**3GPP TSG-RAN WG2#129 R2-2XXXXXX**

**Athens, Greece, 17 – 21 February 2025**

**Agenda item:**

**Source:** Reliance Jio

**Title:** Summary of NavIC L1 stage 3 CR check (Reliance Jio)

**Document for:**  Discussion, Agreement

Introduction

This document is the report of the following email discussion:

* **[Post128][403][POS] NavIC L1 stage 3 CR check (Reliance Jio)**

 Scope: Check the CR in R2-2409726 and update if necessary.

 Intended outcome: Agreeable CR

 Deadline: Phase 1: January 17th, 2025

1. Contact Information

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| --- | --- | --- |
| **Company** | **Name** | **Email Address** |
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1. Discussion
	1. Comments on GNSS Assistance Data Elements

Companies are invited to provide their inputs wrt the changes proposed in R2-2409726 under 6.5.2.2 GNSS Assistance data Elements

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| **Company** | **Agree/Disagree**  | **Remark** |
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* 1. GNSS Assistance Data Request Elements

Companies are invited to provide their inputs wrt the changes proposed in R2-2409726 under 6.5.2.4 GNSS Assistance Data Request Elements

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| **Company** | **Agree/Disagree** | **Remark** |
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* 1. GNSS Capability Information Elements

Companies are invited to provide their inputs wrt the changes proposed in R2-2409726 under 6.5.2.10 GNSS Capability Information Elements

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| **Company** | **Agree/Disagree** | **Remark** |
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* 1. Common GNSS Information Elements

Companies are invited to provide their inputs wrt the changes proposed in R2-2409726 under 6.5.2.13 Common GNSS Information Elements

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| **Company** | **Agree/Disagree** | **Remark** |
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* 1. Other comments

Companies are invited to provide their any further inputs, comments, or suggestions other than those covered under previous sections on the Stage 3 CR for Introduction of NavIC L1 A-GNSS in LPP

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| **Company** | **Remark** |
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1. Conclusion

The discussion above can be summarized in the form of the following proposals:

[TBF]

Annex: NavIC L1 stage 3 CR R2-2409726

*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".

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

[50] BDS-SIS-ICD-B3I-1.0: "BeiDou Navigation Satellite System Signal In Space Interface Control Document Open Service Signal B3I (Version 1.0)", February, 2018.

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

[52] BDS-SIS-ICD-PPP-B2b-1.0: "BeiDou Navigation Satellite System Signal In Space Interface Control Document Precise Point Positioning Service Signal PPP-B2b (Version 1.0)", July, 2020.

[53] Bluetooth Special Interest Group: "Bluetooth Core Specification v5.4", February 2023.

[54] 3GPP TS 38.101-5: "User Equipment (UE) radio transmission and reception; Part 5: Satellite access Radio Frequency (RF) and performance requirements".

[xx] ISRO-NAVIC-ICD-SPS-L1-1.0, NavIC Signal in Space ICD for Standard Positioning Service in L1 frequency (Version 1.0), August 2023.

*NEXT CHANGE*

**6.5.2 A-GNSS Positioning**

**< Unchanged parts are omitted >**

6.5.2.2 GNSS Assistance Data Elements

**< Unchanged parts are omitted >**

– *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 [39].

-- ASN1START

GNSS-IonosphericModel ::= SEQUENCE {

 klobucharModel KlobucharModelParameter OPTIONAL, -- Need ON

 neQuickModel NeQuickModelParameter OPTIONAL, -- Need ON

 ...,

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

 ]],

 [[ neQuickModel2-r19 NeQuickModel2Parameter-r19 OPTIONAL -- Need ON

 ]]

}

-- ASN1STOP

– *KlobucharModelParameter*

-- ASN1START

KlobucharModelParameter ::= SEQUENCE {

 dataID BIT STRING (SIZE (2)),

 alfa0 INTEGER (-128..127),

 alfa1 INTEGER (-128..127),

 alfa2 INTEGER (-128..127),

 alfa3 INTEGER (-128..127),

 beta0 INTEGER (-128..127),

 beta1 INTEGER (-128..127),

 beta2 INTEGER (-128..127),

 beta3 INTEGER (-128..127),

 ...,

 [[ alfa2Ext-r19 INTEGER (-512..511) OPTIONAL, -- Need ON

 alfa3Ext-r19 INTEGER (-2048..2047) OPTIONAL, -- Need ON

 beta2Ext-r19 INTEGER (-1024..1023) OPTIONAL, -- Need ON

 beta3Ext-r19 INTEGER (-8192..8191) OPTIONAL -- Need ON

 ]]

}

-- ASN1STOP

| ***KlobucharModelParamater* field descriptions** |
| --- |
| ***dataID***When dataID has the value ′11′ it indicates that the parameters have been generated by QZSS, and the parameters have been specialized and are applicable within the area defined in [7]. When dataID has the value ′01′ it indicates that the parameters have been generated by BDS, and UE shall use these parameters according to the description given in 5.2.4.7 in [23], [50]. When the dataID has the value ′10′, it indicates that the parameters have been generated by NavIC, and a UE shall use these parameters according to the description given in [38] or [xx]. When the dataID has the value ′10′, and When dataID has the value ′00′ it indicates the parameters are applicable worldwide [4], [7]. |
| ***alfa0***This field specifies the 0 parameter of the Klobuchar model, as specified in [4], [23], [38], [50], [xx].Scale factor 2-30 seconds. |
| ***afa1***This field specifies the 1 parameter of the Klobuchar model, as specified in [4], [23], [38], [50], [xx].Scale factor 2-27 seconds/semi-circle. |
| ***alfa2, alfa2Ext***This field specifies the 2 parameter of the Klobuchar model, as specified in [4], [23], [38], [50], [xx].Scale factor 2-24 seconds/semi-circle2.If dataID has the value ‘10’ and if alfa2Ext field is present and supported by the target device, the device shall ignore the field alfa2. |
| ***alfa3, alfa3Ext***This field specifies the 3 parameter of the Klobuchar model, as specified in [4], [23], [38], [50], [xx].Scale factor 2-24 seconds/semi-circle3.If dataID has the value ‘10’ and if alfa3Ext field is present and supported by the target device, the device shall ignore the field alfa3. |
| ***beta0***This field specifies the 0 parameter of the Klobuchar model, as specified in [4], [23], [38], [50], [xx].Scale factor 211 seconds. |
| ***beta1***This field specifies the 1 parameter of the Klobuchar model, as specified in [4], [23], [38], [50], [xx].Scale factor 214 seconds/semi-circle. |
| ***beta2, beta2Ext***This field specifies the 2 parameter of the Klobuchar model, as specified in [4], [23], [38, [50], [xx].Scale factor 216 seconds/semi-circle2.If dataID has the value ‘10’ and if beta2Ext field is present and supported by the target device, the device shall ignore the field beta2. |
| ***beta3, beta3Ext***This field specifies the 3 parameter of the Klobuchar model, as specified in [4], [23], [38], [50], [xx].Scale factor 216 seconds/semi-circle3.If dataID has the value ‘10’ and if beta3Ext field is present and supported by the target device, the device shall ignore the field beta3. |

