**3GPP TSG-RAN WG2 Meeting #116 electronic *R2-21xxxxx***

**Online, 1st – 12th November, 2021**

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| *CR-Form-v12.1* | | | | | | | | |
| **[DRAFT] CHANGE REQUEST** | | | | | | | | |
|  | | | | | | | | |
|  | **37.355** | **CR** | **-** | **rev** | **-** | **Current version:** | **16.6.0** |  |
|  | | | | | | | | |
| *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 B2a signal in BDS system in A-GNSS | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Source to WG:*** | CATT, CAICT | | | | | | | | | |
| ***Source to TSG:*** | R2 | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Work item code:*** | NR\_pos\_enh-Core | | | | |  | Date: | | | 2021-10-18 |
|  |  | | | |  | |  | | |  |
| ***Category:*** | **B** |  | | | | | ***Release:*** | | | Rel-17 |
|  | *Use one of the following categories:* ***F*** *(correction)* ***A*** *(mirror corresponding to a change in an earlier release)* ***B*** *(addition of feature),* ***C*** *(functional modification。 of feature)* ***D*** *(editorial modification)*  Detailed explanations of the above categories can be found in 3GPP [TR 21.900](http://www.3gpp.org/ftp/Specs/html-info/21900.htm). | | | | | | | | *Use one of the following releases: Rel-8 (Release 8) Rel-9 (Release 9) Rel-10 (Release 10) Rel-11 (Release 11) … Rel-15 (Release 15) Rel-16 (Release 16) Rel-17 (Release 17) Rel-18 (Release 18)* | |
|  |  | | | | | | | | | |
| ***Reason for change:*** | | Introduce the global B2a 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 B2a signal. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Summary of change:*** | | 1. ICD specification of B2a signal is added in section 2 as reference. 2. All impacted IEs have been pointed out and main parts have been changed for introducing B2a signal. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Consequences if not approved:*** | | Network-assisted BDS positioning method can’t provide a higher accuracy multiple-frequency global positioning service. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Clauses affected:*** | | 2, 6.5.2.2, 6.5.2.13 | | | | | | | | |
|  | |  | | | | | | | | |
|  | | **Y** | **N** |  | | | |  | | |
| ***Other specs*** | | **X** |  | Other core specifications | | | | TS 36.305 CR ...  TS 38.305 CR … | | |
| ***affected:*** | |  | **X** | Test specifications | | | | TS/TR ... CR ... | | |
| ***(show related CRs)*** | |  | **X** | O&M Specifications | | | | TS/TR ... CR ... | | |
|  | |  | | | | | | | | |
| ***Other comments:*** | |  | | | | | | | | |
|  | |  | | | | | | | | |
| ***This CR's revision history:*** | |  | | | | | | | | |

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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-B1I-3.0: "BeiDou Navigation Satellite System Signal In Space Interface Control Document Open Service Signal B1I (Version 3.0)", February, 2019.

[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".

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

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

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

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

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

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

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

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

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

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

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

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

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| **The next change** |

#### – *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 [39], [XX].  Scale factor 2-3 TECU. |
| ***alfa2***  This field specifies the 2 parameter of the Klobuchar model, as specified in 7.8.1 in [39], [XX].  Scale factor 2-3 TECU. |
| ***alfa3***  This field specifies the 3 parameter of the Klobuchar model, as specified in 7.8.1 in [39], [XX].  Scale factor 2-3 TECU. |
| ***alfa4***  This field specifies the 4 parameter of the Klobuchar model, as specified in 7.8.1 in [39], [XX].  Scale factor 2-3 TECU. |
| ***alfa5***  This field specifies the  parameter of the Klobuchar model, as specified in 7.8.1 in [39], [XX].  Scale factor -2-3 TECU. |
| ***alfa6***  This field specifies the 6 parameter of the Klobuchar model, as specified in 7.8.1 in [39], [XX].  Scale factor 2-3 TECU. |
| ***alfa7***  This field specifies the 7 parameter of the Klobuchar model, as specified in 7.8.1 in [39], [XX].  Scale factor 2-3 TECU. |
| ***alfa8***  This field specifies the 8 parameter of the Klobuchar model, as specified in 7.8.1 in [39], [XX].  Scale factor 2-3 TECU. |
| ***alfa9***  This field specifies the 9 parameter of the Klobuchar model, as specified in 7.8.1 in [39], [XX].  Scale factor 2-3 TECU. |

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| **The next change** |

#### – *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], [39], [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], [39], [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], [39], [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], [39], [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], [39], [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], [39], [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], [39], [XX]  Scale factor 2-25 seconds/day. |

