2.
3. New klobucharModel, Clock Model, Orbit Model related IEs for B1C signal are added in section 6.5.2.2.
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| ***Consequences if not approved:*** | Network-assisted BDS positioning method can’t support global positioning.  |
|  |  |
| ***Clauses affected:*** | 2, 6.5.2.2, 6.5.2.4, 6.5.2.10, 6.5.2.13 |
|  |  |
|  | **Y** | **N** |  |  |
| ***Other specs*** | **x** |  |  Other core specifications  | TS38.305 CR0013TS36.305 CR0083 |
| ***affected:*** |  | **x** |  Test specifications | TS/TR ... CR ... |
| ***(show related CRs)*** |  | **x** |  O&M Specifications | TS/TR ... CR ... |
|  |  |
| ***Other comments:*** |  |
|  |  |
| ***This CR's revision history:*** |  |

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

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| **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

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

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

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

TECu Total Electron Content unit

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| **The next change** |

#### 6.5.2.2 GNSS Assistance Data Elements

#### – *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. Three Ionospheric Models are supported: The Klobuchar model as defined in [4], the NeQuick model as defined in [8], and the klobucharModel2 as defined in [xx] .

-- ASN1START

GNSS-IonosphericModel ::= SEQUENCE {

 klobucharModel KlobucharModelParameter OPTIONAL, -- Need ON

 neQuickModel NeQuickModelParameter OPTIONAL, -- Need ON

 ...,

 [[ klobucharModel2-r16 KlobucharModel2Parameter-r16 OPTIONAL -- Need ON

 ]]

}

-- ASN1STOP

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| **The next change** |

#### – *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 B1I, and UE shall use these parameters according to the description given in 5.2.4.7 in [23]. When *dataID* has the value ′00′ it indicates the parameters are applicable worldwide [4], [7]. All other values for *dataID* are reserved. |
| ***alpha0***This field specifies the 0 parameter of the Klobuchar model, as specified in [4], [23].Scale factor 2-30 seconds. |
| ***alpha1***This field specifies the 1 parameter of the Klobuchar model, as specified in [4], [23].Scale factor 2-27 seconds/semi-circle. |
| ***alpha2***This field specifies the 2 parameter of the Klobuchar model, as specified in [4], [23].Scale factor 2-24 seconds/semi-circle2. |
| ***alpha3***This field specifies the 3 parameter of the Klobuchar model, as specified in [4], [23].Scale factor 2-24 seconds/semi-circle3. |
| ***beta0***This field specifies the 0 parameter of the Klobuchar model, as specified in [4], [23].Scale factor 211 seconds. |
| ***beta1***This field specifies the 1 parameter of the Klobuchar model, as specified in [4], [23].Scale factor 214 seconds/semi-circle. |
| ***beta2***This field specifies the 2 parameter of the Klobuchar model, as specified in [4], [23].Scale factor 216 seconds/semi-circle2. |
| ***beta3***This field specifies the 3 parameter of the Klobuchar model, as specified in [4], [23].Scale factor 216 seconds/semi-circle3. |

#### – *KlobucharModel2Parameter*

-- ASN1START

KlobucharModel2Parameter-r16 ::= SEQUENCE {

 alfa1-r16 INTEGER (0..1023),

 alfa2-r16 INTEGER (-128..127),

 alfa3-r16 INTEGER (0..255),

 alfa4-r16 INTEGER (0..255),

 alfa5-r16 INTEGER (0..255),

 alfa6-r16 INTEGER (-128..127),

 alfa7-r16 INTEGER (-128..127),

 alfa8-r16 INTEGER (-128..127),

 alfa9-r16 INTEGER (-128..127),

 ...

}

-- ASN1STOP

| *KlobucharModel2Parameter* field descriptions |
| --- |
| ***alfa1***This field specifies the 1 parameter of the Klobuchar model, as specified in 7.8.1 in [xx].Scale factor 2-3 TECu. |
| ***alfa2***This field specifies the 2 parameter of the Klobuchar model, as specified in 7.8.1 in [xx].Scale factor 2-3 TECu. |
| ***alfa3***This field specifies the 3 parameter of the Klobuchar model, as specified in 7.8.1 in [xx].Scale factor 2-3 TECu. |
| ***alfa4***This field specifies the 4 parameter of the Klobuchar model, as specified in 7.8.1 in [xx].Scale factor 2-3 TECu. |
| ***alfa5***This field specifies the  parameter of the Klobuchar model, as specified in 7.8.1 in [xx].Scale factor -2-3 TECu. |
| ***alfa6***This field specifies the 6 parameter of the Klobuchar model, as specified in 7.8.1 in [xx].Scale factor 2-3 TECu. |
| ***alfa7***This field specifies the 7 parameter of the Klobuchar model, as specified in 7.8.1 in [xx].Scale factor 2-3 TECu. |
| ***alfa8***This field specifies the 8 parameter of the Klobuchar model, as specified in 7.8.1 in [xx].Scale factor 2-3 TECu. |
| ***alfa9***This field specifies the 9 parameter of the Klobuchar model, as specified in 7.8.1 in [xx].Scale factor 2-3 TECu. |