– *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], [49].Scale factor 2-3 TECU. |
| ***alfa2***This field specifies the 2 parameter of the Klobuchar model, as specified in 7.8.1 in [39], [49].Scale factor 2-3 TECU. |
| ***alfa3***This field specifies the 3 parameter of the Klobuchar model, as specified in 7.8.1 in [39], [49].Scale factor 2-3 TECU. |
| ***alfa4***This field specifies the 4 parameter of the Klobuchar model, as specified in 7.8.1 in [39], [49].Scale factor 2-3 TECU. |
| ***alfa5***This field specifies the  parameter of the Klobuchar model, as specified in 7.8.1 in [39], [49].Scale factor -2-3 TECU. |
| ***alfa6***This field specifies the 6 parameter of the Klobuchar model, as specified in 7.8.1 in [39], [49].Scale factor 2-3 TECU. |
| ***alfa7***This field specifies the 7 parameter of the Klobuchar model, as specified in 7.8.1 in [39], [49].Scale factor 2-3 TECU. |
| ***alfa8***This field specifies the 8 parameter of the Klobuchar model, as specified in 7.8.1 in [39], [49].Scale factor 2-3 TECU. |
| ***alfa9***This field specifies the 9 parameter of the Klobuchar model, as specified in 7.8.1 in [39], [49].Scale factor 2-3 TECU. |

– *NeQuickModelParameter*

-- ASN1START

NeQuickModelParameter ::= SEQUENCE {

 ai0 INTEGER (0..2047),

 ai1 INTEGER (-1024..1023),

 ai2 INTEGER (-8192..8191),

 ionoStormFlag1 INTEGER (0..1) OPTIONAL, -- Need OP

 ionoStormFlag2 INTEGER (0..1) OPTIONAL, -- Need OP

 ionoStormFlag3 INTEGER (0..1) OPTIONAL, -- Need OP

 ionoStormFlag4 INTEGER (0..1) OPTIONAL, -- Need OP

 ionoStormFlag5 INTEGER (0..1) OPTIONAL, -- Need OP

 ...

}

-- ASN1STOP

| ***NeQuickModelParameter* field descriptions** |
| --- |
| ***ai0***Effective Ionisation Level 1st order parameter.Scale factor 2-2 Solar Flux Units (SFUs), [8] clause 5.1.6. |
| ***ai1***Effective Ionisation Level 2nd order parameter.Scale factor 2-8 Solar Flux Units/degree, [8] clause 5.1.6. |
| ***ai2***Effective Ionisation Level 3rd order parameter.Scale factor 2-15 Solar Flux Units/degree2, [8] clause 5.1.6.  |
| ***ionoStormFlag1, ionoStormFlag2, ionoStormFlag3, ionoStormFlag4, ionoStormFlag5***These fields specify the ionosphere disturbance flags (1,…,5) for five different regions as described in [8], clause 5.1.6. If the ionosphere disturbance flag for a region is not present the target device shall treat the ionosphere disturbance condition as unknown. |

– *NeQuickModel2Parameter*

-- ASN1START

NeQuickModel2Parameter-r19 ::= SEQUENCE {

 iodn-r19 INTEGER (0..3),

 neQuickModel2ParameterList-r19 NeQuickModel2ParameterList-r19,

 ...

}

NeQuickModel2ParameterList-r19 ::= SEQUENCE (SIZE (3)) OF NeQuickModel2ParameterElement-r19

NeQuickModel2ParameterElement-r19 ::= SEQUENCE {

 ai0-r19 INTEGER (0..2047),

 ai1-r19 INTEGER (-1024..1023),

 ai2-r19 INTEGER (-8192..8191),

 ionoDisturbanceFlag-r19 INTEGER (0..1) OPTIONAL, -- Need OP

 modipmax-r19 INTEGER (-32..31) OPTIONAL, -- Need ON

 modipmin-r19 INTEGER (-32..31) OPTIONAL, -- Need ON

 mLonmax-r19 INTEGER (-64..63) OPTIONAL, -- Need ON

 mLonmin-r19 INTEGER (-64..63) OPTIONAL, -- Need ON

 ...

}

-- ASN1STOP

| *NeQuickModel2Parameter* field descriptions |
| --- |
| ***iodn***Issue of data NeQuick-N which indicates the update in the parameters, [xx] clause 6.2.2.5 |
| ***ai0***Effective Ionisation Level 1st order parameter.Scale factor 2-2 Solar Flux Units (SFUs), [xx] clause 6.2.2.5 |
| ***ai1***Effective Ionisation Level 2nd order parameter.Scale factor 2-8 Solar Flux Units/degree, [xx] clause 6.2.2.5 |
| ***ai2***Effective Ionisation Level 3rd order parameter.Scale factor 2-15 Solar Flux Units/degree2, [xx] clause 6.2.2.5.  |
| ***ionoDisturbanceFlag***This field specifies the ionosphere disturbance flag for region corresponding to the set as described in [xx] clause 6.1.3.3. The ionosphere disturbance flag reflects the validity of the parameters. TRUE means valid parameters. If the ionosphere disturbance flag for a region is not present the target device shall treat the ionosphere disturbance condition as unknown. |
| ***modipmax***Maximum Modified DIP latitude (MODIP) coverage (in degree) as defined in [xx] clause 6.2.2.5.Scale factor 5 degree |
| ***modipmin***Minimum Modified DIP latitude (MODIP) coverage (in degree) as defined in [xx] clause 6.2.2.5.Scale factor 5 degree |
| ***mLonmax***Maximum Longitude coverage (in degree) as defined in [xx] clause 6.2.2.5.Scale factor 5 degree |
| ***mLonmin***Minimum Longitude coverage (in degree) as defined in [xx] clause 6.2.2.5.Scale factor 5 degree |

