Calibration of IT01 station – 2022

Prepared by: T. T. Thai, I. Sesia, G. D. Rovera, INRiM

Summary

Calibration values to be used for IT01-PTB05 link are, as of 24/02/2022:

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* CAL   584 TYPE: CAL 544 BRIDGED    MJD: 59630  EST. UNCERT.:    1.400 ns

LOC    REM    CI  S      CALR     ESDVAR  ESIG
IT01   PTB05  584 1    -13.700     0.000 0.000
PTB05  IT01   584 1     13.700    12.320 0.200
```

Motivation

Nominal station switching from IT02 to IT01

Method

Calibration of link IT01 – PTB05 by bridging with IT02 – PTB05 (already calibrated with CI 544 in July 2021).

Schedule: IT01 and IT02 alternatively transmit during odd hours using the same parameters (TX frequency, PRN codes, TX power) with the following schedule for at least 7 days:

oh:10:00 - oh:12:59 IT02 – PTB05

oh:13:00 - oh:15:59 IT01 – PTB05

oh:16:00 - oh:18:59 IT02 – PTB05

oh:19:00 - oh:21:59 IT01 – PTB05

The calibration value for IT01 – PTB05 is estimated by calculating the difference between the IT02 – PTB05 (calibrated) and IT01 – PTB05 (uncalibrated*) baselines using the aforementioned odd-hour measurements. The correctness of the estimated CALR value is then validated against the IT02 – PTB05 baseline during even-hour sessions.