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| **The next change** |

#### – *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

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

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

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 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 the case of broadcasted GPS NAV ephemeris, the *iod* contains the IODC as described in [4].  In the 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 the case of broadcasted SBAS ephemeris, the *iod* contains the 8 bits Issue of Data as defined in [10] Message Type 9.  In the case of broadcasted QZSS QZS-L1 ephemeris, the *iod* contains the IODC as described in [7].  In the case of broadcasted QZSS QZS-L1C/L2C/L5 ephemeris, the *iod* contains the 11-bit parameter toe as defined in [7].  In the 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/B2a ephemeris, the *iod* contains the IODC as described in [39, XX].  In the case of broadcasted NavIC ephemeris, the iod contains 11 MSB bits of the toe as defined in [38].  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) | Ranging  On (0),Off(1) [10] | Corrections On(0),Off(1) [10] | Integrity  On(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(6) B1I  [23] | B1I Health (SatH1) [23] | '0'  (reserved) | '0'  (reserved) | '0'  (reserved) | '0'  (reserved) | '0'  (reserved) | '0'  (reserved) | '0'  (reserved) |
| BDS(7) B1C[39]/B2a [XX] | Sat Clock Health [39,XX] | B1C Health  [39,XX] | B2a Health  [39,XX] | '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 the case that *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] | | | | | | | | | |
| QZSS  QZS-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/B2a | '0' | Issue of Data, Clock [39, XX] | | | | | | | | | |
| NavIC | 11 MSB bits of toe (seconds, scale factor 512) [38] | | | | | | | | | | |

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 | |

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| **The next change** |

#### – *BDS-ClockModel2*

The IE *BDS-ClockModel2* is used for BDS B1C defined in [39] and BDS B2a 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),

...,

[[ bdsTgdB2ap-r17 INTEGER (-2048..2047) OPTIONAL,

bdsIscB2ad-r17 INTEGER (-2048..2047) OPTIONAL

]]

}

-- ASN1STOP

| *BDS-ClockModel2* field descriptions |
| --- |
| ***bdsToc***  Parameter Toc, Clock correction parameters reference time (seconds), see [39], 7.5.1 and [XX], 7.5.1.  Scale factor 300 seconds. |
| ***bdsA0***  Parameter a0, Satellite clock time bias correction coefficient (seconds), see [39], 7.5.1 and [XX], 7.5.1.  Scale factor 2-34 seconds. |
| ***bdsA1***  Parameter a1, Satellite clock time drift correction coefficient (sec/sec), see [39], 7.5.1 and [XX], 7.5.1.  Scale factor 2-50 sec/sec. |
| ***bdsA2***  Parameter a2, Satellite clock time drift rate correction coefficient (sec/sec2), see [39], 7.5.1 and [XX], 7.5.1.  Scale factor 2-66 sec/sec2. |
| ***bdsTgdB1Cp***  Parameter TGDB1Cp Group delay differential of the B1C pilot component (seconds), see [39], 7.6.1 and [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 [39], 7.6.1.  Scale factor is 2-34 seconds. |
| ***bdsTgdB2ap***  Parameter TGDB2ap Group delay differential of the B2a pilot component (seconds), see [39], 7.6.1 and [XX], 7.6.1.  Scale factor is 2-34 seconds. |
| ***bdsIscB2ad***  Parameter ISCB2ad Group delay differential between the B2a data and pilot components (seconds), see [XX], 7.6.1.  Scale factor is 2-34 seconds. |

