Relations of UTC and TAI with GPS time, GLONASS time, UTC(USNO)_GPS and UTC(SU)_GLONASS

(File available at https://webtai.bipm.org/ftp/pub/tai/other-products/utcgnss/utc-gnss)

[*TAI - GPS time*] and [*UTC - GPS time*]

The GPS satellites disseminate a common time scale designated 'GPS time'. The relation between GPS time and TAI is:

$$[TAI - GPS\ time] = 19\ \text{s} + C_0,$$

where the time difference of 19 seconds is kept constant and C_0 is a quantity of the order of tens of nanoseconds, varying with time.

The relation between GPS time and UTC involves a variable number of seconds as a consequence of the leap seconds of the UTC system and is as follows:

From 1 January 2017, 0 h UTC, until further notice, $[UTC - GPS\ time] = -18\ \text{s} + C_0$,

Here C_0 is given at 0 h UTC every day.

C_0 is computed as follows. The GPS data recorded at the Paris Observatory for highest-elevation satellites are first corrected for precise satellite ephemerides and for ionospheric delays derived from IGS maps, and then smoothed to obtain daily values of [*UTC*(*OP*) - *GPS time*] at 0 h UTC. Daily values of C_0 are then derived by linear interpolation of [*UTC* - *UTC*(*OP*)].

The standard deviation σ_0 characterizes the dispersion of individual measurements for a month. The actual uncertainty of user's access to GPS time may differ from these values. N_0 is the number of measurements.

[*TAI – UTC(USNO)_GPS*] and [*UTC – UTC(USNO)_GPS*]

The GPS satellites broadcast a prediction of UTC(USNO) calculated at the USNO, indicated by UTC(USNO)_GPS. The relation between UTC(USNO)_GPS and TAI involves a variable number of seconds as a consequence of the leap seconds of the UTC system, and is as follows:

From 1 January 2017, 0 h UTC, until further notice, $[TAI - UTC(USNO)\_GPS] = 37\ \text{s} + C_0'$

Here C_0' is given at 0 h UTC every day.

C_0' is computed using the values of [*UTC* - *UTC*(*OP*)] similarly than the computation of C_0.

The relation between UTC(USNO)_GPS and UTC is $[UTC - UTC(USNO)\_GPS] = 0\ \text{s} + C_0'$

The standard deviation σ_0' characterizes the dispersion of individual measurements for a month. The actual uncertainty of user's access to UTC(USNO)_GPS may differ from these values. N_0' is the number of measurements.

Relations of UTC and TAI with GPS time, GLONASS time, UTC(USNO)_GPS and UTC(SU)_GLONASS (Cont.)

(File available at https://webtai.bipm.org/ftp/pub/tai/other-products/utcgnss/utc-gnss)

[*UTC - GLONASS time*] and [*TAI - GLONASS time*]

The GLONASS satellites disseminate a common time scale designated 'GLONASS time'. The relationship between GLONASS time and UTC is

$$[UTC - GLONASS\ time] = 0\ \mathrm{s} + C_1,$$

where the time difference 0 s is kept constant by the application of leap seconds so that GLONASS time follows the UTC system, and C_1 is a quantity of the order of tens of nanoseconds (tens of microseconds until 1 July 1997), which varies with time.

The relation between GLONASS time and TAI involves a variable number of seconds and is as follows:

From 1 January 2017, 0 h UTC, until further notice, $[TAI - GLONASS\ time] = 37\ \mathrm{s} + C_1$.

Here C_1 is given at 0 h UTC every day.

C_1 is computed as follows. The GLONASS data recorded at the Astrogeodynamical Observatory, Borowiec, Poland for the highest-elevation satellites are smoothed to obtain daily values of [*UTC*(*AOS*) - *GLONASS time*] at 0 h UTC. Daily values of C_1 are then derived by linear interpolation of [*UTC* - *UTC*(*AOS*)].

To ensure the continuity of C_1 estimates, the following corrections are applied:

+1285 ns from 1 January 1997 (MJD 50449) to 22 March 1999 (MJD 51259)
+107 ns for 23 March 1999 and 24 March (MJD 51260 and MJD 51261)
0 ns since 25 March 1999, (MJD 51262).

The standard deviation σ_1 characterizes the dispersion of individual measurements for a month. The actual uncertainty of user's access to GLONASS time may differ from these values. N_1 is the number of measurements.

[*TAI – UTC(SU)_GLONASS*] and [*UTC – UTC(SU)_GLONASS*]

The satellites broadcast a prediction of UTC(SU) calculated at the SU, indicated by UTC(SU)_GLONASS. The relation between UTC(SU)_GLONASS and TAI involves a variable number of seconds as a consequence of the leap seconds of the UTC system, and is as follows:

From 1 January 2017, 0 h UTC, until further notice, $[TAI – UTC(SU)\_GLONASS] = 37\ \mathrm{s} + C_1'$

Here C_1' is given at 0 h UTC every day.

C_1' is computed using the values of [*UTC* - *UTC*(*AOS*)] similarly than the computation of C_1.

The relation between UTC(SU)_GLONASS and UTC is $[UTC– UTC(SU)\_GLONASS] = 0\ \mathrm{s} + C_1'$

The standard deviation σ_1' characterizes the dispersion of individual measurements for a month. The actual uncertainty of user's access to UTC(SU)_GPS may differ from these values. N_1' is the number of measurements.