*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 determines 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

 navic-ClockModel2-r19 NavIC-ClockModel2-r19 -- Model-9

}

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

 navic-KeplerianSet2-r19 NavModel-NavIC-KeplerianSet2-r19 -- Model-9

}

-- 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/B3I ephemeris, the *iod* contains 11 MSB bits of the toe as defined in [23], [50].In the case of broadcasted BDS B1C/B2a ephemeris, the *iod* contains the IODC as described in [39], [49].In the case of broadcasted NavIC L5 ephemeris, the iod contains 11 MSB bits of the toe as defined in [38].In the case of broadcasted NavIC L1 ephemeris, the iod contains 11 bit parameter toec as defined in [xx].The interpretation of *iod* depends on the *GNSS‑ID* and is as shown in table GNSS to iod Bit String(11) relation below. |
| ***svHealthExt***This field 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(6) B1I[23] | B1I Health (SatH1) [23], [50] | B3I Health (SatH1) [23], [50] | '0'(reserved) | '0'(reserved) | '0'(reserved) | '0'(reserved) | '0'(reserved) | '0'(reserved) |
| BDS(7) B1C[39]/B2a [49] | Sat Clock Health [39], [49] | B1C Health[39], [49] | B2a Health[39],[49] | '0'(reserved) | '0'(reserved) | '0'(reserved) | '0'(reserved) | '0'(reserved) |
| NavIC(8) | L5 health [38] |  L1 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 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.Note 8: If *GNSS‑ID* indicates 'navic', and GNSS Orbit Model-9 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 I/NAV | '0' | IODnav [8] |
| BDS B1I/B3I | 11 MSB bits of toe (seconds, scale factor 512, range 0 – 604672) [23], [50] |
| BDS B1C/B2a | '0' | Issue of Data, Clock [39], [49] |
| NavIC L5 | 11 MSB bits of toe (seconds, scale factor 512) [38] |
| NavIC L1 | toec (seconds, scale factor 300) [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 |

*NEXT CHANGE*

– *NavIC-ClockModel*

The IE *NavIC-ClockModel* is used for NavIC L5 as defined in [38].

-- ASN1START

NavIC-ClockModel-r16 ::= SEQUENCE {

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

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

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

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

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

 ...

}

-- ASN1STOP

| ***NavIC-ClockModel* field descriptions** |
| --- |
| ***navic-Toc***Parameter toc, time of clock (seconds) [38], Table-11.Scale factor 24 seconds. |
| ***navic-af2***Parameter af2, clock correction polynomial coefficient (sec/sec2) [38].Scale factor 2-55 seconds/second2. |
| ***navic-af1***Parameter af1, clock correction polynomial coefficient (sec/sec) [38].Scale factor 2-43 seconds/second. |
| ***navic-af0***Parameter af0, clock correction polynomial coefficient (seconds) [38].Scale factor 2-31 seconds. |
| ***navic-Tgd***Parameter TGD, group delay (seconds) [38].Scale factor 2-31 seconds. |

– *NavIC-ClockModel2*

The IE *NavIC-ClockModel2* is used for NavIC L1 as defined in [xx].

-- ASN1START

NavIC-ClockModel2-r19 ::= SEQUENCE {

 navicL1-Toec-r19 INTEGER (0..2047),

 navicL1-af2-r19 INTEGER (-16384..16383),

 navicL1-af1-r19 INTEGER (-2097152.. 2097151),

 navicL1-af0-r19 INTEGER (-268435456.. 268435455),

 navicL1-Tgd-r19 INTEGER (-2048..2047),

 navicL1-iscL1PorS-r19 INTEGER (-2048..2047),

 navicL1-iscL1D-r19 INTEGER (-2048..2047),

 navicL1-RSF-r19 BOOLEAN, ...

}

-- ASN1STOP

| *NavIC-ClockModel2* field descriptions |
| --- |
| ***navicL1-Toec***Parameter toec, time of ephemeris and clock (seconds) as described in clause 6 of [xx], Table-13.Scale factor 300 seconds. |
| ***navicL1-af2***Parameter af2, clock correction polynomial coefficient (sec/sec2) as described in clause 6 of [xx].Scale factor 2-66 seconds/second2. |
| ***navicL1-af1***Parameter af1, clock correction polynomial coefficient (sec/sec) as described in clause 6 of [xx].Scale factor 2-50 seconds/second. |
| ***navicL1-af0***Parameter af0, clock correction polynomial coefficient (seconds) as described in clause 6 of [xx].Scale factor 2-35 seconds. |
| ***navicL1-Tgd***Parameter TGD, group delay (seconds) as described in clause 6 of [xx].Scale factor 2-35 seconds. |
| ***navicL1-iscL1PorS***Parameter ISCL1P (Reference Signal Flag RSF = 1) or ISCS (Reference Signal Flag RSF = 0), Intersignal correction (seconds) for L1 pilot or S based on reference signal flag status as described in clause 6 of [xx]Scale factor 2-35 seconds |
| ***navicL1-iscL1D***Parameter ISCL1D, Intersignal correction (seconds) for L1 data as described in clause 6 of [xx]Scale factor 2-35 seconds |
| ***navicL1-RSF***Parameter RSF, Reference signal flag as described in clause 6 of [xx] |

#### – *NavModel-NavIC-KeplerianSet*

The IE *NavModel-NavIC-KeplerianSet* is used for NavIC L5 as defined in [38].

-- ASN1START

NavModel-NavIC-KeplerianSet-r16 ::= SEQUENCE {

 navic-Toe-r16 INTEGER (0..65536),

 navic-URAI-r16 INTEGER (0..15),

 navic-W-r16 INTEGER (-2147483648..2147483647),

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

 navic-M0-r16 INTEGER (-2147483648..2147483647),

 navic-OmegaDot-r16 INTEGER (-2147483648..2147483647),

 navic-E-r16 INTEGER (0..4294967295),

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

 navic-APowerHalf-r16 INTEGER (0.. 4294967295),

 navic-I0-r16 INTEGER (-2147483648..2147483647),

 navic-Omega0-r16 INTEGER (-2147483648..2147483647),

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

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

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

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

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

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

 ...