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

#### – *NavModel-BDS-KeplerianSet2*

The IE *NavModel-BDS-KeplerianSet2* is used for BDS B1C and BDS B2a defined in [39], [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 [39], 7.4.1 and [XX], 7.4.1. |
| ***bdsToe***  Parameter toe, Ephemeris reference time (seconds), defined in [39], 7.7.1 and [XX], 7.7.1.  Scale factor 300 seconds. |
| ***bdsDeltaA***  Parameter A, Semi-major axis difference at reference time (metre), defined in [39], 7.7.1 and [XX], 7.7.1.  Scale factor 2-9 metres. |
| ***bdsAdot***  Parameter , Change rate in semi-major axis (metre/second), defined in [39], 7.7.1 and [XX], 7.7.1  Scale factor 2-21 metre/second.  The value 16777216 is not signalled. |
| ***bdsDeltaN0***  Parameter n0, Mean motion difference from computed value at reference time (semi-circles /sec), defined in [39], 7.7.1 and [XX], 7.7.1.  Scale factor 2-44 semi-circles /second. |
| ***bdsDeltaN0dot***  Parameter n0dot, Rate of mean motion difference from computed value at reference time (semi-circles /sec2), defined in [39], 7.7.1 and [XX], 7.7.1.  Scale factor 2-57 semi-circles /second2. |
| ***bdsM0***  Parameter M0, Mean anomaly at reference time (semi-circles) [39], [XX].  Scale factor 2-32 semi-circles. |
| ***bdsE***  Parameter e, Eccentricity [39], [XX].  Scale factor 2-34. |
| ***bdsOmega***  Parameter  Argument of perigee (semi-circles) [39], [XX].  Scale factor 2-32 semi-circles. |
| ***bdsOmega0***  Parameter0, Longitude of ascending node of orbital plane at weekly epoch (semi-circles) [39], [XX].  Scale factor 2-32 semi-circles. |
| ***bdsI0***  Parameter i0, Inclination angle at reference time (semi-circles) [39], [XX].  Scale factor 2-32 semi-circles. |
| ***bdsOmegaDot***  Parameter , Rate of right ascension (semi-circles/sec) [39], [XX].  Scale factor 2-44 semi-circles/second. |
| ***bdsI0Dot***  Parameter i0dot, Rate of inclination angle (semi-circles/sec) [39], [XX].  Scale factor 2-44 semi-circles/second. |
| ***bdsCuc***  Parameter Cuc, Amplitude of cosine harmonic correction to the argument of latitude (radians) [39], [XX].  Scale factor 2-30 radians. |
| ***bdsCus***  Parameter Cus, Amplitude of sine harmonic correction to the argument of latitude (radians) [39], [XX].  Scale factor 2-30 radians. |
| ***bdsCrc***  Parameter Crc, Amplitude of cosine harmonic correction term to the orbit radius (metres) [39], [XX].  Scale factor 2-8 metres. |
| ***bdsCrs***  Parameter Crs, Amplitude of sine harmonic correction term to the orbit radius (metres) [39], [XX].  Scale factor 2-8 metres. |
| ***bdsCic***  Parameter Cic, Amplitude of cosine harmonic correction term to the angle of inclination (radians) [39], [XX].  Scale factor 2-30 radians. |
| ***bdsCis***  Parameter Cis, Amplitude of sine harmonic correction term to the angle of inclination (radians) [39], [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 the case of GPS L1 C/A, it contains the NAV data modulation bits as defined in [4] .  In the case of Modernized GPS L1C, it contains the encoded and interleaved modulation symbols as defined in [6] clause 3.2.3.1. In the 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 the case of Modernized GPS L5, it contains the FEC encoded CNAV data modulation symbols as defined in [5].  In the case of SBAS, it contains the FEC encoded data modulation symbols as defined in [10].  In the case of QZSS QZS-L1, it contains the NAV data modulation bits as defined in [7] clause 5.2. In the case of QZSS QZS-L1C, it contains the encoded and interleaved modulation symbols as defined in [7] clause 5.3. In the case of QZSS QZS-L2C, it contains the encoded modulation symbols as defined in [7] clause 5.5. In the case of QZSS QZS-L5, it contains the encoded modulation symbols as defined in [7] clause 5.6.  In the case of GLONASS, it contains the 100 sps differentially Manchester encoded modulation symbols as defined in [9] clause 3.3.2.2.  In the 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 the case of BDS B1I, it contains the encoded and interleaved modulation symbols as defined in [23], clause 5.1.3.  In the case of BDS B1C, it contains the encoded and interleaved modulation symbols as defined in [39], clause 6.2.2.  In the case of BDS B2a, it contains the encoded and interleaved modulation symbols as defined in [XX], clause 6.2.2.  In the case of NavIC, it contains the FEC encoded and interleaved Navigation symbols as defined in [38]. |

|  |
| --- |
| **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

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 GNSSs.  In the case of Galileo, the almanac reference week number WNa natively contains only the 2 LSB's [8], clause 5.1.10].  In the case of BDS B1C and BDS B2a,the almanac reference week number is defined in [39], 7.9.1 and [XX], 7.9.1.  In the case of NavIC, the almanac reference week number is defined in [38]. |
| ***toa, toa-ext, toa-ext2***  In the cases that *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 GNSSs when the *toa-ext2* is not present.  In the case that *GNSS-ID* indicates 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 the case that *GNSS-ID* indicates 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 [38]. 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. |

|  |
| --- |
| **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, metres [4], [5], [6], [7], [39], [XX].  Scale factor 2+9 metres. |
| ***redAlmOmega0***  Parameter 0, semi-circles [4], [5], [6], [7], [39], [XX].  Scale factor 2-6 semi-circles. |
| ***redAlmPhi0***  Parameter 0, semi-circles [4], [5], [6], [7], [39], [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 [39] for BDS B1C and in table 7-14 [XX] for BDS B2a. |
| ***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 [39] for BDS B1C and in table 7-14 [XX] for BDS B2a. |
| ***redAlmL5Health***  Parameter L5 Health, dimensionless [4], [5], [6], [7].  If *GNSS-ID* = BDS, this field indicates the B2a signal health state (the 6th bit) defined in table 7-14 [39] for BDS B1C and in table 7-14 [XX] for BDS B2a. |

