Change Topic: Public Signals-in-Space (SiS) Updates

This change package accommodates the text changes to support the proposed solution (see table below) within the public Signals-in-Space (SiS) documents. All comments must be submitted in Comments Resolution Matrix (CRM) form.

The columns in the WAS/IS table following this page are defined below:

Section Number: This number indicates the location of the text change within the document.

Proposed Heading: Contains existing and/or proposed changes to section titles and/or the titles to new sections

(WAS) <Document Title>: Contains the baseline text of the impacted document.

Proposed Object Text: Contains proposed changes to baseline text.

Proposed Rationale: Contains the supporting information to explain the reason for the proposed changes.

PROBLEM STATEMENT:
There are seven areas of obsolete/ambiguous language in the Signals-in-Space (SiS) specifications (mean anomaly equation, convolutional encoding, LNAV special messages reference, Universal Coordinated Time Offset Error (UTCOE), User Range Accuracy (URA) Note #3, Right Ascension Angle Language, and the signal health versus navigation data terminology). If this language were interpreted incorrectly it could result in UE developers designing receivers that don't work.
SOLUTION: *(Proposed)*
Resolve the obsolete/ambiguous language in the areas above to avoid the potential for misinterpretation.
Note: For the changes with respect to IS-GPS-705B, IRN-001 there are ***three*** areas that are being amended: i. Coordinated Universal Coordinated Time Offset Error (UTCOE), (1 proposed change)

ii. Signal health versus navigation data terminology) (1 proposed change)
iii. Mean Anomaly equation (1 proposed change)

Start of WAS/IS for IS-GPS-705B, IRN-001 Changes

Section Number	IS-GPS-705 RevB IRN001 (17 Apr 2012) L5 SS and Nav User Segment Interfaces	Proposed Public Signals-in-Space (SiS) Updates Object Text	Proposed Rationale
3.3.4	The L5 CNAV data contains the requisite data for relating GPS time to UTC. The accuracy of this data during the transmission interval will be such that it relates GPS time to UTC (USNO) to within 90.0 nanoseconds (one sigma). This data is generated by the CS (or provided to the CS); therefore, the accuracy of these relationships may degrade if for some reason the CS is unable to upload data to an SV.	The L5 CNAV data contains the requisite data for relating GPS time to UTC. ~~The accuracy of this data during the transmission interval will be such that it relates GPS time to UTC (USNO) to within 90.0 nanoseconds (one sigma).~~ This data is generated by the CS (or provided to the CS); therefore, the accuracy of these relationships may degrade if for some reason the CS is unable to upload data to an SV.	The text "The accuracy of this data during the transmission interval shall be such that it relates GPS time (maintained by the MCS of the CS) to UTC (USNO) within 90 nanoseconds (one sigma)" has been deleted. The rationale is that the time accuracy stated (90ns- one sigma) is not aligned to the PPS PS and the SPS PS (40ns).
20.3.3.4.4	The three, one-bit, health indication in bits 155, 156 and 157 of message type 37 and bits 29,30 and 31 of each packet of reduced almanac refers to the L1, L2, and L5 signals of the SV whose PRN number is specified in the message or in the packet. For each health indicator, a “0” signifies that all navigation data are okay and “1” signifies that some or all navigation data are bad. The predicted health data will be updated at the time of upload when a new reduced almanac has been built by the CS. The transmitted health data may not correspond to the actual health of the transmitting SV or other SVs in the constellation.	The three, one-bit, health indication in bits 155, 156 and 157 of message type 37 and bits 29,30 and 31 of each packet of reduced almanac refers to the L1, L2, and L5 signals of the SV whose PRN number is specified in the message or in the packet. For each health indicator, a “0” signifies that all navigation data are okay and “1” signifies that some or all navigation data are bad. The predicted health data will be updated at the time of upload when a new reduced almanac has been built by the CS.- The transmitted health data may not correspond to the actual health of the transmitting SV or other SVs in the constellation.	The current language states that "For each health indicator, a “0” signifies that all navigation data are okay and “1” signifies that some or all navigation data are bad." This language is misleading in that it implies that one bit designated with a "1" means that all navigation data (L1, L2, and L5) are bad, which may not be true. Recommended text clarifies that a “1” signifies that some or all signals on the associated frequency are bad.
20.3.3.7.4	The user will construct a set of initial (uncorrected) elements by: $A_i = A_0$ $e_i = e_n$ $i_i = i_{0\text{-}n}$ $\Omega_i = \Omega_{0\text{-}n}$ $\alpha_i = e_n \bullet \cos(\omega_n)$ $\beta_i = e_n \bullet \sin(\omega_n)$ $\gamma_i = M_{0\text{-}n} + \omega_n$ where A_0, e_n, $i_{0\text{-}n}$, $\Omega_{0\text{-}n}$, ω_n and $M_{0\text{-}n}$ are obtained from the applicable SV’s message types 10 and 11 data. The terms α_i, β_i, and γ_i form a subset of stabilized ephemeris elements which are subsequently corrected by $\Delta\alpha$, $\Delta\beta$ and $\Delta\gamma$—the values of which are supplied in the message types 34 or 14-as	The user will construct a set of initial (uncorrected) elements by: $A_i = A_0$ $e_i = e_n$ $i_i = i_{0\text{-}n}$ $\Omega_i = \Omega_{0\text{-}n}$ $\alpha_i = e_n \bullet \cos(\omega_n)$ $\beta_i = e_n \bullet \sin(\omega_n)$ $\gamma_i = M_{0\text{-}n} + \omega_n$ where A_0, e_n, $i_{0\text{-}n}$, $\Omega_{0\text{-}n}$, ω_n and $M_{0\text{-}n}$ are obtained from the applicable SV’s message types 10 and 11 data. The terms α_i, β_i, and γ_i form a subset of stabilized ephemeris elements which are subsequently corrected by $\Delta\alpha$, $\Delta\beta$ and $\Delta\gamma$—the values of which are supplied in the message types 34 or 14-as follows:	The current mean anomaly equation, ΔM_0, yields a velocity component and is incorrect. The mean anomaly equation should yield 'radians.'

