

GNSS calibration of ESTEC and NPL receivers with respect to LNE-SYRTE G1 (1017-2024)

Summary

From July to October 2024, the Laboratoire National d'Essais, Systèmes de Référence Temps-Espace (LNE-SYRTE) conducted a trip to calibrate GNSS equipment owned by European Space Agency (ESA) and the National Physical Laboratory (NPL). The trip started and finished at LNE-SYRTE, providing closure with respect to the LNE-SYRTE Group1 reference receiver OP73. The operations and report of measurements are described in the [report by LNE-SYRTE](#).

• 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 Group 1 trip [1001-2022](#) for LNE-SYRTE (GPS, Galileo and BDS) and should not be updated to reflect later changes in the conventional INTDLY values of the reference receiver.

For a P3/E3/B3/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](#).

Table 1. Final P1/P2/E1/E5a,B1C,B5 INTDLY values from the 1017-2024 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 | INTDLY B1C | INTDLY B2a | REF DLY | CABDLY | Note | ΔU_{CAL} | Impl. date |
|--------|------|------------|-----------|-----------|-----------|------------|------------|------------|---------|--------|------|------------------|------------|
| ES07 | ES07 | 2024/07/31 | 28.1 | 24.7 | 30.4 | 30.1 | 30.2 | 29.5 | 16.1 | 210.3 | | 0.0 | 60696 |
| ES08 | ES08 | 2024/07/31 | 29.5 | 27.7 | 32.1 | 34.7 | 31.9 | 34.1 | 16.1 | 251.0 | | 0.0 | 60696 |
| ES09 | ES09 | 2024/07/31 | 19.2 | 16.2 | 19.8 | 22.9 | 19.3 | 22.0 | 20.8 | 253.3 | | 0.0 | 60696 |
| NPL1 | NPL1 | 2024/09/18 | -35.7 | -26.9 | | | | | 68.4 | 251.5 | | 0.0 | 60798 |
| NPL3 | NPL3 | 2024/09/18 | 21.6 | 21.6 | 24.3 | 26.2 | 24.0 | 25.6 | 73.3 | 294.7 | | 0.0 | 60798 |
| NPL4 | NPL4 | 2024/09/18 | 27.2 | 27.9 | 30.6 | 29.3 | | | 63.5 | 336.2 | | 0.0 | 60798 |
| NPL5 | NPL5 | 2024/09/18 | 11.8 | 10.7 | 12.7 | 11.9 | 11.6 | 10.9 | 65.4 | 261.2 | | 0.0 | 60798 |
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Notes:

Version history

V1.0 2025/05/10: Publication of results from V1.1 of the LNE-SYRTE report.