

2025 Group 1 GNSS Calibration Trip

Revision History

Revision	Date	Author(s)	Description
1.0	30.01.2026	GT	Created

Summary

The 2025 visit to Group 1 laboratories is the Sixth Group 1 trip and started in June 2025. The trip is decomposed into several phases, each enclosed with closure at the BIPM.

- Phase 1 (June 2025-November 2025). BIPM-OP-ROA-PTB-INRIM-BIPM with the traveling receivers BP2G and BP2D;

Since phase 1 of the 2022 Group 1 trip, results are provided for the GPS codes P1, P2 and C1, the Galileo E1 and E5a codes, and the BDS B1C B5 codes.

This report provides intermediate results which are determined with respect to one BIPM receiver. Final results for all Group 1 receivers are determined in a separate document [BIPM Technical Memorandum 266](#).

Trip 1001-2025: Report of Phase 1

1 Description of Equipment and Operations

1.1 Traveling Equipment

Two systems were included in the BIPM traveling claibrator: BP2G and BP2D. See Table 2 and the report of operations [1001-2025-phase1-cv.pdf](#). The rest of the traveling equipment is described in Annex 1 of the [Guidelines](#).

1.2 Visited Equipment

See a summary in Table 2. The detailed information on the set-up and the measurements performed is in the report of operations [1001-2025-phase1-cv.pdf](#).

The receiver BP21 from the BIPM serves as a reference for the closure.

2 Data Used

Rinex files have been obtained from all receivers participating to this trip.

3 Results of Raw Data Processing

- The raw code differences have been generated by the DCLRINEX procedure (see [Guidelines](#) Annex 3). Each run for a pair of stations generates 3 files (summary .sum, data .dif, plot .pdf). Summary files and plots are available in [1001-2025-phase1-cv.pdf](#). All code measurements are indicated with 2 digits numeric precision in order to minimize rounding errors in computing iono-free linear combination values.

Table 2: Summary information on the calibration trip

Institute	Status of Equipment	Dates of measurement	BIPM code	RINEX name	Receiver Type
BIPM	Traveling		BP2G	BP2G	Septentrio PolaRx5TR (AC On)
BIPM	Traveling		BP2D	BP2D	Mesit GTR55
BIPM	Reference	60830-60837	BP21	BP21	Septentrio PolaRx5TR (AC On)
OP	G1	60859-60866	OP70	OP70	Septentrio PolaRx5TR
OP	G1	60859-60866	OP73	OP73	Septentrio PolaRx5TR
OP	G1	60859-60866	OP75	OP75	Septentrio PolaRx5TR
OP	G1	60859-60866	OPM9	OPM9	Mesit GTR51
ROA	G1	60896-60901	RO12	RO12	Septentrio PolaRx5TR
ROA	G1	60896-60901	RO13	RO13	Septentrio PolaRx5TR
ROA	G1	60896-60901	RO_9	ROA9	Septentrio PolaRx4TR
ROA	G1	60896-60901	RO_8	RO_8	Mesit GTR51
ROA	G1	60896-60901	RO_7	ROAP	Septentrio PolaRx4TR
ROA	G1	60896-60901	RO10	ROAG	Septentrio PolaRx5TR
ROA	G1	60896-60901	RO_6	RO_6	Septentrio PolaRx3TR
PTB	G1	60909-60921	PT13	PTBB	Septentrio PolaRx5TR
PTB	G1	60909-60921	PT07	PT07	Mesit GTR50
PTB	G1	60909-60921	PT09	PT09	Septentrio PolaRx4TR
PTB	G1	60909-60921	PT10	PT10	Mesit GTR51
PTB	G1	60909-60920	PT15	PT15	Mesit GTR55
IT	G1	60962-60972	IT07	IENG	Septentrio PolaRx5TR
IT	G1	60962-60972	IT16	IT16	Septentrio PolaRx5TR
IT	G1	60962-60972	IT11	IT11	Septentrio PolaRx4TR
IT	G1	60962-60972	IT20	IT20	Septentrio PolaRx5TR
IT	G1	60962-60972	IT21	IT21	Septentrio PolaRx5TR
IT	G1	60962-60972	IT05	IT05	Septentrio PolaRx5TR
BIPM	Reference	60996-61003	BP21	BP21	Septentrio PolaRx5TR (AC On)

- For each pair (traveling – visited) or (traveling – reference):
 - Plots of the data differences and of the statistical analysis (Tdev) are in the report of operations [1001-2025-phase1-cv.pdf](#);
 - For each code, the inferred RAWDIF(code) are taken as the median of the raw differences. The associated uncertainties are taken as the floor of the Tdev values, with a minimum of 0.1 ns.
- Summary tables.

For this report, the BIPM system BP21 is considered to be the reference. The raw code differences between the reference receiver and the traveling ones are presented in Tables [3](#) [4](#) [5](#).

Table 3: GPS raw differential results for all pairs (Traveling – Reference) (ns)