}

-- ASN1STOP

| *NavModel-NavIC-KeplerianSet* field descriptions |
| --- |
| ***navic-Toe***Parameter toe, time-of-ephemeris in seconds [38].Scale factor 24 seconds. |
| ***navic-URAI***Parameter User Range Accuracy Index (in metres). This is a one-sigma estimate of the user range errors in the navigation data for the transmitting satellite as described under clause 6.2.1.4 in [38] |
| ***navic-W***Parameter ω, argument of perigee (semi-circles) [38].Scale factor 2-31 semi-circles. |
| ***navic-DeltaN***Parameter n, mean motion difference from computed value (semi-circles/sec) [38]Scale factor 2-41 semi-circles/second |
| ***navic-M0***Parameter M0, mean anomaly at reference time (semi-circles) [38]Scale factor 2-31 semi-circles. |
| ***navic-OmegaDot***Parameter OMEGAdot, rate of change of right ascension (semi-circles/sec) [38]Scale factor 2-41 semi-circles/second |
| ***navic-E***Parameter e, eccentricity [38]Scale factor 2-33. |
| ***navic-IDot***Parameter Idot, rate of change of inclination angle (semi-circles/sec) [38]Scale factor 2-43 semi-circles/second. |
| ***navic-APowerHalf***Parameter sqrtA, square root of semi-major Axis in (metres)½ [38]Scale factor 2-19 metres ½. |
| ***navic-I0***Parameter i0, inclination angle at reference time (semi-circles) [38]Scale factor 2-31 semi-circles. |
| ***navic-Omega0***Parameter OMEGA0, longitude of ascending node of orbit plane at weekly epoch (semi-circles) [38]Scale factor 2-31 semi-circles. |
| ***navic-Crs***Parameter Crs, amplitude of the sine harmonic correction term to the orbit radius (metres) [38]Scale factor 2-4 metres |
| ***navic-Cis***Parameter Cis, amplitude of the sine harmonic correction term to the angle of inclination (radians) [38]Scale factor 2-28 radians |
| ***navic-Cus***Parameter Cus, amplitude of the sine harmonic correction term to the argument of latitude (radians) [38]Scale factor 2-28 radians |
| ***navic-Crc***Parameter Crc, amplitude of the cosine harmonic correction term to the orbit radius (metres) [38]Scale factor 2-4 metres |
| ***navic-Cic***Parameter Cic, amplitude of the cosine harmonic correction term to the angle of inclination (radians) [38]Scale factor 2-28 radians |
| ***navic-Cuc***Parameter Cuc, amplitude of the cosine harmonic correction term to the argument of latitude (radians) [38]Scale factor 2-28 radians |

#### – *NavModel-NavIC-KeplerianSet2*

The IE *NavModel-NavIC-KeplerianSet2* is used for NavIC L1 as defined in [xx].

-- ASN1START

NavModel-NavIC-KeplerianSet2-r19 ::= SEQUENCE {

 navicL1-Toec-r19 INTEGER (0..2047),

 navicL1-URAI-r19 INTEGER (-16..15),

 navicL1-DeltaA-r19 INTEGER (-33554432..33554431),

 navicL1-Adot-r19 INTEGER (-33554432..33554431),

 navicL1-DeltaN0-r19 INTEGER (-262144..262143),

 navicL1-DeltaNdot-r19 INTEGER (-4194304..4194303),

 navicL1-M0-r19 INTEGER (-4294967296..4294967295),

 navicL1-E-r19 INTEGER (0..8589934591),

 navicL1-W-r19 INTEGER (-4294967296..4294967295),

 navicL1-Omega0-r19 INTEGER (-4294967296..4294967295),

 navicL1-OmegaDot-r19 INTEGER (-16777216..16777215),

 navicL1-I0-r19 INTEGER (-4294967296..4294967295),

 navicL1-IDot-r19 INTEGER (-16384..16383),

 navicL1-Cis-r19 INTEGER (-32768..32767),

 navicL1-Cic-r19 INTEGER (-32768..32767),

 navicL1-Crs-r19 INTEGER (-8388608..8388607),

 navicL1-Crc-r19 INTEGER (-8388608..8388607),

 navicL1-Cus-r19 INTEGER (-1048576..1048575),

 navicL1-Cuc-r19 INTEGER (-1048576..1048575),

 ...

}

-- ASN1STOP

| *NavModel-NavIC-KeplerianSet2* field descriptions |
| --- |
| ***navicL1-Toec***Parameter toec, time-of-ephemeris and clock in seconds as described under clause 6 in [xx]Scale factor 300 seconds. |
| ***navicL1-URAI***Parameter User Range Accuracy Index (in metres). This is a one-sigma estimate of the user range errors in the navigation data for the transmitting satellite as described under clause 6 in [xx] |
| ***navicL1-DeltaA***Parameter , semi major axis difference at reference time (in meters) as described under clause 6 in [xx]Scale factor 2-9 meters |
| ***navicL1-Adot***Parameter , change rate in semi major axis at reference time (in meters/sec) as described under clause 6 in [xx]Scale factor 2-21 meters/sec |
| ***navicL1-DeltaN0***Parameter n0, mean motion difference at reference time (semi-circles/sec) as described under clause 6 in [xx]Scale factor 2-44 semi-circles/second |
| ***navicL1-DeltaNdot***Parameter , rate of mean motion difference at reference time (semi-circles/sec) as described under clause 6 in [xx]Scale factor 2-57 semi-circles/second |
| ***navicL1-M0***Parameter M0, mean anomaly at reference time (semi-circles) as described under clause 6 in [xx]Scale factor 2-32 semi-circles. |
| ***navicL1-E***Parameter e, eccentricity as described under clause 6 in [xx]Scale factor 2-34. |
| ***navicL1-W***Parameter , argument of perigee as described under clause 6 in [xx]Scale factor 2-32 semi-circles. |
| ***navicL1-Omega0***Parameter , longitude of ascending node of orbit plane at weekly epoch (semi-circles) as described under clause 6 in [xx]Scale factor 2-32 semi-circles. |
| ***navicL1-OmegaDot***Parameter , rate of change of right ascension (semi-circles/sec) as described under clause 6 in [xx]Scale factor 2-44 semi-circles/second |
| ***navicL1-I0***Parameter i0, inclination angle at reference time (semi-circles) as described under clause 6 in [xx]Scale factor 2-32 semi-circles. |
| ***navicL1-IDot***Parameter Idot, rate of change of inclination angle (semi-circles/sec) as described under clause 6 in [xx]Scale factor 2-44 semi-circles/second. |
| ***navicL1-Cis***Parameter Cis, amplitude of the sine harmonic correction term to the angle of inclination (radians) as described under clause 6 in [xx]Scale factor 2-30 radians |
| ***navicL1-Cic***Parameter Cic, amplitude of the cosine harmonic correction term to the angle of inclination (radians) as described under clause 6 in [xx]Scale factor 2-30 radians |
| ***navicL1-Crs***Parameter Crs, amplitude of the sine harmonic correction term to the orbit radius (metres) as described under clause 6 in [xx]Scale factor 2-8 metres |
| ***navicL1-Crc***Parameter Crc, amplitude of the cosine harmonic correction term to the orbit radius (metres) as described under clause 6 in [xx]Scale factor 2-8 metres |
| ***navicL1-Cus***Parameter Cus, amplitude of the sine harmonic correction term to the argument of latitude (radians) as described under clause 6 in [xx]Scale factor 2-30 radians |
| ***navicL1-Cuc***Parameter Cuc, amplitude of the cosine harmonic correction term to the argument of latitude (radians) as described under clause 6 in [xx]Scale factor 2-30 radians |

