

# GPS calibration of KZ equipment with respect to SU G1 (1202-2021)

## Summary

In November 2021, the VNIIFTRI, Russia (UTC acronym SU) hosted a GNSS equipment owned by the Kazakhstan Institute of Standardization and Metrology (UTC acronym KZ) for direct calibration with respect to the SU Group1 reference receiver SU31.

The report of operations and measurements by SU are available [here](#).

- **Final results for the calibration trip**

The INTDLY values of the KZ receiver given in Table 1 have been computed by SU based on the results of the [1001-2018](#) Group 1 trip for SU31 and should not be updated to reflect later changes in the conventional INTDLY values of the reference receivers.

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  $U_{CAL0} = 4.0$  ns at the time of calibration, as given conventionally to Direct calibration, and where  $\Delta U_{CAL}$  (generally zero) is specified for each system.

For single frequency C1 links,  $U_{CAL0}$  is 4.0 ns but could be complemented by an additional component to represent systematic errors in the ionospheric model.

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 <https://webtai.bipm.org/ftp/pub/tai/publication/gnss-calibration/guidelines/>.

Table 1. Final P1/P2/C1 INTDLY values from the 1202-2021 trip. The value of CABDLY during the calibration is also indicated for reference. REFDLY is not relevant for Direct calibration. All values are 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 should be implemented in the receiver.

System	BIPM	Meas. date	INTDLY P1	INTDLY P2	INTDLY C1	REFDLY	CABDLY	Note	$\Delta U_{CAL}$	Impl. date
KZ04	KZ04	2021/11/20	17.9	16.2	18.8		611.5		0.0	59582

- **Transfer of calibration performed by PTB in August 2022**

In August 2022, Physikalisch-Technische Bundesanstalt (PTB) conducted a Transfer of Calibration from the KZ receiver KZ04 (see preceding section) to the receiver KZ03, see the [report by PTB](#).

The INTDLY values given in Table 2 have been computed by the PTB using INTDLY values for the receiver KZ04 taken from Table 1.

Table 2. Final P1/P2 INTDLY values for KZ03. Values of REFDLY and 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 were implemented in the receiver.

System	BIPM	Meas. date	INTDLY P1	INTDLY P2	INTDLY C1	REFDLY	CABDLY	Note	$\Delta U_{CAL}$	Impl. date
KZ03	KZ03	2022/08/27	-36.0	-41.7	-34.3	674.9	147.5		0.3	

#### Version history

V1.0 2021/12/22: Publication of results from version V1.1 of the Calibration report by SU, to be implemented in the receivers.

V2.0 2022/09/13: Transfer of calibration from KZ04 to receiver KZ03