Labo	Date	Pair	RDIF(C1)	Unc	RDIF(P1)	Unc	RDIF(P2)	Unc
BIPM	60830-60837	BP2D-BP21	19.10	0.1	20.31	0.1	25.15	0.1
BIPM	60830-60837	BP2G-BP21	36.51	0.1	36.33	0.1	34.94	0.1
OP	60859-60865	OP70-BP2D	-69.56	0.1	-70.79	0.1	-75.68	0.1
OP	60859-60865	OP73-BP2D	-61.44	0.1	-62.63	0.1	-69.64	0.1
OP	60859-60865	OPM9-BP2D	14.95	0.1	13.87	0.1	7.39	0.1
OP	60859-60865	OP75-BP2D	-60.74	0.1	-62.11	0.1	-70.36	0.1
OP	60860-60866	OP70-BP2G	-86.73	0.1	-86.56	0.1	-85.33	0.1
OP	60860-60866	OP73-BP2G	-78.59	0.1	-78.40	0.1	-79.29	0.1
OP	60860-60866	OPM9-BP2G	-2.23	0.1	-1.90	0.1	-2.28	0.1
OP	60860-60866	OP75-BP2G	-77.89	0.1	-77.88	0.1	-80.01	0.1
ROA	60896-60901	RO12-BP2D	312.06	0.1	310.85	0.1	306.32	0.1
ROA	60896-60901	RO12-BP2G	294.98	0.1	295.11	0.1	296.92	0.1
ROA	60896-60901	RO13-BP2D	-45.60	0.1	-46.56	0.1	-52.43	0.1
ROA	60896-60901	RO13-BP2G	-62.68	0.1	-62.27	0.1	-61.80	0.1
ROA	60896-60901	RO_9-BP2D	-205.42	0.1	-205.96	0.1	-210.49	0.1
ROA	60896-60901	RO_9-BP2G	-222.49	0.1	-221.62	0.1	-219.85	0.1
ROA	60896-60901	RO10-BP2D	355.76	0.1	354.89	0.1	347.74	0.1
ROA	60896-60901	RO10-BP2G	338.67	0.1	339.15	0.1	338.33	0.1
ROA	60896-60901	RO_6-BP2D	-217.15	0.1	-217.76	0.1	-222.20	0.1
ROA	60896-60901	RO_6-BP2G	-234.22	0.1	-233.46	0.1	-231.57	0.1
ROA	60896-60901	RO_8-BP2D	337.93	0.1	336.83	0.1	331.76	0.1
ROA	60896-60901	RO_8-BP2G	320.86	0.1	321.14	0.1	322.51	0.1
ROA	60896-60901	RO_7-BP2D	-176.46	0.1	-176.82	0.1	-181.13	0.1
ROA	60896-60901	RO_7-BP2G	-193.53	0.1	-192.48	0.1	-190.50	0.1
PTB	60909-60921	PT13-BP2G	53.92	0.1	54.24	0.1	54.53	0.1
PTB	60909-60921	PT13-BP2D	71.01	0.1	69.99	0.1	64.18	0.1
PTB	60909-60921	PT07-BP2G	-128.22	0.1	-125.80	0.1	-123.11	0.1
PTB	60909-60921	PT07-BP2D	-111.10	0.1	-109.93	0.1	-113.56	0.1
PTB	60909-60921	PT09-BP2G	-55.79	0.1	-54.87	0.1	-52.80	0.1
PTB	60909-60921	PT09-BP2D	-38.69	0.1	-39.16	0.1	-43.18	0.1
PTB	60909-60921	PT10-BP2G	117.42	0.1	117.75	0.1	114.02	0.1
PTB	60909-60921	PT10-BP2D	134.56	0.1	133.50	0.1	123.64	0.1
PTB	60909-60920	PT15-BP2G	104.48	0.1	103.62	0.1	99.15	0.1
PTB	60909-60920	PT15-BP2D	121.58	0.1	119.36	0.1	108.81	0.1
IT	60962-60972	IT11-BP2G	-191.04	0.1	-190.08	0.1	-189.01	0.1
IT	60962-60972	IT11-BP2D	-173.78	0.1	-174.25	0.1	-179.03	0.1
IT	60962-60972	IT16-BP2G	160.45	0.1	160.67	0.1	160.78	0.1
IT	60962-60972	IT16-BP2D	177.66	0.1	176.45	0.1	170.76	0.1
IT	60962-60972	IT07-BP2G	-276.30	0.1	-276.31	0.1	-273.65	0.1
IT	60962-60972	IT07-BP2D	-259.03	0.1	-260.46	0.1	-263.68	0.1
IT	60962-60972	IT20-BP2G	-64.20	0.1	-64.34	0.1	-64.08	0.1
IT	60962-60972	IT20-BP2D	-47.03	0.1	-48.58	0.1	-54.12	0.1
IT	60962-60972	IT21-BP2G	-208.19	0.1	-208.22	0.1	-208.18	0.1
IT	60962-60972	IT21-BP2D	-190.93	0.1	-192.41	0.1	-198.19	0.1
IT	60962-60972	IT05-BP2G	-153.99	0.1	-154.11	0.1	-153.33	0.1
IT	60962-60972	IT05-BP2D	-136.75	0.1	-138.28	0.1	-143.32	0.1
BIPM	60996-61003	BP2D-BP21	19.11	0.1	20.38	0.1	24.77	0.1
BIPM	60996-61003	BP2G-BP21	36.70	0.1	36.53	0.1	35.11	0.1

Table 4: Galileo raw differential results for all pairs (Traveling – Reference) (ns)

Labo	Date	Pair	RDIF(E1)	Unc	RDIF(E5)	Unc
BIPM	60830-60837	BP2D-BP21	18.85	0.1	22.63	0.1
BIPM	60830-60837	BP2G-BP21	36.49	0.1	35.63	0.1
OP	60859-60865	OP70-BP2D	-69.32	0.1	-73.32	0.1
OP	60859-60865	OP73-BP2D	-61.21	0.1	-65.99	0.1
OP	60859-60865	OPM9-BP2D	16.39	0.1	5.89	0.1
OP	60859-60865	OP75-BP2D	-60.51	0.1	-66.07	0.1
OP	60860-60866	OP70-BP2G	-86.78	0.1	-85.80	0.1
OP	60860-60866	OP73-BP2G	-78.68	0.1	-78.09	0.1
OP	60860-60866	OPM9-BP2G	-1.09	0.1	-6.51	0.1
OP	60860-60866	OP75-BP2G	-77.98	0.1	-78.17	0.1
ROA	60896-60901	RO12-BP2D	312.38	0.1	307.96	0.1
ROA	60896-60901	RO12-BP2G	294.99	0.1	294.90	0.1
ROA	60896-60901	RO13-BP2D	-45.27	0.1	-48.17	0.1
ROA	60896-60901	RO13-BP2G	-62.64	0.1	-61.08	0.1
ROA	60896-60901	RO_9-BP2D	-205.71	0.1	-200.60	0.1
ROA	60896-60901	RO_9-BP2G	-223.07	0.1	-213.54	0.1
ROA	60896-60901	RO10-BP2D	356.08	0.1	351.07	0.1
ROA	60896-60901	RO10-BP2G	338.68	0.1	338.10	0.1
ROA	60896-60901	RO_8-BP2D	339.41	0.1	327.42	0.1
ROA	60896-60901	RO_8-BP2G	322.01	0.1	314.54	0.1
ROA	60896-60901	RO_7-BP2D	-176.67	0.1	-171.98	0.1
ROA	60896-60901	RO_7-BP2G	-194.04	0.1	-184.94	0.1
PTB	60909-60921	PT13-BP2G	53.90	0.1	54.54	0.1
PTB	60909-60921	PT13-BP2D	71.26	0.1	66.82	0.1
PTB	60909-60921	PT09-BP2G	-56.29	0.1	-46.56	0.1
PTB	60909-60921	PT09-BP2D	-38.92	0.1	-34.32	0.1
PTB	60909-60921	PT10-BP2G	118.66	0.1	108.38	0.1
PTB	60909-60921	PT10-BP2D	136.05	0.1	120.63	0.1
PTB	60909-60920	PT15-BP2G	104.88	0.1	98.38	0.1
PTB	60909-60920	PT15-BP2D	122.26	0.1	110.63	0.1
IT	60962-60972	IT11-BP2G	-191.50	0.1	-183.92	0.1
IT	60962-60972	IT11-BP2D	-174.04	0.1	-171.91	0.1
IT	60962-60972	IT16-BP2G	160.49	0.1	159.51	0.1
IT	60962-60972	IT16-BP2D	177.91	0.1	171.56	0.1
IT	60962-60972	IT07-BP2G	-276.33	0.1	-273.94	0.1
IT	60962-60972	IT07-BP2D	-258.84	0.1	-261.91	0.1
IT	60962-60972	IT20-BP2G	-64.20	0.1	-64.17	0.1
IT	60962-60972	IT20-BP2D	-46.79	0.1	-52.08	0.1
IT	60962-60972	IT21-BP2G	-208.21	0.1	-208.07	0.1
IT	60962-60972	IT21-BP2D	-190.73	0.1	-196.05	0.1
IT	60962-60972	IT05-BP2G	-154.00	0.1	-151.31	0.1
IT	60962-60972	IT05-BP2D	-136.52	0.1	-139.31	0.1
BIPM	60996-61003	BP2D-BP21	18.85	0.1	23.31	0.1
BIPM	60996-61003	BP2G-BP21	36.64	0.1	35.57	0.1