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#### – *GNSS-EarthOrientationParameters*

The IE *GNSS-EarthOrientationParameters* is used by the location server to provide parameters to construct the ECEF and ECI coordinate transformation as defined in [4]. The IE *GNSS-EarthOrientationParameters* indicates the relationship between the Earth′s rotational axis and WGS-84 reference system.

-- ASN1START

GNSS-EarthOrientationParameters ::= SEQUENCE {

 teop INTEGER (0..65535),

 pmX INTEGER (-1048576..1048575),

 pmXdot INTEGER (-16384..16383),

 pmY INTEGER (-1048576..1048575),

 pmYdot INTEGER (-16384..16383),

 deltaUT1 INTEGER (-1073741824..1073741823),

 deltaUT1dot INTEGER (-262144..262143),

 ...

}

-- ASN1STOP

| *GNSS-EarthOrientationParameters* field descriptions |
| --- |
| ***teop***This field specifies the EOP data reference time in seconds, as specified in [4], [xx].Scale factor 24 seconds. |
| ***pmX***This field specifies the X-axis polar motion value at reference time in arc-seconds, as specified in [4], [xx].Scale factor 2-20 arc-seconds. |
| ***pmXdot***This field specifies the X-axis polar motion drift at reference time in arc-seconds/day, as specified in [4], [xx].Scale factor 2-21 arc-seconds/day. |
| ***pmY***This field specifies the Y-axis polar motion value at reference time in arc-seconds, as specified in [4], [xx].Scale factor 2-20 arc-seconds. |
| ***pmYdot***This field specifies the Y-axis polar motion drift at reference time in arc-seconds/day, as specified in [4], [xx].Scale factor 2-21 arc-seconds/day. |
| ***deltaUT1***This field specifies the UT1-UTC difference at reference time in seconds, as specified in [4], [xx].Scale factor 2-24 seconds. |
| ***deltaUT1dot***This field specifies the Rate of UT1-UTC difference at reference time in seconds/day, as specified in [4], [xx].Scale factor 2-25 seconds/day. |

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#### – *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

 bds-ClockModel2-r16 BDS-ClockModel2-r16 -- Model-7

}

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

 bds-KeplerianSet2-r16 NavModel-BDS-KeplerianSet2-r16 -- Model-7

}

-- 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 specifies the 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 B1I ephemeris, the *iod* contains 11 MSB bits of the toe as defined in [23].In the case of broadcasted BDS B1C ephemeris, the *iod* contains the IODC as described 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 specifies the 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 B1I[23] | B1I Health (SatH1) [23] | '0'(reserved) | '0'(reserved) | '0'(reserved) | '0'(reserved) | '0'(reserved) | '0'(reserved) | '0'(reserved) |
| BDS B1C[xx] | Sat Clock Health [xx] | B1C Health[xx] | '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.Note 6: If *GNSS‑ID* indicates 'bds', and GNSS Orbit Model-6 is included, this interpretation of *svHealth* applies.Note 7: If *GNSS‑ID* indicates 'bds', and GNSS Orbit Model-7 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 B1I | 11 MSB bits of toe (seconds, scale factor 512, range 0 – 604672) [23] |
| BDS B1C | ‘0’ | Issue of Data, Clock [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 |

|  |
| --- |
| **The next change** |

#### – *BDS-ClockModel*

The IE *BDS-ClockModel* is used for BDS B1I defined in [23].

-- 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. |

#### – *BDS-ClockModel2*

The IE *BDS-ClockModel2* is used for BDS B1C defined in [xx].

-- ASN1START

BDS-ClockModel2-r16 ::= SEQUENCE {

 bdsToc-r16 INTEGER (0..2047),

 bdsA0-r16 INTEGER (-16777216..16777215),

 bdsA1-r16 INTEGER (-2097152..2097151),

 bdsA2-r16 INTEGER (-1024..1023),

 bdsTgdB1Cp-r16 INTEGER (-2048..2047),

 bdsIscB1Cd-r16 INTEGER (-2048..2047),

 ...

