GPS calibration of CNM and CNMP equipment with respect to NIST G1 (1011-2017)

Summary

Over February-May 2017, the National Institute of Standards and Technology, Boulder (NIST) conducted a trip to calibrate GNSS equipment owned by Centro Nacional de Metrología, Querétaro (CENAM, UTC acronym CNM) and the Centro Nacional de Metrología de Panamá (CENAMEP, UTC acronym CNMP). The trip started and finished at the NIST, providing closure with respect to NIST Group1 reference receiver NIST.
The operations and report of measurements are described in in the report by NIST.

- **Final results for the calibrated systems**

The INTDLY values of the receivers given in Table 1 have been computed by NIST based on the results of the 1001-2016 Group 1 trip for NIST and should not be updated to reflect later changes in the conventional INTDLY values of the reference receivers.

For a P3/PPP UTC link A-B involving any Group 1 and any receiver in this trip, the uncertainty resulting from the calibration, U_B(A-B), is computed as

$$U_B(A\text{-}B) = (U_{CAL0}^2 + \Delta U_{CAL}(A)^2 + \Delta U_{CAL}(B)^2)^{1/2} \quad (1)$$

where U_{CAL0} = 2.5 ns at the time of calibration, as given conventionally to Group 2, and where ΔU_{CAL} (generally zero) is specified for each system.

For single frequency C1 links, U_{CAL0} is 2.5 ns but could be complemented by an additional component to represent systematic errors in the ionospheric model.

Changes in the set-up of the receivers after the calibration must be accounted for as described in section A.3.6 of the most recent Calibration guidelines in ftp://ftp2.bipm.org/pub/tai/publication/gnss-calibration/guidelines/.

Table 1. Final P1/P2 INTDLY values from the 1011-2017 trip. Values of REFDLY with respect to UTC(k) and of CABDLY during the calibration are also indicated for reference. All values are in ns. “Meas. Date” refers to the first day of the differential calibration, to which the calibration results can be applied. “Impl. Date” is the MJD when the results should be implemented in the receiver.

System	BIPM	Meas. date	**INTDLY P1**	**INTDLY P2**	**INTDLY C1**	REFDLY	CABDLY	Note	**ΔU_{CAL}**	Impl. date
CN00	CN00	2017/02/17	**N/A**	**N/A**	**-22.8**	25.3	146.5	(1)	1.5	58816
MP1_	MP1_	2017/04/13	**-30.0**	**-32.8**	N/A	50.6	123.3	(2,3)	4.0	58816

Notes:
(1) **ΔU_{CAL}** = 1.5 ns reflects the fact that the traveling receiver was not in common clock with the local receiver.
(2) The REFDLY value of the MP1_ TTS5 receiver has not been measured in full accordance with the Annex 1 of the calibration guidelines, see the report. Calibration results are valid as long as the set-up of the receiver does not change.
(3) **ΔU_{CAL}** = 4.0 ns reflects the fact that a change in the set-up, as seen in the REFDLY value, occurred since the calibration (see note 2).

Version history
V1.0 2019/11/29: Publication of results from Version 6 of the Calibration report, to be implemented in the receivers.
V1.1 2021/08/06: Introduction of $\mathbf{\Delta U_{CAL}}$ = 4.0 ns for MP1_.