Table 5: Beidou raw differential results for all pairs (Traveling – Reference) (ns)

Labo	Date	Pair	RDIF(BC)	Unc	RDIF(B5)	Unc
BIPM	60830-60837	BP2D-BP21	18.28	0.1	22.27	0.1
BIPM	60830-60837	BP2G-BP21	36.47	0.1	35.62	0.1
OP	60859-60865	OP70-BP2D	-68.62	0.1	-72.96	0.1
OP	60859-60865	OP73-BP2D	-60.54	0.1	-65.64	0.1
OP	60859-60865	OP75-BP2D	-59.92	0.1	-65.71	0.1
OP	60860-60866	OP70-BP2G	-86.53	0.1	-85.81	0.1
OP	60860-60866	OP73-BP2G	-78.45	0.1	-78.06	0.1
OP	60860-60866	OP75-BP2G	-77.84	0.1	-78.13	0.1
ROA	60896-60901	RO12-BP2D	313.07	0.1	308.28	0.1
ROA	60896-60901	RO12-BP2G	295.12	0.1	294.86	0.1
ROA	60896-60901	RO13-BP2D	-44.52	0.1	-47.82	0.1
ROA	60896-60901	RO13-BP2G	-62.42	0.1	-61.08	0.1
ROA	60896-60901	RO10-BP2D	356.81	0.1	351.46	0.1
ROA	60896-60901	RO10-BP2G	338.83	0.1	338.05	0.1
PTB	60909-60921	PT13-BP2G	54.02	0.1	54.54	0.1
PTB	60909-60921	PT13-BP2D	71.94	0.1	67.29	0.1
IT	60962-60972	IT16-BP2G	160.49	0.1	159.49	0.1
IT	60962-60972	IT16-BP2D	178.47	0.1	171.91	0.1
IT	60962-60972	IT07-BP2G	-276.20	0.1	-273.92	0.1
IT	60962-60972	IT07-BP2D	-258.08	0.1	-261.46	0.1
IT	60962-60972	IT20-BP2G	-64.23	0.1	-64.20	0.1
IT	60962-60972	IT20-BP2D	-46.29	0.1	-51.75	0.1
IT	60962-60972	IT21-BP2G	-208.16	0.1	-208.06	0.1
IT	60962-60972	IT21-BP2D	-190.06	0.1	-195.51	0.1
IT	60962-60972	IT05-BP2G	-153.93	0.1	-151.29	0.1
IT	60962-60972	IT05-BP2D	-135.73	0.1	-138.80	0.1
BIPM	60996-61003	BP2D-BP21	18.30	0.1	22.93	0.1
BIPM	60996-61003	BP2G-BP21	36.64	0.1	35.59	0.1

4 Calibration Results

In the first step, one computes $\Delta SYSDLY$, the differences of $SYSDLY$ for all pairs (Traveling-Reference) and (Traveling-Visited), from

$$\Delta SYSDLY_{A-B}(Code) = RAWDIF_{A-B}(Code) + REFDLY_A - REFDLY_B \quad (1)$$

where $RAWDIF(Code)$ is read in Tables 3 4 5 and where the values $REFDLY$ are in the report of operations [1001-2025-phase1-cv.pdf](#). The $\Delta SYSDLY$ values are reported in Tables 6 7 8 for the pairs Traveling-Reference (section 4.3) and in Table 9 10 11 for the pairs Visited-Traveling (section 4.3). In the second step one computes $\Delta SYSDLY$ (Visited-Reference) for all visited systems.

$$\Delta SYSDLY_{V-R} = \Delta SYSDLY_{T-R} + \Delta SYSDLY_{V-T}. \quad (2)$$

One can then compute $\Delta INTDLY$ (Visited-Reference) for all visited systems.

$$\Delta INTDLY_{V-R} = \Delta SYSDLY_{V-R} - CABDLY_V + CABDLY_R \quad (3)$$

where the values $CABDLY$ are taken from the report of operations [1001-2025-phase1-cv.pdf](#); Tables 12 13 14 reports the $\Delta INTDLY_{V-R}$ results for the pairs Visited-Reference (section 4.3). Using assumed $INTDLY_R$ values for the Reference system, Tables 15 16 17 then reports $INTDLY_V$ for all visited systems (section 4.4).