* CALR set to 999999999; it is noted that there is a ESDVAR of 12.320 ns on PTB side, which we decided to not change to 0 to not absorb into the new CALR of IT01 as it is a bridge from IT02.
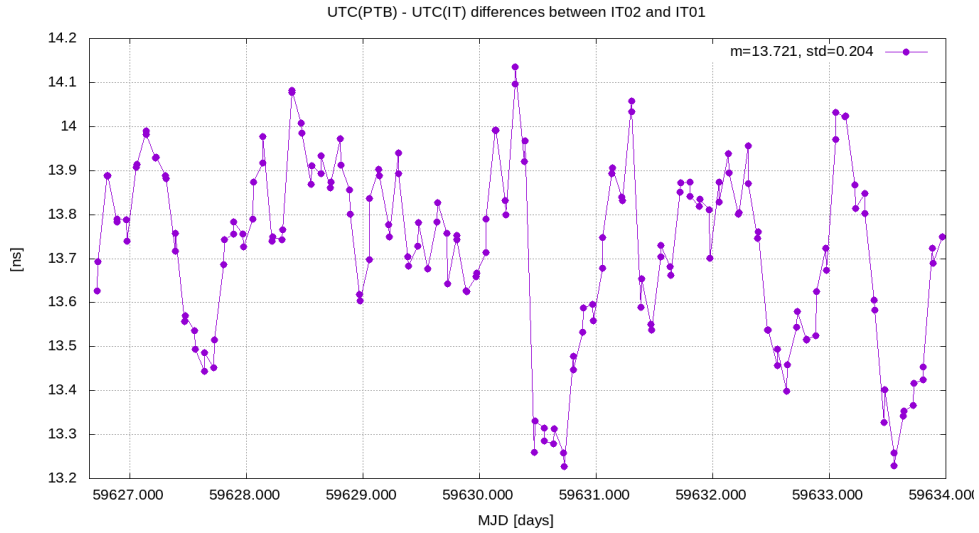
Results

Figure 1 UTC(PTB) - UTC(IT) differences between IT02 and IT01

Figure 1 shows the calculation of the difference between the baseline UTC(PTB) – UTC(IT) during odd hours using IT02 and IT01 (per schedule, 2 points every odd hour).

The mean value reported is 13.7 ns with a standard deviation of 0.2 ns.

This brings to the new CALR values of 13.700, and an uncertainty of 1.4 ns (taking into account the uncertainty of CI 544 = 1.3 ns from which we are bridging).

Applying CALR = -13.700 to IT01 files and CALR = +13.700 to PTB05 files, we obtain Figure 2, which shows the baseline using IT01 is properly bridged. Figure 3 shows the improvement in stability using the IT01 station instead of IT02 during odd hours.
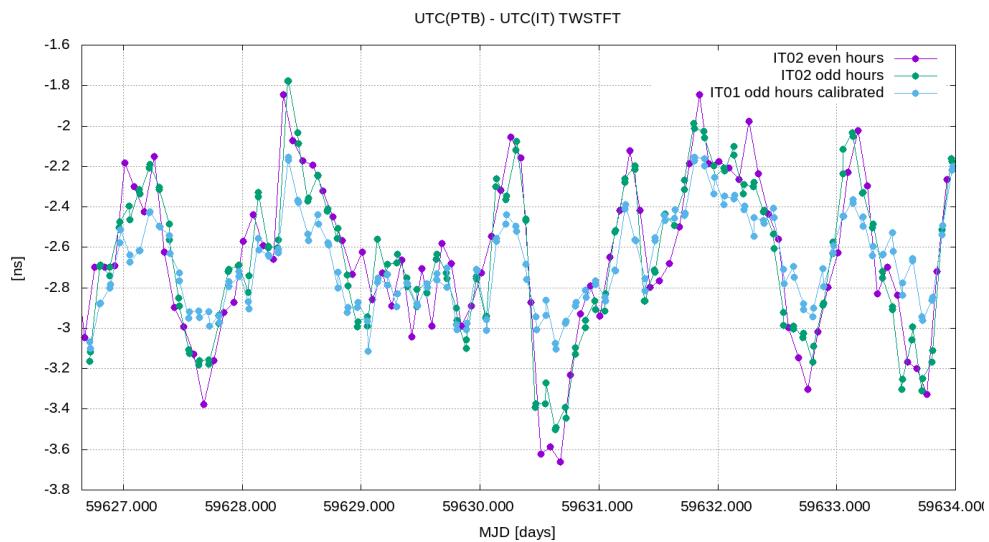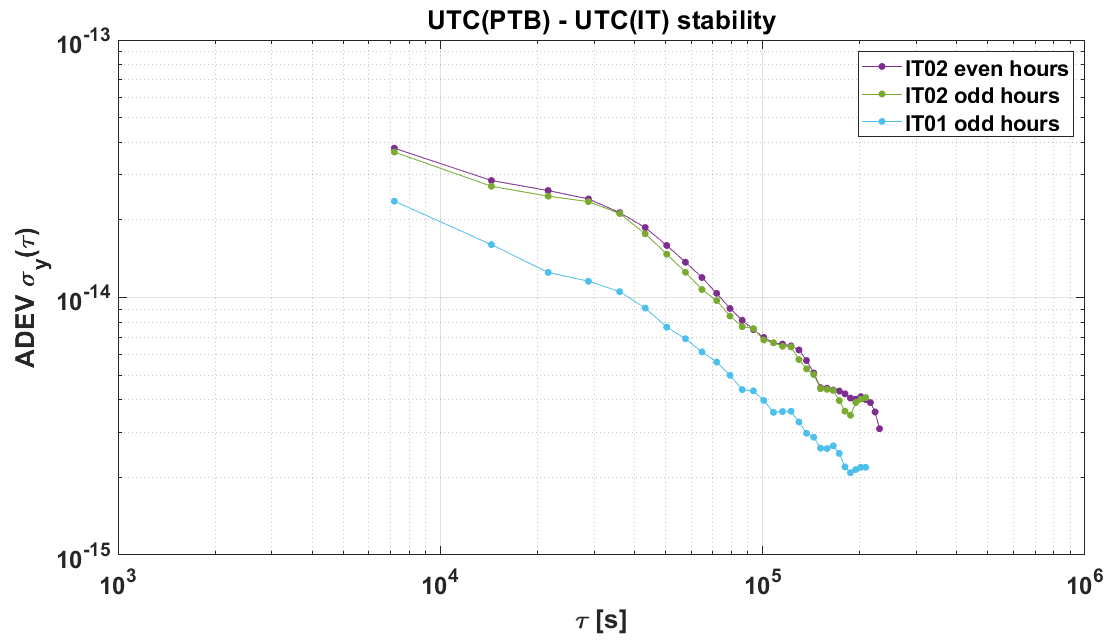

Figure 2 UTC(PTB) - UTC(IT) calibrated baselines

Figure 3 UTC(PTB) - UTC(IT) link stability