*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 [49], clause 6.2.2.In the case of BDS B3I, it contains the encoded and interleaved modulation symbols as defined in [50], clause 5.1.3.In the case of NavIC L5, it contains the FEC encoded and interleaved Navigation symbols as defined in [38] In the case of NavIC L1, it contains the encoded and interleaved Navigation symbols as defined in [xx], clause 5. |

*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

 keplerianNavIC-Almanac2-r19 AlmanacNavIC-AlmanacSet2-r19 -- Model-9

}

-- 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 [49], 7.9.1.In the case of NavIC, the almanac reference week number is defined in [38] [xx]. |
| ***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. |

**< Unchanged parts are omitted >**

– *AlmanacNavIC-AlmanacSet*

The IE *AlmanacNavIC-AlmanacSet* is used for NavIC L5 as defined in [38].

-- ASN1START

AlmanacNavIC-AlmanacSet-r16 ::= SEQUENCE {

 svID-r16 SV-ID,

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

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

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

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

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

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

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

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

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

 ...

}

-- ASN1STOP

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

| ***AlmanacNavIC-AlmanacSet* field descriptions** |
| --- |
| ***svID***This field identifies the satellite for which the Almanac model is given |
| ***navic-AlmToa***This field provides the time of almanac setScale factor 16 seconds. |
| ***navic-AlmE***Parameter e, eccentricity, dimensionlessScale factor 2-21. |
| ***navic-AlmOMEGADOT***Parameter , rate of right ascension, semi-circles/secScale factor 2-38 semi-circles/second |
| ***navic-AlmSqrtA***Parameter , square root of the semi-major axis, metres1/2Scale factor 2-11 metres1/2. |
| ***navic-AlmOMEGAo***Parameter 0, longitude of ascending node of orbit plane at weekly epoch, semi-circlesScale factor 2-23 semi-circles. |
| ***navic-AlmOmega***Parameter ω, argument of perigee semi-circlesScale factor 2-23 semi-circles. |
| ***navic-AlmMo***Parameter M0, mean anomaly at reference time semi-circlesScale factor 2-23 semi-circles. |
| ***navic-Almaf0***Parameter af0, apparent satellite clock correction secondsScale factor 2-20 seconds. |
| ***navic-Almaf1***Parameter af1, apparent satellite clock correction sec/secScale factor 2-38 semi-circles seconds/second. |

– *AlmanacNavIC-AlmanacSet2*

The IE *AlmanacNavIC-AlmanacSet2* is used for NavIC L1 as defined in [xx].

-- ASN1START

AlmanacNavIC-AlmanacSet-r19 ::= SEQUENCE {

 svID-r19 SV-ID,

 navicL1-AlmToa-r19 INTEGER (0..65535) OPTIONAL, -- Cond NotSameForAllSV

 navicL1-AlmE-r19 INTEGER (0..1048575),

 navicL1-i0-r19 INTEGER (-8388608..8388607),

 navicL1-AlmOMEGADOT-r19 INTEGER (-262144..262143),

 navicL1-AlmSqrtA-r19 INTEGER (0..16777215),

 navicL1-AlmOMEGAo-r19 INTEGER (-8388608..8388607),

 navicL1-AlmOmega-r19 INTEGER (-8388608..8388607),

 navicL1-AlmMo-r19 INTEGER (-8388608..8388607),

 navicL1-Almaf0-r19 INTEGER (-8192..8191),

 navicL1-Almaf1-r19 INTEGER (-1024..1023),

 ...

}

-- ASN1STOP

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

| ***AlmanacNavIC-AlmanacSet2 field descriptions*** |
| --- |
| ***svID***This field identifies the satellite for which the Almanac model is given |
| ***navicL1-AlmToa***This field provides the time of almanac setScale factor 16 seconds. |
| ***navicL1-AlmE***Parameter e, eccentricity, dimensionless as described in clause 6 of [xx]Scale factor 2-21. |
| ***navicL1-i0***Parameter I0, inclination (semi-circles) as described in clause 6 of [xx]Scale factor 2-23 semicircles. |
| ***navicL1-AlmOMEGADOT***Parameter , rate of right ascension, semi-circles/sec as described in clause 6 of [xx]Scale factor 2-38 semi-circles/second |
| ***navicL1-AlmSqrtA***Parameter , square root of the semi-major axis, metres1/2 as described in clause 6 of [xx]Scale factor 2-11 metres1/2. |
| ***navicL1-AlmOMEGAo***Parameter 0, longitude of ascending node of orbit plane at weekly epoch, semi-circles as described in clause 6 of [xx]Scale factor 2-23 semi-circles. |
| ***navicL1-AlmOmega***Parameter ω, argument of perigee semi-circles as described in clause 6 of [xx]Scale factor 2-23 semi-circles. |
| ***navicL1-AlmMo***Parameter M0, mean anomaly at reference time semi-circles as described in clause 6 of [xx]Scale factor 2-23 semi-circles. |
| ***navicL1-Almaf0***Parameter af0, apparent satellite clock correction seconds as described in clause 6 of [xx]Scale factor 2-20 seconds. |
| ***navicL1-Almaf1***Parameter af1, apparent satellite clock correction sec/sec as described in clause 6 of [xx]Scale factor 2-38 seconds/second. |

*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], [49].