4.1 Traveling System with Respect to the Reference System

$REFDLY$ values are available from the report of operations [1001-2025-phase1-cv.pdf](#).

Results for the traveling systems are reported in Tables 6 7 8.

Table 6: Computed GPS Δ SYSDLY values for the traveling systems with respect to reference receiver. The misclosures are also indicated. (all values in ns).

Pair	Date	REFDLY _T	REFDLY _R	Note	C1 (ns)		P1 (ns)		P2 (ns)		P3 (ns)	
					RAWDIF	Δ SYSDLY	RAWDIF	Δ SYSDLY	RAWDIF	Δ SYSDLY	RAWDIF	Δ SYSDLY
BP2G-BP21	60830-60837	0.00	43.34		36.51	-6.81	36.33	-6.99	34.94	-8.38	38.49	-4.83
BP2G-BP21	60996-61003	0.02	43.34		36.70	-6.62	36.53	-6.79	35.11	-8.21	38.78	-4.54
		Misc.				-0.19		-0.20		-0.17		-0.29
BP2G-BP21		Mean				-6.72		-6.89		-8.30		-4.69
BP2D-BP21	60830-60837	0.00	43.34		19.10	-24.23	20.31	-23.02	25.15	-18.18	12.94	-30.39
BP2D-BP21	60996-61003	0.01	43.34		19.11	-24.22	20.38	-22.95	24.77	-18.56	13.54	-29.79
		Misc.				-0.01		-0.07		0.38		-0.60
BP2D-BP21		Mean				-24.22		-22.98		-18.37		-30.09

Table 7: Computed Galileo Δ SYSDLY values for the traveling systems with respect to reference receiver. The misclosures are also indicated. (all values in ns).

Pair	Date	REFDLY _T	REFDLY _R	Note	E1 (ns)		E5 (ns)		E3 (ns)	
					RAWDIF	Δ SYSDLY	RAWDIF	Δ SYSDLY	RAWDIF	Δ SYSDLY
BP2G-BP21	60830-60837	0.00	43.34		36.49	-6.83	35.63	-7.69	37.58	-5.74
BP2G-BP21	60996-61003	0.02	43.34		36.64	-6.68	35.57	-7.75	37.98	-5.34
		Misc.				-0.15		0.06		-0.40
BP2G-BP21		Mean				-6.75		-7.72		-5.54
BP2D-BP21	60830-60837	0.00	43.34		18.85	-24.48	22.63	-20.70	14.11	-29.22
BP2D-BP21	60996-61003	0.01	43.34		18.85	-24.48	23.31	-20.02	13.22	-30.11
		Misc.				0.00		-0.69		0.89
BP2D-BP21		Mean				-24.48		-20.36		-29.67

Table 8: Computed Beidou Δ SYSDLY values for the traveling systems with respect to reference receiver. The misclosures are also indicated. (all values in ns).

Pair	Date	REFDLY _T	REFDLY _R	Note	BC (ns)		B5 (ns)		B3 (ns)	
					RAWDIF	Δ SYSDLY	RAWDIF	Δ SYSDLY	RAWDIF	Δ SYSDLY
BP2G-BP21	60830-60837	0.00	43.34		36.47	-6.85	35.62	-7.70	37.53	-5.79
BP2G-BP21	60996-61003	0.02	43.34		36.64	-6.68	35.59	-7.73	37.99	-5.33
		Misc.				-0.17		0.04		-0.46
BP2G-BP21		Mean				-6.77		-7.71		-5.56
BP2D-BP21	60830-60837	0.00	43.34		18.28	-25.05	22.27	-21.06	13.34	-29.99
BP2D-BP21	60996-61003	0.01	43.34		18.30	-25.03	22.93	-20.40	12.59	-30.74
		Misc.				-0.02		-0.65		0.75
BP2D-BP21		Mean				-25.04		-20.73		-30.37

4.2 Traveling System with Respect to the Visited Systems

REFDLY values are available from the report of operations [1001-2025-phase1-cv.pdf](#).

Table 9: Computed GPS Δ SYSDLY values for the traveling systems with respect to visited receiver. (all values in ns).

Pair	Date	REFDLY _V	REFDLY _T	Note	C1 (ns)		P1 (ns)		P2 (ns)	
					RAWDIF	Δ SYSDLY	RAWDIF	Δ SYSDLY	RAWDIF	Δ SYSDLY
OP70-BP2G	60860-60866	90.60	9.98		-86.73	-6.11	-86.56	-5.94	-85.33	-4.71
OP73-BP2G	60860-60866	85.25	9.98		-78.59	-3.32	-78.40	-3.13	-79.29	-4.02
OP75-BP2G	60860-60866	85.34	9.98		-77.89	-2.53	-77.88	-2.52	-80.01	-4.65
OPM9-BP2G	60860-60866	60.46	9.98		-2.23	48.25	-1.90	48.58	-2.28	48.20
RO12-BP2G	60896-60901	39.80	277.50		294.98	57.28	295.11	57.41	296.92	59.22
RO13-BP2G	60896-60901	289.00	277.50		-62.68	-51.18	-62.27	-50.77	-61.80	-50.30
RO_9-BP2G	60896-60901	451.80	277.50		-222.49	-48.19	-221.62	-47.32	-219.85	-45.55
RO_8-BP2G	60896-60901	20.40	277.50		320.86	63.76	321.14	64.04	322.51	65.41
RO_7-BP2G	60896-60901	452.40	277.50		-193.53	-18.63	-192.48	-17.58	-190.50	-15.60
RO10-BP2G	60896-60901	5.10	277.50		338.67	66.27	339.15	66.75	338.33	65.93
RO_6-BP2G	60896-60901	485.10	277.50		-234.22	-26.62	-233.46	-25.86	-231.57	-23.97
PT13-BP2G	60909-60921	55.73	35.96		53.92	73.69	54.24	74.01	54.53	74.30

