

GPS calibration of NPL and SMD equipment with respect to ROA G1 (1014-2017)

Summary

Over April-May 2017, the ROA conducted a trip to calibrate GPS equipment owned by NPL and SMD. The trip started and finished at the ROA, providing closure with respect to ROA Group1 reference receivers RO_5.

The operations and report of measurements are described in the [report by ROA](#).

• Final results for the calibrated equipment

The INTDLY values given in Table 1 have been computed by ROA using INTDLY values of RO_5 from the Group 1 trip [1001-2016](#). These INTDLY values should not be updated to reflect later changes in the conventional INTDLY values of RO_5.

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

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

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 SMD receivers, $\Delta U_{CAL} = 0.5$ ns reflects the use of a special antenna cable, for which set-up a complete closure is not available, see the [report](#).

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

Calibration results in Table 1 correspond to the set-up during the measurements, from the date indicated as “Meas. Date”. Changes in the set-up of the receivers after the calibration must be accounted for as described in section A.3.6 of the Calibration guidelines v3.2 in [ftp://ftp2.bipm.org/pub/tai/publication/gnss-calibration/guidelines/](http://ftp2.bipm.org/pub/tai/publication/gnss-calibration/guidelines/).

Table 1. Final P1/P2/C1 INTDLY values from the 1014-2017 trip. Values of REF DLY (with respect to the indicated REF) and CABDLY during the calibration and the resulting P3 Total delay TOTDLY are also indicated for reference (all values in ns). “Meas. Date” refers to the first day of the differential calibration, to which the calibration results can be applied.

System	BIPM	Meas. date	INTDLY P1	INTDLY P2	INTDLY C1	REF	REFDLY	CABDLY	Note	TOTDLY P3	ΔU_{CAL}
SD01	SD01	2017/04/26	-36.5	-29.7	-35.6	UTC(SMD)	15.0	392.2	(1)	330.2	0.5
SMDB	SD21	2017/04/26	-17.7	-19.2	-16.0	UTC(SMD)	19.1	400.6	(2)	366.1	0.5
NPL1	NPL1	2017/05/05	-35.3	-26.7	-34.9	UTC(NPL)	70.1	251.5		132.8	0.0
NPL2	NPL2	2017/05/05	-23.8	-23.3	-21.8	UTC(NPL)	68.6	261.2		168.0	0.0

Notes:

(1) SD01 is a Dicom GTR50: Listed INTDLY are total values. Direct results of the calibration are changes (-1.8 ns P1, -5.6 ns P2, -6.2 ns C1) with respect to the values entered in the receiver.

(2) The REFDLY value of SD21 (a Piktime TTS-4) has not been measured in full accordance with the Annex 1 of the [calibration guidelines](#), see the [report](#). Results are expressed as INTDLY for consistency with the CGGTTS V2 format but **care should be taken if the set-up is changed**: Only the “Total delay” (TOTDLY = INTDLY + CABDLY – REFDLY) is a strictly meaningful result.

Version history

V1.0 2017/08/30: Final results from Version 6.0 of the ROA Calibration report, to be implemented in G2 receivers: IMPLEMENTATION DATE = MJD 57997.