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

**< Unchanged parts are omitted >**

– *UTC-ModelSet2*

-- ASN1START

UTC-ModelSet2 ::= SEQUENCE {

 utcA0 INTEGER (-32768..32767),

 utcA1 INTEGER (-4096..4095),

 utcA2 INTEGER (-64..63),

 utcDeltaTls INTEGER (-128..127),

 utcTot INTEGER (0..65535),

 utcWNot INTEGER (0..8191),

 utcWNlsf INTEGER (0..255),

 utcDN BIT STRING (SIZE(4)),

 utcDeltaTlsf INTEGER (-128..127),

 ...,

 [[

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

 ]]

}

-- ASN1STOP

| ***UTC-ModelSet2* field descriptions** |
| --- |
| ***utcA0***Parameter A0-n, bias coefficient of GNSS time scale relative to UTC time scale (seconds) [4], [5], [6], [7], [38], [39], [49], [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], [49], [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], [49], [xx].Scale factor 2-68 seconds/second2. |
| ***utcDeltaTls***Parameter ΔtLS, current or past leap second count (seconds) [4], [5], [6], [7], [38], [39], [49], [xx].Scale factor 1 second. |
| ***utcTot***Parameter tot, time data reference time of week (seconds) [4], [5], [6], [7], [38], [39], [49], [xx].Scale factor 24 seconds. |
| ***utcWNot***Parameter WNot, time data reference week number (weeks) [4], [5], [6], [7], [38], [39], [49], [xx].Scale factor 1 week. |
| ***utcWNlsf, utcWNlsf-ext***Parameter WNLSF, leap second reference week number (weeks) [4], [5], [6], [7], [38], [39], [49], [xx].If the field *utcWNlsf-ext* is present, the field *utcWNlsf* shall be ignored by the receiver. Either utcWNlsf or utcWNlsf-ext is required for NavIC GNSS.Scale factor 1 week. |
| ***utcDN***Parameter DN, leap second reference day number (days) [4], [5], [6], [7], [38], [39], [49], [xx].Scale factor 1 day. |
| ***utcDeltaTlsf***Parameter ΔtLSF, current or future leap second count (seconds) [4], [5], [6], [7], [38], [39], [49], [xx].Scale factor 1 second. |

*NEXT CHANGE*

– *NavIC-DifferentialCorrections*

The IE *NavIC-DifferentialCorrections* parameters provide users with sets of correction terms that apply to the clock and ephemeris data transmitted by other satellites in the AutoNav mode for NavIC L5 SPS signals as defined in [38] under clause 6.2.6.

-- ASN1START

NavIC-DifferentialCorrections-r16 ::= SEQUENCE {

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

 navic-CorrectionListAutoNav-r16 NavIC-CorrectionListAutoNav-r16,

 ...

}

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

NavIC-CorrectionElementAutoNav-r16 ::= SEQUENCE {

 svID SV-ID,

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

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

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

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

 navic-EDC-r16 NavIC-EDC-r16,

 navic-CDC-r16 NavIC-CDC-r16,

 ...

}

NavIC-EDC-r16 ::= SEQUENCE {

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

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

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

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

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

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

 ...

}

NavIC-CDC-r16 ::= SEQUENCE {

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

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

 ...

}

-- ASN1STOP

| ***NavIC-DifferentialCorrections* field descriptions** |
| --- |
| ***navic-RefTOWC***The transmission timing of the navigation message provided through the Time of Week Count (TOWC) corresponding to the given set of grid ionospheric parameters. It indicates the number of 12 second counts represented in 17 bits. The TOW count value ranges from 1 to 50400 to cover one entire week. The Time of Week (TOW) in seconds is obtained by multiplying TOWC with 12 as defined in [38], clause 5.7. |
| ***navic-Tod***This field indicates the NavIC Time of Differential Correction in seconds.Scale factor 16 seconds |
| ***navic-iodec***This field indicates Issue of Data Ephemeris and Clock which provides the user with a convenient means of detecting any change in the ephemeris and clock parameters as described under clause 6.2.1.3 in [38] |
| ***navic-UDRAI***This field indicates the index for the User Differential Range Accuracy (in metres) value which enables users to estimate the accuracy obtained after differential corrections are applied as described under clause 6.2.6 in [38] |
| ***navic-UDRArateI***This field indicates the index for the change rate of User Differential Range Accuracy (metres/second)value which enables users to estimate the accuracy obtained after differential corrections are applied as described under clause 6.2.6 in [38] |
| ***navic-AlphaEDC***This field indicates the Alpha correction to Ephemeris parameter (Δα), which is one of the six keplerian elements defining the ephemeris differential corrections (EDC) for NavIC as defined under clause 6.1.3.5 in [38].Scale factor 2–34 |
| ***navic-BetaEDC***This field indicates Beta correction to Ephemeris parameter (Δβ), which is one of the six keplerian elements defining the ephemeris differential corrections (EDC) for NavIC as defined under clause 6.1.3.5 in [38].Scale factor 2–34 |
| ***navic-GammaEDC***This field indicates the Gamma correction to Ephemeris parameter (Δγ), which is one of the six keplerian elements defining the ephemeris differential corrections (EDC) for NavIC as defined under clause 6.1.3.5 in [38].Scale factor 2–32 semi-circles. |
| ***navic-AoIcorrection***This field indicates the Angle of inclination correction (Δi), which is one of the six keplerian elements defining the ephemeris differential corrections (EDC) for NavIC as defined under clause 6.1.3.5 in [38].Scale factor 2–32 semi-circles. |
| ***navic-AoRAcorrection***This field indicates the Angle of right ascension correction (ΔΩ), which is one of the six keplerian elements defining the ephemeris differential corrections (EDC) for NavIC as defined under clause 6.1.3.5 in [38].Scale factor 2–32 semi-circles. |
| ***navic-SemiMajorcorrection***This field indicates the Semi-major correction (ΔA), which is one of the six keplerian elements defining the ephemeris differential corrections (EDC) for NavIC as defined under clause 6.1.3.5 in [38].Scale factor 2–9 metres. |
| ***navic-ClockBiasCorrection***This field indicates correction to the satellite clock bias coefficient (δaf0), which is one of the two Satellite clock differential corrections (CDC) containing corrections to the NavIC satellite clock polynomial coefficients as defined under clause 6.1.3.5 in [38].Scale factor 2–35 seconds. |
| ***navic-ClockDriftCorrection***This field indicates correction to the satellite clock drift coefficient (δaf1), which is one of the two Satellite clock differential corrections (CDC) containing corrections to the NavIC satellite clock polynomial coefficients as defined under clause 6.1.3.5 in [38].Scale factor 2–51 sec / sec. |

– *NavIC-GridModelParameter*

The IE *NavIC-GridModelParameter* is used for NavIC GNSS as defined in [38], [xx].