PT07-BP2G	60909-60921	-0.51	35.96	-128.22	-164.69	-125.80	-162.28	-123.11	-159.59
PT09-BP2G	60909-60921	182.14	35.96	-55.79	90.39	-54.87	91.31	-52.80	93.38
PT10-BP2G	60909-60921	36.44	35.96	117.42	117.90	117.75	118.23	114.02	114.50
PT15-BP2G	60909-60920	11.04	35.96	104.48	79.56	103.62	78.70	99.15	74.23
IT07-BP2G	60962-60972	372.70	101.10	-276.30	-4.70	-276.31	-4.70	-273.65	-2.05
IT16-BP2G	60962-60972	161.10	101.10	160.45	220.45	160.67	220.67	160.78	220.78
IT11-BP2G	60962-60972	483.60	101.10	-191.04	191.46	-190.08	192.42	-189.01	193.49
IT20-BP2G	60962-60972	151.00	101.10	-64.20	-14.30	-64.34	-14.44	-64.08	-14.18
IT21-BP2G	60962-60972	374.50	101.10	-208.19	65.21	-208.22	65.18	-208.18	65.22
IT05-BP2G	60962-60972	373.50	101.10	-153.99	118.41	-154.11	118.29	-153.33	119.07
OP70-BP2D	60859-60865	90.60	9.98	-69.56	11.06	-70.79	9.83	-75.68	4.94
OP73-BP2D	60859-60865	85.25	9.98	-61.44	13.83	-62.63	12.64	-69.64	5.63
OP75-BP2D	60859-60865	85.34	9.98	-60.74	14.62	-62.11	13.25	-70.36	5.00
OPM9-BP2D	60859-60865	60.46	9.98	14.95	65.43	13.87	64.35	7.39	57.87
RO12-BP2D	60896-60901	39.80	277.50	312.06	74.36	310.85	73.15	306.32	68.62
RO13-BP2D	60896-60901	289.00	277.50	-45.60	-34.10	-46.56	-35.06	-52.43	-40.93
RO_9-BP2D	60896-60901	451.80	277.50	-205.42	-31.12	-205.96	-31.66	-210.49	-36.19
RO_8-BP2D	60896-60901	20.40	277.50	337.93	80.83	336.83	79.73	331.76	74.66
RO_7-BP2D	60896-60901	452.40	277.50	-176.46	-1.56	-176.82	-1.92	-181.13	-6.23
RO10-BP2D	60896-60901	5.10	277.50	355.76	83.36	354.89	82.49	347.74	75.34
RO_6-BP2D	60896-60901	485.10	277.50	-217.15	-9.55	-217.76	-10.16	-222.20	-14.60
PT13-BP2D	60909-60921	55.73	35.20	71.01	91.54	69.99	90.52	64.18	84.71
PT07-BP2D	60909-60921	-0.51	35.20	-111.10	-146.82	-109.93	-145.65	-113.56	-149.28
PT09-BP2D	60909-60921	182.14	35.20	-38.69	108.25	-39.16	107.78	-43.18	103.76
PT10-BP2D	60909-60921	36.44	35.20	134.56	135.80	133.50	134.74	123.64	124.88
PT15-BP2D	60909-60920	11.04	35.20	121.58	97.42	119.36	95.20	108.81	84.65
IT07-BP2D	60962-60972	372.70	101.10	-259.03	12.57	-260.46	11.14	-263.68	7.92
IT16-BP2D	60962-60972	161.10	101.10	177.66	237.66	176.45	236.45	170.76	230.76
IT11-BP2D	60962-60972	483.60	101.10	-173.78	208.72	-174.25	208.25	-179.03	203.47
IT20-BP2D	60962-60972	151.00	101.10	-47.03	2.87	-48.58	1.32	-54.12	-4.22
IT21-BP2D	60962-60972	374.50	101.10	-190.93	82.47	-192.41	80.99	-198.19	75.21
IT05-BP2D	60962-60972	373.50	101.10	-136.75	135.66	-138.28	134.12	-143.32	129.08

Table 10: Computed Galileo Δ SYSDLY values for the traveling systems with respect to visited receiver. (all values in ns).

Pair	Date	REFDLY _V	REFDLY _T	Note	E1 (ns)		E5 (ns)	
					RAWDIF	ΔSYSDLY	RAWDIF	ΔSYSDLY
OP70-BP2G	60860-60866	90.60	9.98		-86.78	-6.16	-85.80	-5.18
OP73-BP2G	60860-60866	85.25	9.98		-78.68	-3.41	-78.09	-2.82
OP75-BP2G	60860-60866	85.34	9.98		-77.98	-2.62	-78.17	-2.81
OPM9-BP2G	60860-60866	60.46	9.98		-1.09	49.39	-6.51	43.97
RO12-BP2G	60896-60901	39.80	277.50		294.99	57.29	294.90	57.20
RO13-BP2G	60896-60901	289.00	277.50		-62.64	-51.14	-61.08	-49.58
RO_9-BP2G	60896-60901	451.80	277.50		-223.07	-48.77	-213.54	-39.24
RO_8-BP2G	60896-60901	20.40	277.50		322.01	64.91	314.54	57.44
RO_7-BP2G	60896-60901	452.40	277.50		-194.04	-19.14	-184.94	-10.04
RO10-BP2G	60896-60901	5.10	277.50		338.68	66.28	338.10	65.70
PT13-BP2G	60909-60921	55.73	35.96		53.90	73.67	54.54	74.31
PT09-BP2G	60909-60921	182.14	35.96		-56.29	89.89	-46.56	99.62
PT10-BP2G	60909-60921	36.44	35.96		118.66	119.14	108.38	108.86
PT15-BP2G	60909-60920	11.04	35.96		104.88	79.96	98.38	73.46
IT07-BP2G	60962-60972	372.70	101.10		-276.33	-4.73	-273.94	-2.34
IT16-BP2G	60962-60972	161.10	101.10		160.49	220.49	159.51	219.51
IT11-BP2G	60962-60972	483.60	101.10		-191.50	191.00	-183.92	198.58
IT20-BP2G	60962-60972	151.00	101.10		-64.20	-14.30	-64.17	-14.27
IT21-BP2G	60962-60972	374.50	101.10		-208.21	65.19	-208.07	65.33
IT05-BP2G	60962-60972	373.50	101.10		-154.00	118.40	-151.31	121.09
OP70-BP2D	60859-60865	90.60	9.98		-69.32	11.30	-73.32	7.30
OP73-BP2D	60859-60865	85.25	9.98		-61.21	14.06	-65.99	9.28
OP75-BP2D	60859-60865	85.34	9.98		-60.51	14.85	-66.07	9.29
OPM9-BP2D	60859-60865	60.46	9.98		16.39	66.87	5.89	56.37
RO12-BP2D	60896-60901	39.80	277.50		312.38	74.68	307.96	70.26
RO13-BP2D	60896-60901	289.00	277.50		-45.27	-33.77	-48.17	-36.68
RO_9-BP2D	60896-60901	451.80	277.50		-205.71	-31.41	-200.60	-26.30
RO_8-BP2D	60896-60901	20.40	277.50		339.41	82.31	327.42	70.32
RO_7-BP2D	60896-60901	452.40	277.50		-176.67	-1.77	-171.98	2.92
RO10-BP2D	60896-60901	5.10	277.50		356.08	83.68	351.07	78.67
PT13-BP2D	60909-60921	55.73	35.20		71.26	91.79	66.82	87.35
PT09-BP2D	60909-60921	182.14	35.20		-38.92	108.02	-34.32	112.62
PT10-BP2D	60909-60921	36.44	35.20		136.05	137.29	120.63	121.87
PT15-BP2D	60909-60920	11.04	35.20		122.26	98.10	110.63	86.47

