

GNSS calibration of NPL receivers with respect to ROA G1 (1018-2021)

Summary

In October 2021, the Real Instituto y Observatorio de la Armada (ROA) conducted a trip to calibrate GNSS equipment owned by the National Physical Laboratory (NPL, UK). The trip started and finished at the ROA, providing closure with respect to the ROA Group1 reference receiver RO_9. The operations and report of measurements are described in the [report by ROA](#).

- **Final results for the calibrated systems**

The INTDLY or SYSDLY values of the receivers given in Table 1 have been computed by ROA based on the results of the Group 1 trip [1001-2020](#) for RO_9 (GPS and Galileo) and should not be updated to reflect later changes in the conventional INTDLY values of the reference receiver.

For a P3/E3/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

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

where $U_{CAL0} = 2.5$ ns is the conventional Group 2 value, and where ΔU_{CAL} (generally zero) is specified for each system.

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 <https://webtai.bipm.org/ftp/pub/tai/publication/gnss-calibration/guidelines/>.

Table 1. Final P1/P2/C1/E1/E5a INTDLY/SYSDLY values from the 1018-2021 exercise. Values of REFDLY and CABDLY used to compute calibration results 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	INTDLY E1	INTDLY E5a	REFDLY	CABDLY	Note	ΔU_{CAL}	Impl. date
NPL1	NPL1	2021/10/12	-34.9	-35.3	-26.8	N/A	N/A	77.2	251.5	(1)	0.0	59636
NPL2	NPL2	2021/10/12	35.4	36.0	37.1	38.5	35.1	81.8	261.2		0.0	59636
NPL3	NPL3	2021/10/12	23.1	23.1	25.7	25.7	27.0	74.4	294.7	(2)	0.0	59636
NPL4	GAL1	2021/10/12	29.8	30.2	31.7	33.0	31.1	65.3	336.2		0.0	59636

Notes:

(1) NPL1 is a GTR50. Results shown here are the total INT DLY vales. Results from the calibration are the differences to the past values entered in the receiver (2.3 ns C1, 2.6 ns P1, 2.2 ns P2)

(2) NPL3 is a PolaRx5 with auto compensation PPS-in ON.

Version history

V1.0 2022/02/03: Publication of results from V1 of the ROA report.