-- ASN1START

NavIC-GridModelParameter-r16 ::= SEQUENCE {

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

 regionMasked-r16 INTEGER (0..1023),

 regionIgpList-r16 RegionIgpList-r16,

 ...,

 [[ navic-RefITOW-r19 INTEGER (0..255) OPTIONAL, -- Need ON

 navic-RefTOI-r19 INTEGER (0..511) OPTIONAL -- Need ON

 ]]

}

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

RegionIgpElement-r16 ::= SEQUENCE {

 regionID-r16 INTEGER (0..15),

 givei1-r16 INTEGER (0..15),

 givd1-r16 INTEGER (0..511),

 givei2-r16 INTEGER (0..15),

 givd2-r16 INTEGER (0..511),

 givei3-r16 INTEGER (0..15),

 givd3-r16 INTEGER (0..511),

 givei4-r16 INTEGER (0..15),

 givd4-r16 INTEGER (0..511),

 givei5-r16 INTEGER (0..15),

 givd5-r16 INTEGER (0..511),

 givei6-r16 INTEGER (0..15),

 givd6-r16 INTEGER (0..511),

 givei7-r16 INTEGER (0..15),

 givd7-r16 INTEGER (0..511),

 givei8-r16 INTEGER (0..15),

 givd8-r16 INTEGER (0..511),

 givei9-r16 INTEGER (0..15),

 givd9-r16 INTEGER (0..511),

 givei10-r16 INTEGER (0..15),

 givd10-r16 INTEGER (0..511),

 givei11-r16 INTEGER (0..15),

 givd11-r16 INTEGER (0..511),

 givei12-r16 INTEGER (0..15),

 givd12-r16 INTEGER (0..511),

 givei13-r16 INTEGER (0..15),

 givd13-r16 INTEGER (0..511),

 givei14-r16 INTEGER (0..15),

 givd14-r16 INTEGER (0..511),

 givei15-r16 INTEGER (0..15),

 givd15-r16 INTEGER (0..511),

 ...

}

-- ASN1STOP

| ***NavIC-GridModelParameter field descriptions*** |
| --- |
| ***navic-RefTOWC***The transmission timing of the navigation message provided through the Time of Week Count (TOWC) corresponding to the given set of grid ionospheric parameters as received in NavIC L5 message. It indicates the number of 12 second counts represented in 17 bits. The TOW count value ranges from 1 to 50400 to cover one entire week. The Time of Week (TOW) in seconds is obtained by multiplying TOWC with 12 as defined in [38], clause 5.7. This field is applicable for NavIC L5 receiver. |
| ***navic-RefITOW***The transmission timing of the navigation message provided through the Interval Time of Week (ITOW) corresponding to the given set of grid ionospheric parameters as received in NavIC L1 message. It is the number of 2 hr intervals elapsed from the start of the NavIC week as described in clause 5.6 of [xx]This field is applicable for NavIC L1 receiver. |
| ***navic-RefTOI***The transmission timing of the navigation message provided through the Time of Interval (TOI) corresponding to the given set of grid ionospheric parameters as received in NavIC L1 message. It is the count of number of 18 second message intervals in each 2 hour ITOW as described in clause 5.6 of [xx]This field is applicable for NavIC L1 receiver. |
| ***regionMasked***Total 90 Ionospheric Grid Points(IGP) are defined in [38] clause 6.2.3 table 25. 15 IGP points are grouped into a single region. The region masked indicates the total number of regions for which the corrections are provided. For the current service area of the IRNSS, regions masked are 6. |
| ***regionIgpList***This list provides the set of IGPs corresponding to each region. Up to 6 instances (0 to 5) are used in this version of the specification. The values 6 to 15 are reserved for future use. |
| ***regionID***regionID along with index of the IGPS point corresponding gives the location of IGPS point as defined in [38], table 25, clause 6.2.3. |
| ***givei1, give2, .. , give15***This field indicates the Grid Ionospheric Vertical Error Index (GIVEI) which is used to describe the delay correction accuracy at ionospheric grid point indicated by the igp-ID, the mapping between GIVEI and GIVE is defined in [38], clause 6.2.2 and table 27. |
| ***givd1, givd2, … , givd15***This field indicates the Grid Ionospheric Vertical Delay (GIVD) as defined in [38], clause 5.3.3.8.1, i.e. the vertical delay at the corresponding Ionospheric Grid points (IGPs) indicated by igp-ID. The scale factor is 0.125 metre. |

*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

 ]],

 [[ neQuickModel2Req-r19 NULL OPTIONAL -- Cond neQuick2

 ]]

}

-- 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. |
| *neQuickModel2* | The field is mandatory present if the target device requests *neQuickModel2*; otherwise. it is not present. |

**< Unchanged parts are omitted >**

– *GNSS-NavigationModelReq*

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

-- ASN1START

GNSS-NavigationModelReq ::= CHOICE {

 storedNavList StoredNavListInfo,

 reqNavList ReqNavListInfo,

 ...

}

StoredNavListInfo ::= SEQUENCE {

 gnss-WeekOrDay INTEGER (0..4095),

 gnss-Toe INTEGER (0..255),

 t-toeLimit INTEGER (0..15),

 satListRelatedDataList SatListRelatedDataList OPTIONAL,

 ...

}

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

SatListRelatedDataElement ::= SEQUENCE {

 svID SV-ID,

 iod BIT STRING (SIZE(11)),

 clockModelID INTEGER (1..8) OPTIONAL,

orbitModelID INTEGER (1..8) OPTIONAL,

 ...,

 [[

 clockModelExt-r19 INTEGER (9..16) OPTIONAL,

 orbitModelExt-r19 INTEGER (9..16) OPTIONAL

 ]]

}

ReqNavListInfo ::= SEQUENCE {

 svReqList BIT STRING (SIZE (64)),

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

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

 addNavparamReq BOOLEAN OPTIONAL, -- Cond orbitModelID-2

 ...,

 [[

 clockModelID-PrefListExt-r19 INTEGER(9..16) OPTIONAL,

 orbitModelID-PrefListExt-r19 INTEGER(9..16) OPTIONAL

 ]]

}

-- ASN1STOP

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

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

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

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

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

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

**< Unchanged parts are omitted >**

– *GNSS-AlmanacReq*

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

-- ASN1START

GNSS-AlmanacReq ::= SEQUENCE {

 modelID INTEGER(1..8) OPTIONAL,

 ...,

 [[

 modelID-Ext-r19 INTEGER (9..16) OPTIONAL -- Need ON

 ]]

}

-- ASN1STOP

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

**GNSS-ID to modelID relation**

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

*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),

 neQuick2-r19 (3) } (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. |

#### – *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),

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

 orbitModel BIT STRING { model-1 (0),

 model-2 (1),

 model-3 (2),

 model-4 (3),

 model-5 (4),

 model-6 (5),

 model-7-r16 (6),

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

 ...,

 [[ clockModelExt-v19xy BIT STRING { model-9-r19 (0)