}

-- ASN1STOP

| *BDS-ClockModel2* field descriptions |
| --- |
| ***bdsToc***Parameter Toc, Clock correction parameters reference time (seconds), see [xx], 7.5.1.Scale factor 300 seconds. |
| ***bdsA0***Parameter a0, Satellite clock time bias correction coefficient (seconds), see [xx], 7.5.1.Scale factor 2-34 seconds. |
| ***bdsA1***Parameter a1, Satellite clock time drift correction coefficient (sec/sec), see [xx], 7.5.1.Scale factor 2-50 sec/sec. |
| ***bdsA2***Parameter a2, Satellite clock time drift rate correction coefficient (sec/sec2), see [xx], 7.5.1.Scale factor 2-66 sec/sec2. |
| ***bdsTgdB1Cp***Parameter TGDB1Cp Group delay differential of the B1C pilot component (seconds), see [xx], 7.6.1.Scale factor is 2-34 seconds. |
| ***bdsIscB1Cd***Parameter ISCB1Cd Group delay differential between the B1C data and pilot components (seconds), see [xx], 7.6.1.Scale factor is 2-34 seconds. |

|  |
| --- |
| **The next change** |

#### – *NavModel-BDS-KeplerianSet*

The IE *NavModel-BDS-KeplerianSet* is used for BDS B1I defined in [23].

-- ASN1START

NavModel-BDS-KeplerianSet-r12 ::= SEQUENCE {

 bdsAODE-r12 INTEGER (0..31),

 bdsURAI-r12 INTEGER (0..15),

 bdsToe-r12 INTEGER (0..131071),

 bdsAPowerHalf-r12 INTEGER (0..4294967295),

 bdsE-r12 INTEGER (0..4294967295),

 bdsW-r12 INTEGER (-2147483648..2147483647),

 bdsDeltaN-r12 INTEGER (-32768..32767),

 bdsM0-r12 INTEGER (-2147483648..2147483647),

 bdsOmega0-r12 INTEGER (-2147483648..2147483647),

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

 bdsI0-r12 INTEGER (-2147483648..2147483647),

 bdsIDot-r12 INTEGER (-8192..8191),

 bdsCuc-r12 INTEGER (-131072..131071),

 bdsCus-r12 INTEGER (-131072..131071),

 bdsCrc-r12 INTEGER (-131072..131071),

 bdsCrs-r12 INTEGER (-131072..131071),

 bdsCic-r12 INTEGER (-131072..131071),

 bdsCis-r12 INTEGER (-131072..131071),

 ...

}

-- ASN1STOP

| *NavModel-BDS-KeplerianSet* field descriptions |
| --- |
| ***bdsAODE***Parameter Age of Data, Ephemeris (AODE), see [23], Table 5-8. |
| ***bdsURAI***Parameter URA Index, URA is used to describe the signal-in-space accuracy in meters as defined in [23]. |
| ***bdsToe***Parameter toe, Ephemeris reference time (seconds) [23].Scale factor 23 seconds. |
| ***bdsAPowerHalf***Parameter A1/2, Square root of semi-major axis (meters1/2) [23].Scale factor 2-19 meters1/2. |
| ***bdsE***Parameter e, Eccentricity, dimensionless [23].Scale factor 2-33. |
| ***bdsW***Parameter , Argument of perigee (semi-circles) [23].Scale factor 2-31 semi-circles. |
| ***bdsDeltaN***Parameter n, Mean motion difference from computed value (semi-circles/sec) [23].Scale factor 2-43 semi-circles/sec. |
| ***bdsM0***Parameter M0, Mean anomaly at reference time (semi-circles) [23].Scale factor 2-31 semi-circles. |
| ***bdsOmega0***Parameter 0, Longitude of ascending node of orbital of plane computed according to reference time (semi-circles) [23].Scale factor 2-31 semi-circles. |
| ***bdsOmegaDot***Parameter  Rate of right ascension (semi-circles/sec) [23].Scale factor 2-43 semi-circles/sec. |
| ***bdsI0***Parameter i0, Inclination angle at reference time (semi-circles) [23]Scale factor 2-31 semi-circles. |
| ***bdsIDot*** Parameter Idot, Rate of inclination angle (semi-circles/sec) [23].Scale factor 2-43 semi-circles/sec. |
| ***bdsCuc*** Parameter Cuc, Amplitude of cosine harmonic correction term to the argument of latitude (radians) [23].Scale factor 2-31 radians. |
| ***bdsCus***Parameter Cus, Amplitude of sine harmonic correction term to the argument of latitude (radians) [23].Scale factor 2-31 radians. |
| ***bdsCrc***Parameter Crc, Amplitude of cosine harmonic correction term to the orbit radius (meters) [23].Scale factor 2-6 meters. |
| ***bdsCrs***Parameter Crs, Amplitude of sine harmonic correction term to the orbit radius (meters) [23].Scale factor 2-6 meters. |
| ***bdsCic***Parameter Cic, Amplitude of cosine harmonic correction term to the angle of inclination (radians) [23].Scale factor 2-31 radians. |
| ***bdsCis***Parameter Cis, Amplitude of sine harmonic correction term to the angle of inclination (radians) [23].Scale factor 2-31 radians. |

