

GPS calibration of NRC equipment with respect to NIST G1 (1019-2017)

Summary

In summer 2017, the NIST conducted a trip to calibrate GPS equipment owned by the National Research Council (UTC acronym NRC). 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 the [report by NIST](#).

In March2020, the NRC conducted a transfer of calibration from the receiver NRC4, part of the original trip, to a new receiver NRCC. The operations and report of measurements are in the [report by NRC](#).

- **Final results for the equipment calibrated in the original trip**

The INTDLY values of the NRC receiver 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 NIST.

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.

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 1019-2017 trip. Values of REFDLY (with respect to the indicated REF) and of CABDLY during the calibration are also indicated for reference. “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	REF	REFDLY	CABDLY	Note	ΔU_{CAL}	Impl. date
NRC4	NRC4	2017/08/01	62.4	65.5	Clock	144.0	269.3	(1)	0.0	58206
NRCA	NRCA	2017/08/01	296.2	318.3	Clock	57.0	264.6	(1)	0.0	58206

Notes:

(1) The reference used in the calibration is not UTC(NRC) but a local clock, see the report by NIST.

- **Transfer of calibration performed by NRC in March 2020**

In March2020, the NRC calibrated a new GNSS receiver NRCC by transfer of calibration with respect to the receiver NRC4, see the [report by NRC](#) and the results in Table 2.

The value ΔU_{CAL} for use in equation (1) has been computed from information provided in the report. For UTC use, the ageing uncertainty will be based on the date of original calibration of NRC4 i.e. 2017/08/01.

Table 2. Final P1/P2 INTDLY values for NRCC. Values of REFDLY with respect to the indicated reference and of CABDLY during the calibration are also indicated for reference. “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	REF	REFDLY	CABDLY	Note	ΔU_{CAL}	Impl. date
NRCC	NRCC	2020/03/07	33.7	28.3		37.4	315.0	(1)	0.3	59121

Notes:

(1) The reference used in the calibration is not UTC(NRC) but a local PPS, see the report by NRC

Version history

V1.0 2018/07/06: Publication of results from Version 4 of the NIST calibration report, implemented in the NRC receivers:

V1.1 2020/10/13: Transfer of calibration by NRC to provide GPS results for NRCC (Table 2); Correction of the CABDLY value for NRC4 in Table 1 (from 266.6 ns to 269.3 ns), results unchanged.