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

 orbitModelExt-v19xy BIT STRING { model-9-r19 (0)

 } (SIZE (1..8)) OPTIONAL

 ]]

}

-- ASN1STOP

| *GNSS-NavigationModelSupport* field descriptions |
| --- |
| ***clockModel, clockModelExt***This field specifies the *gnss-ClockModel* choice(s) in *GNSS-NavigationModel* IE supported by the target device for the GNSS indicated by *GNSS‑ID*. This is represented by a bit string, with a one‑value at the bit position means the particular clock model is supported; a zero‑value means not supported.If the target device supports GPS and *GNSS-NavigationModel* assistance, it shall support *clockModel* Model-2.If the target device supports SBAS and *GNSS-NavigationModel* assistance, it shall support *clockModel* Model-5.If the target device supports QZSS and *GNSS-NavigationModel* assistance, it shall support *clockModel* Model-2.If the target device supports Galileo and *GNSS-NavigationModel* assistance, it shall support *clockModel* Model-1.If the target device supports GLONASS and *GNSS-NavigationModel* assistance, it shall support *clockModel* Model-4.If the target device supports BDS and *GNSS-NavigationModel* assistance, it shall support *clockModel* Model-6.If the target device supports NavIC L5 and *GNSS-NavigationModel* assistance, it shall support *clockModel* Model-8.If the target device supports NavIC L1 and *GNSS-NavigationModel* assistance, it shall support *clockModel* Model-9.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, orbitModelExt***This field specifies the *gnss-OrbitModel* choice(s) in *GNSS-NavigationModel* IE supported by the target device for the GNSS indicated by *GNSS‑ID*. This is represented by a bit string, with a one‑value at the bit position means the particular orbit model is supported; a zero‑value means not supported.If the target device supports GPS and *GNSS-NavigationModel* assistance, it shall support *orbitModel* Model-2.If the target device supports SBAS and *GNSS-NavigationModel* assistance, it shall support *orbitModel* Model-5.If the target device supports QZSS and *GNSS-NavigationModel* assistance, it shall support *orbitModel* Model-2.If the target device supports Galileo and *GNSS-NavigationModel* assistance, it shall support*orbitModel* Model-1.If the target device supports GLONASS and *GNSS-NavigationModel* assistance, it shall support *orbitModel* Model-4.If the target device supports BDS and *GNSS-NavigationModel* assistance, it shall support *orbitModel* Model-6.If the target device supports NavIC L5 and *GNSS-NavigationModel* assistance, it shall support *orbitModel* Model-8.If the target device supports NavIC L1 and *GNSS-NavigationModel* assistance, it shall support *orbitModel* Model-9.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*. |

– *GNSS-AlmanacSupport*

-- ASN1START

GNSS-AlmanacSupport ::= SEQUENCE {

 almanacModel BIT STRING { model-1 (0),

 model-2 (1),

 model-3 (2),

 model-4 (3),

 model-5 (4),

 model-6 (5),

 model-7 (6),

 model-8-v16xy (7) } (SIZE (1..8)) OPTIONAL,

 ...,

 [[

 almanacModelExt-v19xy BIT STRING { model-9-v19xy (0)

 } (SIZE (1..8)) OPTIONAL

 ]]

}

-- ASN1STOP

| ***GNSS-AlmanacSupport* field descriptions** |
| --- |
| ***almanacModel, almanacModelExt***This field specifies the *almanacModel* choice(s) in *GNSS-Almanac* 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 almanac model is supported; a zero‑value means not supported.If the target device supports GPS and *GNSS-Almanac* assistance, it shall support Model-2.If the target device supports SBAS and *GNSS-Almanac* assistance, it shall support Model-6.If the target device supports QZSS and *GNSS-Almanac* assistance, it shall support Model-2.If the target device supports Galileo and *GNSS-Almanac* assistance, it shall support Model-1.If the target device supports GLONASS and *GNSS-Almanac* assistance, it shall support Model-5.If the target device supports BDS and *GNSS-Almanac* assistance, it shall support Model-7.If the target device supports NavIC L5 and GNSS-Almanac assistance, it shall support Model-8.If the target device supports NavIC L1 and GNSS-Almanac assistance, it shall support Model-9.If this field is absent, the target device supports the mandatory (native) *almanacModel* choice only as listed above for the GNSS indicated by *GNSS‑ID*. |

**– *GNSS-UTC-ModelSupport***

-- ASN1START

GNSS-UTC-ModelSupport ::= SEQUENCE {

 utc-Model BIT STRING { model-1 (0),

 model-2 (1),

 model-3 (2),

 model-4 (3),

 model-5 (4) } (SIZE (1..8)) OPTIONAL,

 ...

}

-- ASN1STOP

|  |
| --- |
| ***GNSS-UTC-ModelSupport* field descriptions** |
| ***utc-Model***This field specifies the *GNSS-UTC-Model* choice(s) in *GNSS-UTC-Model* 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 UTC model is supported; a zero‑value means not supported.If the target device supports GPS and *GNSS-UTC-Model* assistance, it shall support Model-1.If the target device supports SBAS and *GNSS-UTC-Model* assistance, it shall support Model-4.If the target device supports QZSS and *GNSS-UTC-Model* assistance, it shall support Model-1.If the target device supports Galileo and *GNSS-UTC-Model* assistance, it shall support Model-1.If the target device supports GLONASS and *GNSS-UTC-Model* assistance, it shall support Model-3.If the target device supports BDS and *GNSS-UTC-Model* assistance, it shall support Model-5.If the target device supports NavIC and *GNSS-UTC-Model* assistance, it shall support Model-2.If this field is absent, the target device supports the mandatory (native) *utc-Model* choice only as listed above for the GNSS indicated by *GNSS‑ID*. |

*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 | B2a | 1176.450 |
|  | 5-7 | reserved |
| NavIC | 0 | L5 | 1176.450 |
|  | 1 | L1 | 1575.420 |
|  | 2-7 | reserved |

*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 -- Need ON

 ]]

}

-- 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 | NavIC L1 SPS I |
| 2 | NavIC L1 SPS Q |
| 3 | NavIC L1 SPS I+Q |
| 4-23 | 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 -- Need ON

 ]]

}

-- 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 | L1 SPS I | L1 SPS Q | L1 SPS I+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 | 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 |  |  |  |  |  |  |  |  |

*END OF CHANGE*