#### – *NavModel-BDS-KeplerianSet2*

The IE *NavModel-BDS-KeplerianSet2* is used for BDS B1C defined in [xx].

-- ASN1START

NavModel-BDS-KeplerianSet2-r16 ::= SEQUENCE {

 bdsIODE-r16 INTEGER (0..255),

 bdsToe-r16 INTEGER (0..2047),

 bdsDeltaA-r16 INTEGER (-33554432..33554431),

 bdsAdot-r16 INTEGER (-16777216..16777216),

 bdsDeltaN0-r16 INTEGER (-65536..65535),

 bdsDeltaN0dot-r16 INTEGER (-4194304..4194303),

 bdsM0-r16 INTEGER (-4294967296..4294967295),

 bdsE-r16 INTEGER (0..8589934591),

 bdsOmega-r16 INTEGER (-4294967296..4294967295),

 bdsOmega0-r16 INTEGER (-4294967296..4294967295),

 bdsI0-r16 INTEGER (-4294967296..4294967295),

 bdsOmegaDot-r16 INTEGER (-262144..262143),

 bdsI0Dot-r16 INTEGER (-16384..16383),

 bdsCuc-r16 INTEGER (-1048576..1048575),

 bdsCus-r16 INTEGER (-1048576..1048575),

 bdsCrc-r16 INTEGER (-8388608..8388607),

 bdsCrs-r16 INTEGER (-8388608..8388607),

 bdsCic-r16 INTEGER (-32768..32767),

 bdsCis-r16 INTEGER (-32768..32767),

 ...

}

-- ASN1STOP

| *NavModel-BDS-KeplerianSet2* field descriptions |
| --- |
| ***bdsIODE***Parameter, Issue Of Data, Ephemeris (IODE), see [xx], 7.4.1. |
| ***bdsToe***Parameter toe, Ephemeris reference time (seconds), defined in [xx], 7.7.1.Scale factor 300 seconds. |
| ***bdsDeltaA***Parameter A, Semi-major axis difference at reference time (meter), defined in [xx], 7.7.1.Scale factor 2-9 meters. |
| ***bdsAdot***Parameter , Change rate in semi-major axis (meter/sec), defined in [xx], 7.7.1Scale factor 2-21 meter/sec. |
| ***bdsDeltaN0***Parameter n0, Mean motion difference from computed value at reference time (semi-circles /sec), defined in [xx], 7.7.1Scale factor 2-44 semi-circles /sec. |
| ***bdsDeltaN0dot***Parameter n0dot, Rate of mean motion difference from computed value at reference time (semi-circles /sec2), defined in [xx], 7.7.1Scale factor 2-57 semi-circles /sec2. |
| ***bdsM0***Parameter M0, Mean anomaly at reference time (semi-circles) [xx].Scale factor 2-32 semi-circles. |
| ***bdsE***Parameter e, Eccentricity [xx].Scale factor 2-34. |
| ***bdsOmega***Parameter  Argument of perigee (semi-circles) [xx].Scale factor 2-32 semi-circles. |
| ***bdsOmega0***Parameter0, Longitude of ascending node of orbital plane at weekly epoch (semi-circles) [xx].Scale factor 2-32 semi-circles. |
| ***bdsI0***Parameter i0, Inclination angle at reference time (semi-circles) [xx]Scale factor 2-32 semi-circles. |
| ***bdsOmegaDot***Parameter , Rate of right ascension (semi-circles/sec) [xx].Scale factor 2-44 semi-circles/sec. |
| ***bdsI0Dot***Parameter i0dot, Rate of inclination angle (semi-circles/sec) [xx].Scale factor 2-44 semi-circles/sec. |
| ***bdsCuc***Parameter Cuc, Amplitude of cosine harmonic correction to the argument of latitude (radians) [xx].Scale factor 2-30 radians. |
| ***bdsCus***Parameter Cus, Amplitude of sine harmonic correction to the argument of latitude (radians) [xx].Scale factor 2-30 radians. |
| ***bdsCrc***Parameter Crc, Amplitude of cosine harmonic correction term to the orbit radius (meters) [xx].Scale factor 2-8 meters. |
| ***bdsCrs***Parameter Crs, Amplitude of sine harmonic correction term to the orbit radius (meters) [xx].Scale factor 2-8 meters. |
| ***bdsCic***Parameter Cic, Amplitude of cosine harmonic correction term to the angle of inclination (radians) [xx].Scale factor 2-30 radians. |
| ***bdsCis***Parameter Cis, Amplitude of sine harmonic correction term to the angle of inclination (radians) [xx].Scale factor 2-30 radians. |

