

GNSS calibration of ESA receivers with respect to PTB G1 (1014-2022)

Summary

From July to August 2022, the Physikalisch-Technische Bundesanstalt (PTB) conducted a trip to calibrate GNSS equipment owned by the European Space Agency (ESA). The trip started and finished at the PTB, providing closure with respect to the PTB Group1 reference receiver PT13. The operations and report of measurements are described in the [report by PTB](#).

- **Final results for the calibrated systems**

The INTDLY values of the receivers given in Table 1 have been computed by PTB based on the results of the Group 1 trip [1001-2020](#) for PT13 (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 <ftp://ftp2.bipm.org/pub/tai/publication/gnss-calibration/guidelines/>.

Table 1. Final P1/P2/E1/E5a INTDLY values from the 1014-2022 exercise. Values of REFDLY and CABDLY during the calibration are also indicated for reference. All values are in ns date in YYYY/MM/DD format. “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 E1 | INTDLY E5a | REF DLY | CABD LY | Note | ΔU_{CAL} | Impl. date |
|--------|------|------------|-----------|-----------|-----------|------------|---------|---------|------|------------------|------------|
| ES07 | ES07 | 2022/08/09 | 29.0 | 26.1 | 31.2 | 30.7 | 16.4 | 210.3 | (1) | 0.0 | 59850 |
| ES08 | ES08 | 2022/08/09 | 30.7 | 29.3 | 33.1 | 35.5 | 16.4 | 251.0 | (1) | 0.0 | 59850 |
| ES09 | ES09 | 2022/08/09 | 20.7 | 18.1 | 21.1 | 23.9 | 21.17 | 253.3 | | 0.0 | 59850 |
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Notes:

(1) Receiver autocompensating for PPSIN internal delays

Version history

V1.0 2022/09/15: Publication of results from V1.1 of the PTB report.