IT07-BP2D	60962-60972	372.70	101.10	-258.84	12.76	-261.91	9.69
IT16-BP2D	60962-60972	161.10	101.10	177.91	237.91	171.56	231.56
IT11-BP2D	60962-60972	483.60	101.10	-174.04	208.46	-171.91	210.59
IT20-BP2D	60962-60972	151.00	101.10	-46.79	3.11	-52.08	-2.18
IT21-BP2D	60962-60972	374.50	101.10	-190.73	82.67	-196.05	77.35
IT05-BP2D	60962-60972	373.50	101.10	-136.52	135.88	-139.31	133.09

Table 11: Computed Beidou Δ SYSDLY values for the traveling systems with respect to visited receiver. (all values in ns).

Pair	Date	REFDLY _V	REFDLY _T	Note	BC (ns)		B5 (ns)	
					RAWDIF	Δ SYSDLY	RAWDIF	Δ SYSDLY
OP70-BP2G	60860-60866	90.60	9.98		-86.53	-5.91	-85.81	-5.19
OP73-BP2G	60860-60866	85.25	9.98		-78.45	-3.18	-78.06	-2.79
OP75-BP2G	60860-60866	85.34	9.98		-77.84	-2.48	-78.13	-2.77
RO12-BP2G	60896-60901	39.80	277.50		295.12	57.42	294.86	57.16
RO13-BP2G	60896-60901	289.00	277.50		-62.42	-50.92	-61.08	-49.58
RO10-BP2G	60896-60901	5.10	277.50		338.83	66.43	338.05	65.65
PT13-BP2G	60909-60921	55.73	35.96		54.02	73.79	54.54	74.31
IT07-BP2G	60962-60972	372.70	101.10		-276.20	-4.60	-273.92	-2.32
IT16-BP2G	60962-60972	161.10	101.10		160.49	220.49	159.49	219.49
IT20-BP2G	60962-60972	151.00	101.10		-64.23	-14.33	-64.20	-14.30
IT21-BP2G	60962-60972	374.50	101.10		-208.16	65.24	-208.06	65.34
IT05-BP2G	60962-60972	373.50	101.10		-153.93	118.47	-151.29	121.11
OP70-BP2D	60859-60865	90.60	9.98		-68.62	12.00	-72.96	7.66
OP73-BP2D	60859-60865	85.25	9.98		-60.54	14.73	-65.64	9.63
OP75-BP2D	60859-60865	85.34	9.98		-59.92	15.44	-65.71	9.65
RO12-BP2D	60896-60901	39.80	277.50		313.07	75.37	308.28	70.58
RO13-BP2D	60896-60901	289.00	277.50		-44.52	-33.02	-47.82	-36.32
RO10-BP2D	60896-60901	5.10	277.50		356.81	84.41	351.46	79.06
PT13-BP2D	60909-60921	55.73	35.20		71.94	92.47	67.29	87.82
IT07-BP2D	60962-60972	372.70	101.10		-258.08	13.52	-261.46	10.14
IT16-BP2D	60962-60972	161.10	101.10		178.47	238.47	171.91	231.91
IT20-BP2D	60962-60972	151.00	101.10		-46.29	3.61	-51.75	-1.85
IT21-BP2D	60962-60972	374.50	101.10		-190.06	83.35	-195.51	77.89
IT05-BP2D	60962-60972	373.50	101.10		-135.73	136.67	-138.80	133.60

4.3 Visited Systems with Respect to Reference System

The Tables [12](#) [13](#) [14](#) provide the values obtained by differencing Tables in sub-section (BP21reference) and Tables in sub-section . CABDLY values are taken from the report of operations [1001-2025-phase1-cv.pdf](#) and have not been measured during this calibration.

Table 12: Computed GPS Δ INTDLY values for the visited systems with respect to reference receiver. (all values in ns).