|  |
| --- |
| **The next change** |

#### – *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 B1I, it contains the encoded and interleaved modulation symbols as defined in [23, clause 5.1.3].In case of BDS B1C, it contains the encoded and interleaved modulation symbols as defined in [xx, clause 6.2.2]. |

|  |
| --- |
| **The next change** |

#### – *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

 ]]

}

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

}

-- 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. This field 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 BDS B1C,the almanac reference week number is defined in [xx], 7.9.1. |
| ***toa, toa-ext***In case of *GNSS-ID* does not indicate Galileo, 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.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. |
| ***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. |

|  |
| --- |
| **The next change** |

#### – *AlmanacReducedKeplerianSet*

-- ASN1START

AlmanacReducedKeplerianSet ::= SEQUENCE {

 svID SV-ID,

 redAlmDeltaA INTEGER (-128..127),

 redAlmOmega0 INTEGER (-64..63),

 redAlmPhi0 INTEGER (-64..63),

 redAlmL1Health BOOLEAN,

 redAlmL2Health BOOLEAN,

 redAlmL5Health BOOLEAN,

 ...

}

-- ASN1STOP

| *AlmanacReducedKeplerianSet* field descriptions |
| --- |
| ***svID***This field identifies the satellite for which the GNSS Almanac Model is given. |
| ***redAlmDeltaA***Parameter A, meters [4,5,6,7,xx].Scale factor 2+9 meters. |
| ***redAlmOmega0***Parameter 0, semi-circles [4,5,6,7,xx].Scale factor 2-6 semi-circles. |
| ***redAlmPhi0***Parameter 0, semi-circles [4,5,6,7,xx].Scale factor 2-6 semi-circles. |
| ***redAlmL1Health***Parameter L1 Health, dimensionless [4,5,6,7].If *GNSS-ID* = BDS, this field indicates the Satellite clock health state (the 8th bit) defined in table 7-14 [xx] for BDS B1C. |
| ***redAlmL2Health***Parameter L2 Health, dimensionless [4,5,6,7].If *GNSS-ID* = BDS, this field indicates the B1C signal health state (the 7th bit) defined in table 7-14 [xx] for BDS B1C. |
| ***redAlmL5Health***Parameter L5 Health, dimensionless [4,5,6,7]. |

#### – *AlmanacMidiAlmanacSet*

-- ASN1START

AlmanacMidiAlmanacSet ::= SEQUENCE {

 svID SV-ID,

 midiAlmE INTEGER (0..2047),

 midiAlmDeltaI INTEGER (-1024..1023),

 midiAlmOmegaDot INTEGER (-1024..1023),

 midiAlmSqrtA INTEGER (0..131071),

 midiAlmOmega0 INTEGER (-32768..32767),

 midiAlmOmega INTEGER (-32768..32767),

 midiAlmMo INTEGER (-32768..32767),

 midiAlmaf0 INTEGER (-1024..1023),

 midiAlmaf1 INTEGER (-512..511),

 midiAlmL1Health BOOLEAN,

 midiAlmL2Health BOOLEAN,

 midiAlmL5Health BOOLEAN,

 ...

