

# GPS calibration of ORB equipment with respect to OP G1 (1018-2017)

## Summary

In March 2017, the LNE-SYRTE conducted a trip to calibrate GPS equipment owned by ORB. The trip started and finished at the LNE-SYRTE, providing closure with respect to OP Group1 reference receiver OP71.

The operations and report of measurements are described in the [report by LNE-SYRTE](#) and [annexes](#).

In February 2020, the ORB conducted a transfer of calibration from the receiver OR1Z, part of the original trip, to the new receiver OR5Z. The operations and report of measurements are described in the [report by ORB](#).

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

The INTDLY values given in Table 1 have been computed by LNE-SYRTE using INTDLY values of OP71 from the Group 1 trip [1001-2016](#). These INTDLY values should not be updated to reflect later changes in the conventional INTDLY values of OP71.

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  $\Delta U_{CAL}$  (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 Calibration guidelines v3.2 in <ftp://ftp2.bipm.org/pub/tai/publication/gnss-calibration/guidelines/>.

Table 1. Final P1/P2 INTDLY values from the 1018-2017 trip. Values of REFDLY (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	REF	REFDLY	CABDLY	Note	TOTDLY P3	$\Delta U_{CAL}$
BRUX	OR1Z	2017/03/27	<b>54.5</b>	<b>51.6</b>	UTC(ORB)	149.5	237.0		146.5	0.0
ZTB1	OR2Z	2017/03/27	<b>303.7</b>	<b>312.4</b>	UTC(ORB)	58.9	150.0		381.4	0.0
ZTB3	OR3Z	2017/03/27	<b>58.3</b>	<b>58.4</b>	UTC(ORB)	160.7	147.9		45.3	0.0
ORBA	OR4A	2017/03/27	<b>55.2</b>	<b>55.5</b>	UTC(ORB)	158.0	149.2		45.9	0.0

Notes:

- **Transfer of calibration performed by ORB in February 2020**

The IGS station BRUX is now provided by a new receiver with BIPM code OR5Z. The INTDLY values given in Table 2 for OR5Z have computed by ORB from the OR1Z values, see the [report by ORB](#).

The value  $\Delta U_{CAL}$  for use in equation (1) has been computed from uncertainties given in the report by ORB.

Table 2. Final P1/P2 TOTDLY values for the OR5Z receiver. Values of REFDLY with respect to UTC(ORB) and CABDLY during the calibration 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. “Impl. Date” is the MJD when the results were implemented in the receiver.

System	BIPM	Meas. date	INTDLY P1	INTDLY P2	REFDLY	CABDLY	Note	$\Delta U_{CAL}$	Impl. date
BRUX	OR5Z	2020/02/25	<b>28.7</b>	<b>24.7</b>	69.0	237.0	(1)	0.3	58905

Notes:

(1) CABDLY unchanged from the OR1Z value in the original calibration.

#### Version history

V1.0 2017/09/28: Final results from Issue 1 of the LNE-SYRTE Calibration report, to be implemented in G2 receivers: IMPLEMENTATION DATE = MJD 58026.

V1.1 2020/03/05: Transfer of calibration performed by ORB in February 2020 to include a new receiver OR5Z.