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	follows: $\alpha_c = \alpha_i + \Delta\alpha$ $\beta_c = \beta_i + \Delta\beta$ $\gamma_c = \gamma_i + \Delta\gamma$ The quasi-Keplerian elements are then corrected by $A_c = A_i + \Delta A$ $e_c = (\alpha_c^2 + \beta_c^2)^{1/2}$ $i_c = i_i + \Delta i$ $\Omega_c = \Omega_i + \Delta\Omega$ $\omega_c = \tan^{-1}(\beta_c/\alpha_c)$ $M_{0\_c} = \gamma_c - \omega_c + \Delta M_0$ where ΔA, Δi and $\Delta\Omega$ are provided in the EDC data packet of the message type 34 or 14 and ΔM_0 is obtained from $\Delta M_0 = -3*(\mu^{1/2})/A_c^2*[(t_{oe}) - (t_{OD})]$. The corrected quasi-Keplerian elements above are applied to the user algorithm for determination of antenna phase center position in Section 20.3.3.1.3, Table 20-II.	$\alpha_c = \alpha_i + \Delta\alpha$ $\beta_c = \beta_i + \Delta\beta$ $\gamma_c = \gamma_i + \Delta\gamma$ The quasi-Keplerian elements are then corrected by $A_c = A_i + \Delta A$ $e_c = (\alpha_c^2 + \beta_c^2)^{1/2}$ $i_c = i_i + \Delta i$ $\Omega_c = \Omega_i + \Delta\Omega$ $\omega_c = \tan^{-1}(\beta_c/\alpha_c)$ $M_{0\_c} = \gamma_c - \omega_c + \Delta M_0$ where ΔA, Δi and $\Delta\Omega$ are provided in the EDC data packet of the message type 34 or 14 and ΔM_0 is obtained from $$\Delta M_0 = \frac{-3}{2}\left(\frac{\mu}{A_0^3}\right)^{\frac{1}{2}}\left(\frac{\Delta A_0}{A_0}\right)\left[\left(t_{oe} + WN_{oe} * 604800\right) - \left(t_{OD} + WN * 604800\right)\right]$$ The corrected quasi-Keplerian elements above are applied to the user algorithm for determination of antenna phase center position in Section 20.3.3.1.3, Table 20-II.	

End of WAS/IS for IS-GPS-705B, IRN-001 Changes