}

-- ASN1STOP

| *AlmanacMidiAlmanacSet* field descriptions |
| --- |
| ***svID***This field identifies the satellite for which the GNSS Almanac Model is given. |
| ***midiAlmE***Parameter e, dimensionless [4,5,6,7,xx].Scale factor 2-16. |
| ***midiAlmDeltaI***Parameter i, semi-circles [4,5,6,7,xx].Scale factor 2-14 semi-circles. |
| ***midiAlmOmegaDot***Parameter , semi-circles/sec [4,5,6,7,xx].Scale factor 2-33 semi-circles/second. |
| ***midiAlmSqrtA***Parameter , meters1/2 [4,5,6,7,xx].Scale factor 2-4 meters1/2. |
| ***midiAlmOmega0***Parameter 0, semi-circles [4,5,6,7,xx].Scale factor 2-15 semi-circles. |
| ***midiAlmOmega***Parameter , semi-circles [4,5,6,7,xx].Scale factor 2-15 semi-circles. |
| ***midiAlmMo***Parameter M0, semi-circles [4,5,6,7,xx].Scale factor 2-15 semi-circles. |
| ***midiAlmaf0***Parameter afo, seconds [4,5,6,7,xx].Scale factor 2-20 seconds. |
| ***midiAlmaf1***Parameter af1, sec/sec [4,5,6,7,xx].Scale factor 2-37 seconds/second. |
| ***midiAlmL1Health***Parameter L1 Health, dimensionless [4,5,6,7].If *GNSS-ID* = BDS, this field indicates the satellite clock health state (the 8th bit) defined in table 7-14 [xx] for BDS B1C. |
| ***midiAlmL2Health***Parameter L2 Health, dimensionless [4,5,6,7].If *GNSS-ID* = BDS, This field indicates the B1C signal health state (the 7th bit) defined in table 7-14 [xx] for BDS B1C. |
| ***midiAlmL5Health***Parameter L5 Health, dimensionless [4,5,6,7]. |

|  |
| --- |
| **The next change** |

#### – *AlmanacBDS-AlmanacSet*

-- ASN1START

AlmanacBDS-AlmanacSet-r12 ::= SEQUENCE {

 svID SV-ID,

 bdsAlmToa-r12 INTEGER (0..255) OPTIONAL, -- Cond NotSameForAllSV

 bdsAlmSqrtA-r12 INTEGER (0..16777215),

 bdsAlmE-r12 INTEGER (0..131071),

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

 bdsAlmM0-r12 INTEGER (-8388608..8388607),

 bdsAlmOmega0-r12 INTEGER (-8388608..8388607),

 bdsAlmOmegaDot-r12 INTEGER (-65536..65535),

 bdsAlmDeltaI-r12 INTEGER (-32768..32767),

 bdsAlmA0-r12 INTEGER (-1024..1023),

 bdsAlmA1-r12 INTEGER (-1024..1023),

 bdsSvHealth-r12 BIT STRING (SIZE(9)) OPTIONAL, -- Cond SV-ID

 ...

}

-- 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*. |
| *SV-ID* | This field is mandatory present if *SV-ID* is between 0 and 63; otherwise it is not present. |

|  |
| --- |
| **The next change** |

#### – *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)*,* where *UTC-ModelSet2* is used for BDS B1C, and *UTC-ModelSet5* is used for BDS B1I.

-- 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

|  |
| --- |
| **The next change** |

#### – *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

 ]]

}

| *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].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. |

|  |
| --- |
| **The next change** |

#### – *GNSS-AuxiliaryInformation*

The IE *GNSS-AuxiliaryInformation* is used by the location server to provide additional information dependent on the *GNSS‑ID*. If *GNSS-AuxiliaryInformation* is provided together with other satellite dependent GNSS assistance data (i.e., any of *GNSS-DifferentialCorrections*, *GNSS-NavigationModel*, *GNSS-DataBitAssistance*, or *GNSS-AcquisitionAssistance* IEs), the *GNSS-AuxiliaryInformation* should be provided for the same satellites and in the same LPP message as the other satellite dependent GNSS assistance data.

-- ASN1START

GNSS-AuxiliaryInformation ::= CHOICE {

 gnss-ID-GPS GNSS-ID-GPS,

 gnss-ID-GLONASS GNSS-ID-GLONASS,

 ...,

 [[ gnss-ID-BDS-r16 GNSS-ID-BDS-r16

 ]]

}

GNSS-ID-GPS ::= SEQUENCE (SIZE(1..64)) OF GNSS-ID-GPS-SatElement

GNSS-ID-GPS-SatElement ::= SEQUENCE {

 svID SV-ID,

 signalsAvailable GNSS-SignalIDs,

 ...

}

GNSS-ID-GLONASS ::= SEQUENCE (SIZE(1..64)) OF GNSS-ID-GLONASS-SatElement

GNSS-ID-GLONASS-SatElement ::= SEQUENCE {

 svID SV-ID,

 signalsAvailable GNSS-SignalIDs,

 channelNumber INTEGER (-7..13) OPTIONAL, -- Cond FDMA

 ...