Pair	Date	CABDLY _V	CABDLY _R	Note	C1 (ns)		P1 (ns)		P2 (ns)	
					Δ SYSDLY	Δ INTDLY	Δ SYSDLY	Δ INTDLY	Δ SYSDLY	Δ INTDLY
IT20-BP21 via BP2G	2025.8	119.40	140.80		-21.02	0.38	-21.33	0.07	-22.47	-1.07
IT20-BP21 via BP2D	2025.8	119.40	140.80		-21.35	0.05	-21.66	-0.26	-22.58	-1.18
IT21-BP21 via BP2G	2025.8	199.30	140.80		58.50	-0.00	58.29	-0.21	56.92	-1.58
IT21-BP21 via BP2D	2025.8	199.30	140.80		58.24	-0.26	58.01	-0.49	56.84	-1.66
IT07-BP21 via BP2G	2025.8	130.50	140.80		-11.42	-1.12	-11.59	-1.29	-10.34	-0.04
IT07-BP21 via BP2D	2025.8	130.50	140.80		-11.65	-1.35	-11.84	-1.54	-10.44	-0.14
IT05-BP21 via BP2G	2025.8	254.70	140.80		111.69	-2.21	111.40	-2.50	110.77	-3.13
IT05-BP21 via BP2D	2025.8	254.70	140.80		111.43	-2.47	111.13	-2.77	110.72	-3.18
IT16-BP21 via BP2G	2025.8	355.50	140.80		213.74	-0.96	213.78	-0.92	212.48	-2.22
IT16-BP21 via BP2D	2025.8	355.50	140.80		213.43	-1.27	213.46	-1.24	212.39	-2.31
IT11-BP21 via BP2G	2025.8	298.60	140.80		184.75	26.95	185.53	27.73	185.19	27.39
IT11-BP21 via BP2D	2025.8	298.60	140.80		184.49	26.69	185.26	27.46	185.10	27.30
OP70-BP21 via BP2G	2025.5	128.70	140.80		-12.82	-0.72	-12.83	-0.73	-13.01	-0.91
OP70-BP21 via BP2D	2025.5	128.70	140.80		-13.17	-1.06	-13.15	-1.05	-13.42	-1.32
OP73-BP21 via BP2G	2025.5	129.60	140.80		-10.03	1.17	-10.02	1.18	-12.31	-1.11
OP73-BP21 via BP2D	2025.5	129.60	140.80		-10.39	0.81	-10.34	0.86	-12.73	-1.53
OPM9-BP21 via BP2G	2025.5	173.60	140.80		41.53	8.73	41.69	8.89	39.90	7.10
OPM9-BP21 via BP2D	2025.5	173.60	140.80		41.20	8.40	41.36	8.57	39.50	6.70
OP75-BP21 via BP2G	2025.5	129.60	140.80		-9.25	1.95	-9.41	1.79	-12.94	-1.74
OP75-BP21 via BP2D	2025.5	129.60	140.80		-9.60	1.60	-9.73	1.47	-13.36	-2.16
PT09-BP21 via BP2G	2025.6	198.70	140.80		83.67	25.77	84.42	26.52	85.08	27.18
PT09-BP21 via BP2D	2025.6	198.70	140.80		84.02	26.12	84.80	26.90	85.39	27.49
PT15-BP21 via BP2G	2025.6	205.50	140.80		72.85	8.15	71.82	7.12	65.93	1.23
PT15-BP21 via BP2D	2025.6	205.50	140.80		73.20	8.50	72.22	7.52	66.28	1.58
PT10-BP21 via BP2G	2025.6	250.00	140.80		111.18	1.98	111.35	2.15	106.20	-3.00

PT10-BP21 via BP2D	2025.6	250.00	140.80	111.58	2.38	111.76	2.56	106.52	-2.68
PT13-BP21 via BP2G	2025.6	205.70	140.80	66.97	2.08	67.12	2.22	66.00	1.10
PT13-BP21 via BP2D	2025.6	205.70	140.80	67.32	2.42	67.53	2.63	66.34	1.44
PT07-BP21 via BP2G	2025.6	0.00	140.80	-171.41	-30.61	-169.16	-28.36	-167.89	-27.09
PT07-BP21 via BP2D	2025.6	0.00	140.80	-171.04	-30.24	-168.63	-27.83	-167.64	-26.84
RO10-BP21 via BP2G	2025.6	200.00	140.80	59.56	0.36	59.86	0.66	57.64	-1.56
RO10-BP21 via BP2D	2025.6	200.00	140.80	59.14	-0.06	59.51	0.31	56.97	-2.23
RO13-BP21 via BP2G	2025.6	83.00	140.80	-57.89	-0.09	-57.66	0.14	-58.60	-0.80
RO13-BP21 via BP2D	2025.6	83.00	140.80	-58.33	-0.53	-58.05	-0.25	-59.30	-1.50
RO_7-BP21 via BP2G	2025.6	89.90	140.80	-25.34	25.56	-24.47	26.43	-23.90	27.00
RO_7-BP21 via BP2D	2025.6	89.90	140.80	-25.78	25.12	-24.90	26.00	-24.59	26.31
RO_9-BP21 via BP2G	2025.6	59.70	140.80	-54.90	26.20	-54.21	26.89	-53.84	27.26
RO_9-BP21 via BP2D	2025.6	59.70	140.80	-55.34	25.76	-54.64	26.46	-54.56	26.54
RO_8-BP21 via BP2G	2025.6	197.10	140.80	57.04	0.74	57.15	0.85	57.11	0.81
RO_8-BP21 via BP2D	2025.6	197.10	140.80	56.61	0.31	56.74	0.44	56.29	-0.01
RO12-BP21 via BP2G	2025.6	190.50	140.80	50.56	0.86	50.52	0.82	50.92	1.22
RO12-BP21 via BP2D	2025.6	190.50	140.80	50.14	0.44	50.16	0.46	50.25	0.55
RO_6-BP21 via BP2G	2025.6	82.00	140.80	-33.34	25.46	-32.75	26.05	-32.27	26.53
RO_6-BP21 via BP2D	2025.6	82.00	140.80	-33.77	25.03	-33.14	25.66	-32.96	25.84

Table 13: Computed Galileo Δ INTDLY values for the visited systems with respect to reference receiver. (all values in ns).

Pair	Date	CABDLY _V	CABDLY _R	Note	E1 (ns)		E5 (ns)	
					Δ SYSDLY	Δ INTDLY	Δ SYSDLY	Δ INTDLY
IT07-BP21 via BP2G	2025.8	130.50	140.80		-11.48	-1.18	-10.06	0.24
IT07-BP21 via BP2D	2025.8	130.50	140.80		-11.72	-1.42	-10.67	-0.37
IT20-BP21 via BP2G	2025.8	119.40	140.80		-21.06	0.34	-21.99	-0.59
IT20-BP21 via BP2D	2025.8	119.40	140.80		-21.37	0.03	-22.54	-1.14
IT05-BP21 via BP2G	2025.8	254.70	140.80		111.65	-2.25	113.37	-0.53
IT05-BP21 via BP2D	2025.8	254.70	140.80		111.40	-2.50	112.73	-1.17
IT11-BP21 via BP2G	2025.8	298.60	140.80		184.24	26.44	190.86	33.06
IT11-BP21 via BP2D	2025.8	298.60	140.80		183.98	26.18	190.23	32.43
IT16-BP21 via BP2G	2025.8	355.50	140.80		213.73	-0.97	211.79	-2.91
IT16-BP21 via BP2D	2025.8	355.50	140.80		213.44	-1.26	211.20	-3.50