#### – *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], [39], [XX].  Scale factor 2-16. |
| ***midiAlmDeltaI***  Parameter i, semi-circles [4], [5], [6], [7], [39], [XX].  Scale factor 2-14 semi-circles. |
| ***midiAlmOmegaDot***  Parameter , semi-circles/sec [4], [5], [6], [7], [39], [XX].  Scale factor 2-33 semi-circles/second. |
| ***midiAlmSqrtA***  Parameter , metres1/2 [4], [5], [6], [7], [39], [XX].  Scale factor 2-4 metres1/2. |
| ***midiAlmOmega0***  Parameter 0, semi-circles [4], [5], [6], [7], [39], [XX].  Scale factor 2-15 semi-circles. |
| ***midiAlmOmega***  Parameter , semi-circles [4], [5], [6], [7], [39], [XX].  Scale factor 2-15 semi-circles. |
| ***midiAlmMo***  Parameter M0, semi-circles [4], [5], [6], [7], [39], [XX].  Scale factor 2-15 semi-circles. |
| ***midiAlmaf0***  Parameter afo, seconds [4], [5], [6], [7], [39], [XX].  Scale factor 2-20 seconds. |
| ***midiAlmaf1***  Parameter af1, sec/sec [4], [5], [6], [7], [39], [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 [39] for BDS B1C and in table 7-14 [XX] for BDS B2a. |
| ***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 [39] for BDS B1C and in table 7-14 [XX] for BDS B2a. |
| ***midiAlmL5Health***  Parameter L5 Health, dimensionless [4], [5], [6], [7].  If *GNSS-ID* = BDS, this field indicates the B2a signal health state (the 6th bit) defined in table 7-14 [39] for BDS B1C and in table 7-14 [XX] for BDS B2a. |

|  |
| --- |
| **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], [38], [39], [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 BDS B2a, and *UTC-ModelSet5* is used for BDS B1I; if the *GNSS-ID* indicates NavIC, the *GNSS-UTC-Model* contains a set of parameters needed to relate 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

|  |
| --- |
| **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

]]

}

-- 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], [38], [39], [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], [38], [39], [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], [38], [39], [XX].  Scale factor 2-68 seconds/second2. |
| ***utcDeltaTls***  Parameter ΔtLS, current or past leap second count (seconds) [4], [5], [6], [7], [38], [39], [XX].  Scale factor 1 second. |
| ***utcTot***  Parameter tot, time data reference time of week (seconds) [4], [5], [6], [7], [38], [39], [XX].  Scale factor 24 seconds. |
| ***utcWNot***  Parameter WNot, time data reference week number (weeks) [4], [5], [6], [7], [38], [39], [XX].  Scale factor 1 week. |
| ***utcWNlsf, utcWNlsf-ext***  Parameter WNLSF, leap second reference week number (weeks) [4], [5], [6], [7], [38], [39], [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], [38], [39], [XX].  Scale factor 1 day. |
| ***utcDeltaTlsf***  Parameter ΔtLSF, current or future leap second count (seconds) [4], [5], [6], [7], [38], [39], [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-r16

GNSS-ID-BDS-SatElement-r16 ::= SEQUENCE {

svID-r16 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. |
| ***gnss-ID-BDS***  This choice may only be present if *GNSS-ID* indicates BDS. |
| ***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 and BDS B2a Satellite orbit type, defined in [39], [XX] respectively.  1 indicates the GEO satellite, 2 indicates the IGSO satellite, 3 indicates the MEO satellite, and 0 is reserved. |

|  |
| --- |
| **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 | |
| GLONASS  k = -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 | B2a | 1176.450 |
|  | 5-7 | reserved | |
| NavIC | 0 | L5 | 1176.450 |
|  | 1-7 | 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 | GLONASS G1a(D) |
| 6 | GLONASS G1a(P) |
| 7 | GLONASS G1a (D+P) |
| 8 | GLONASS G2a(I) |
| 9 | GLONASS G2a(P) |
| 10 | GLONASS G2a(I+P) |
| 11 | GLONASS G3 I |
| 12 | GLONASS G3 Q |
| 13 | GLONASS G3 I+Q |
| 14-23 | 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 | B2a(D) |
| 13 | B2a(P) |
| 14 | B2a(D+P) |
| 15-23 | 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 | G1a(D) | G1a(P) | G1a(D+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 | G2a(I) | G2a(P) | G2a(I+P) | G3 I | G3 Q | G3(I+Q) |  |  |
| 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) | B2a(D) | B2a(P) | B2a(D+P) |  |
| 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 |  |  |  |  |  |  |  |  |