}

GNSS-ID-BDS-r16 ::= SEQUENCE (SIZE(1..64)) OF GNSS-ID-BDS-SatElement

GNSS-ID-BDS-SatElement ::= SEQUENCE {

 svID SV-ID,

 satType-r16 INTEGER (0..3),

 ...

}

-- ASN1STOP

| Conditional presence | Explanation |
| --- | --- |
| *FDMA* | The field is mandatory present if the GLONASS SV indicated by *svID* broadcasts FDMA signals; otherwise it is not present. |

| *GNSS-AuxiliaryInformation* field descriptions |
| --- |
| ***gnss-ID-GPS***This choice may only be present if *GNSS-ID* indicates GPS. |
| ***gnss-ID-GLONASS***This choice may only be present if *GNSS-ID* indicates GLONASS. |
| ***svID***This field specifies the GNSS SV for which the *GNSS-AuxiliaryInformation* is given. |
| ***signalsAvailable***This field indicates the ranging signals supported by the satellite indicated by *svID*. This field is given as a bit string as defined in *GNSS-SignalIDs* for a particular GNSS. If a bit is set to '1' it indicates that the satellite identified by *svID* transmits ranging signals according to the signal correspondence in *GNSS-SignalIDs*. If a bit is set to '0' it indicates that the corresponding signal is not supported on the satellite identified by *svID*. |
| ***channelNumber***This field indicates the GLONASS carrier frequency number of the satellite identified by *svID*, as defined in [9]. |
| ***satType***This field identifies the BDS B1C Satellite orbit type, defined in [xx].1 indicates the GEO satellite, 2 indicates the IGSO satellite, 3 indicates the MEO satellite, and 0 is reserved. |

|  |
| --- |
| **The next change** |

#### – *BDS-DifferentialCorrections*

The IE *BDS-DifferentialCorrections* is used by the location server to provide differential corrections to the target device for BDS B1I.

-- ASN1START

BDS-DifferentialCorrections-r12 ::= SEQUENCE {

 dbds-RefTime-r12 INTEGER (0..3599),

 bds-SgnTypeList-r12 BDS-SgnTypeList-r12,

 ...

}

BDS-SgnTypeList-r12 ::= SEQUENCE (SIZE (1..3)) OF BDS-SgnTypeElement-r12

BDS-SgnTypeElement-r12 ::= SEQUENCE {

 gnss-SignalID GNSS-SignalID OPTIONAL, -- Need ON

 dbds-CorrectionList-r12 DBDS-CorrectionList-r12,

 ...

}

DBDS-CorrectionList-r12 ::= SEQUENCE (SIZE (1..64)) OF DBDS-CorrectionElement-r12

DBDS-CorrectionElement-r12 ::= SEQUENCE {

 svID SV-ID,

 bds-UDREI-r12 INTEGER (0..15),

 bds-RURAI-r12 INTEGER (0..15),

 bds-ECC-DeltaT-r12 INTEGER (-4096..4095),

 ...

}

-- ASN1STOP

| *BDS-DifferentialCorrections* field descriptions |
| --- |
| ***dbds-RefTime***This field *specifies* the time for which the differential corrections are valid, modulo 1 hour. d*bds-RefTime* is given in BDS system time.Scale factor 1‑second. |
| ***bds-UDREI***This field indicates user differential range error information by user differential range error index (UDREI) as defined in [23], clause 5.3.3.7.2. |
| ***bds-RURAI***This field indicates Regional User Range Accuracy (RURA) information by Regional User Range Accuracy Index (UDREI) as defined in [23], clause 5.3.3.6. |
| ***bds-ECC***-***DeltaT***This field indicates the BDS differential correction information which is expressed in equivalent clock correction (t). Add the value of t to the observed pseudo-range to correct the effect caused by the satellite clock offset and ephemeris error. Value -4096 means the t is not available.The scale factor is 0.1 meter. |

#### – *BDS-GridModelParameter*

The IE *BDS-GridModelParameter* is used by the location server to provide Ionospheric Grid Information to the target device for BDS B1I.

-- ASN1START

BDS-GridModelParameter-r12 ::= SEQUENCE {

 bds-RefTime-r12 INTEGER (0..3599),

 gridIonList-r12 GridIonList-r12,

 ...

}

GridIonList-r12 ::= SEQUENCE (SIZE (1..320)) OF GridIonElement-r12

GridIonElement-r12 ::= SEQUENCE {

 igp-ID-r12 INTEGER (1..320),

 dt-r12 INTEGER (0..511),

 givei-r12 INTEGER (0..15) ,

 ...

