GPS calibration of NPL and TP receivers with respect to ROA G1 (1015-2019)

Summary

In Summer 2019, the Real Instituto y Observatorio de la Armada (ROA) conducted a trip to calibrate GNSS equipment owned by the National Physical Laboratory, UK (NPL) and the Institute of Photonics and Electronics, Czech Academy of Sciences (UFE, UTC code TP). The trip started and finished at the ROA, providing closure with respect to ROA Group1 reference receiver R0_7.
The operations and report of measurements are described in in the report by ROA.

- **Final results for the calibrated systems**

The INTDLY values of the receivers given in Table 1 have been computed by ROA based on the results of the 1001-2018 Group 1 trip for RO_7 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

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

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/C1 INTDLY values from the 1015-2019 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
NPL1	NPL1	2019/08/19	**-37.9**	**-29.0**	**-37.2**	70.1	251.5		0.0	58816
NPL2	NPL2	2019/08/19	**33.6**	**34.3**	**35.7**	68.6	261.2		0.0	58816
TP01	TP01	2019/09/13	**19.8**	**23.4**	**20.9**	0.0	149.0		0.0	58816
TP02	TP02	2019/09/13	**19.2**	**20.6**	**20.1**	10.6	154.7		0.0	58816

Notes:
(1).

Version history
V1.0 2019/11/28: Publication of results from Issue 2.0 of the Calibration report, to be implemented in the receivers.