}

-- ASN1STOP

| *BDS-GridModelParamater* field descriptions |
| --- |
| ***bds-RefTime***This field specifies the time for which the grid model parameters are valid, modulo 1 hour. *bds-RefTime* is given in BDS system time.Scale factor 1‑second. |
| ***gridIonList***This list provides ionospheric grid point information for each grid point. Up to 16 instances are used in this version of the specification. The values 17 to 320 are reserved for future use.  |
| ***igp-ID***This field indicates the ionospheric grid point (IGP) number as defined in [23], clause 5.3.3.8. |
| ***dt***This field indicates dT as defined in [23], clause 5.3.3.8.1, i.e. the vertical delay at the corresponding IGP indicated by *igp-ID*.The scale factor is 0.125 meter. |
| ***givei***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 *igp-ID*, the mapping between GIVEI and GIVE is defined in [23], clause 5.3.3.8.2 |

|  |
| --- |
| **The next change** |

#### 6.5.2.4 GNSS Assistance Data Request Elements

#### – *GNSS-IonosphericModelReq*

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

-- ASN1START

GNSS-IonosphericModelReq ::= SEQUENCE {

 klobucharModelReq BIT STRING (SIZE(2)) OPTIONAL, -- Cond klobuchar

 neQuickModelReq NULL OPTIONAL, -- Cond nequick

 ...,

 [[ klobucharModel2Req-r16 NULL OPTIONAL -- Cond klobuchar2

 ]]

}

-- ASN1STOP

| Conditional presence | Explanation |
| --- | --- |
| *klobuchar* | The field is mandatory present if the target device requests *klobucharModel*; otherwise it is not present. The BIT STRING defines the *dataID* requested, defined in IE *KlobucharModelParameter*.  |
| *nequick* | The field is mandatory present if the target device requests *neQuickModel*; otherwise it is not present.  |
| *klobuchar2* | The field is mandatory present if the target device requests *klobucharModel2*; otherwise it is not present. |

|  |
| --- |
| **The next change** |

#### – *BDS-DifferentialCorrectionsReq*

The IE *BDS-DifferentialCorrectionsReq* is used by the target device to request the *BDS-DifferentialCorrections* assistancefrom the location server.

-- ASN1START

BDS-DifferentialCorrectionsReq-r12 ::= SEQUENCE {

 dgnss-SignalsReq GNSS-SignalIDs,

 ...

}

-- ASN1STOP

| *BDS-DifferentialCorrectionsReq* field descriptions |
| --- |
| ***dgnss-SignalsReq***This field specifies the BDS Signal(s) for which the *BDS-DifferentialCorrections* are requested. A one‑value at a bit position means BDS 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'.This only applies for the B1I signal. |

|  |
| --- |
| **The next change** |

#### 6.5.2.10 GNSS Capability Information Elements

#### – *GNSS-IonosphericModelSupport*

-- ASN1START

GNSS-IonosphericModelSupport ::= SEQUENCE {

 ionoModel BIT STRING { klobuchar (0),

 neQuick (1),

 klobuchar2-r16 (2) } (SIZE (1..8)),

 ...

}

-- ASN1STOP

| *GNSS-IonosphericModelSupport* field descriptions |
| --- |
| ***ionoModel***This field specifies the ionospheric model(s) supported by the target device. This is represented by a bit string, with a one‑value at the bit position means the particular ionospheric model is supported; a zero‑value means not supported. |

|  |
| --- |
| **The next change** |

#### – *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-7-r16 (6) } (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-7-r16 (6) } (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 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 this field is absent, the target device supports the mandatory (native) *orbitModel* choice only as listed above for the GNSS indicated by *GNSS‑ID*. |

|  |
| --- |
| **The next change** |

#### 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 | B1I | 1561.098 |
| 1 | B1C | 1575.420 |
| 2 | B2 | 1207.140 |
| 3 | B3 | 1268.520 |
| 4-7 | reserved |

|  |
| --- |
| **The next change** |

#### – *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 | B1C(D) |
| 10 | B1C(P) |
| 11 | B1C(D+P) |
| 12-23 | Reserved |

|  |
| --- |
| **The next change** |

#### – *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 |

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 | B1C(D) | B1C(P) | B1C(D+P) |  |  |  |  |

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 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 |  |  |  |  |  |  |  |  |

|  |
| --- |
| **The next change** |

#### – *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''0' – '62''63' | Satellite ranging code number signal No.1 to 37 [23]PRN Signal No. 1 to 63 [xx]Reserved |

|  |
| --- |
| **The end** |