IT21-BP21 via BP2G	2025.8	199.30	140.80	58.43	-0.07	57.61	-0.89
IT21-BP21 via BP2D	2025.8	199.30	140.80	58.19	-0.31	56.99	-1.51
OP70-BP21 via BP2G	2025.5	128.70	140.80	-12.91	-0.81	-12.90	-0.80
OP70-BP21 via BP2D	2025.5	128.70	140.80	-13.18	-1.08	-13.06	-0.96
OPM9-BP21 via BP2G	2025.5	173.60	140.80	42.64	9.84	36.25	3.45
OPM9-BP21 via BP2D	2025.5	173.60	140.80	42.39	9.59	36.01	3.21
OP73-BP21 via BP2G	2025.5	129.60	140.80	-10.17	1.03	-10.54	0.66
OP73-BP21 via BP2D	2025.5	129.60	140.80	-10.42	0.78	-11.08	0.12
OP75-BP21 via BP2G	2025.5	129.60	140.80	-9.38	1.82	-10.53	0.67
OP75-BP21 via BP2D	2025.5	129.60	140.80	-9.63	1.57	-11.07	0.13
PT15-BP21 via BP2G	2025.6	205.50	140.80	73.20	8.50	65.74	1.04
PT15-BP21 via BP2D	2025.6	205.50	140.80	73.62	8.92	66.11	1.41
PT13-BP21 via BP2G	2025.6	205.70	140.80	66.91	2.01	66.59	1.69
PT13-BP21 via BP2D	2025.6	205.70	140.80	67.31	2.41	66.99	2.09
PT09-BP21 via BP2G	2025.6	198.70	140.80	83.13	25.23	91.90	34.00
PT09-BP21 via BP2D	2025.6	198.70	140.80	83.54	25.64	92.26	34.36
PT10-BP21 via BP2G	2025.6	250.00	140.80	112.39	3.19	101.14	-8.06
PT10-BP21 via BP2D	2025.6	250.00	140.80	112.81	3.62	101.51	-7.69
RO_9-BP21 via BP2G	2025.6	59.70	140.80	-55.52	25.58	-46.97	34.13
RO_9-BP21 via BP2D	2025.6	59.70	140.80	-55.89	25.21	-46.66	34.44
RO10-BP21 via BP2G	2025.6	200.00	140.80	59.53	0.33	57.98	-1.22
RO10-BP21 via BP2D	2025.6	200.00	140.80	59.20	0.00	58.31	-0.89
RO13-BP21 via BP2G	2025.6	83.00	140.80	-57.90	-0.10	-57.30	0.50
RO13-BP21 via BP2D	2025.6	83.00	140.80	-58.25	-0.45	-57.04	0.76
RO_7-BP21 via BP2G	2025.6	89.90	140.80	-25.89	25.01	-17.76	33.14
RO_7-BP21 via BP2D	2025.6	89.90	140.80	-26.25	24.65	-17.44	33.46
RO12-BP21 via BP2G	2025.6	190.50	140.80	50.53	0.83	49.48	-0.22
RO12-BP21 via BP2D	2025.6	190.50	140.80	50.20	0.50	49.90	0.20
RO_8-BP21 via BP2G	2025.6	197.10	140.80	58.16	1.86	49.72	-6.58
RO_8-BP21 via BP2D	2025.6	197.10	140.80	57.83	1.53	49.96	-6.34

Table 14: Computed Beidou Δ INTDLY values for the visited systems with respect to reference receiver. (all values in ns).

Pair	Date	CABDLY _V	CABDLY _R	Note	BC (ns)		B5 (ns)	
					Δ SYSDLY	Δ INTDLY	Δ SYSDLY	Δ INTDLY
IT16-BP21 via BP2G	2025.8	355.50	140.80		213.72	-0.98	211.78	-2.92
IT16-BP21 via BP2D	2025.8	355.50	140.80		213.43	-1.27	211.18	-3.52
IT05-BP21 via BP2G	2025.8	254.70	140.80		111.70	-2.20	113.39	-0.51
IT05-BP21 via BP2D	2025.8	254.70	140.80		111.63	-2.27	112.87	-1.03
IT21-BP21 via BP2G	2025.8	199.30	140.80		58.48	-0.02	57.63	-0.87
IT21-BP21 via BP2D	2025.8	199.30	140.80		58.31	-0.19	57.16	-1.34
IT07-BP21 via BP2G	2025.8	130.50	140.80		-11.36	-1.06	-10.04	0.26
IT07-BP21 via BP2D	2025.8	130.50	140.80		-11.51	-1.21	-10.59	-0.29
IT20-BP21 via BP2G	2025.8	119.40	140.80		-21.10	0.30	-22.01	-0.61
IT20-BP21 via BP2D	2025.8	119.40	140.80		-21.43	-0.03	-22.58	-1.18
OP70-BP21 via BP2G	2025.5	128.70	140.80		-12.67	-0.57	-12.90	-0.80
OP70-BP21 via BP2D	2025.5	128.70	140.80		-13.04	-0.93	-13.07	-0.97
OP73-BP21 via BP2G	2025.5	129.60	140.80		-9.95	1.25	-10.50	0.70
OP73-BP21 via BP2D	2025.5	129.60	140.80		-10.31	0.89	-11.10	0.10
OP75-BP21 via BP2G	2025.5	129.60	140.80		-9.24	1.96	-10.48	0.72
OP75-BP21 via BP2D	2025.5	129.60	140.80		-9.60	1.60	-11.08	0.12
PT13-BP21 via BP2G	2025.6	205.70	140.80		67.03	2.13	66.59	1.69
PT13-BP21 via BP2D	2025.6	205.70	140.80		67.43	2.53	67.09	2.19
RO13-BP21 via BP2G	2025.6	83.00	140.80		-57.68	0.12	-57.29	0.51
RO13-BP21 via BP2D	2025.6	83.00	140.80		-58.05	-0.25	-57.05	0.75
RO10-BP21 via BP2G	2025.6	200.00	140.80		59.67	0.47	57.93	-1.27
RO10-BP21 via BP2D	2025.6	200.00	140.80		59.37	0.17	58.33	-0.87
RO12-BP21 via BP2G	2025.6	190.50	140.80		50.66	0.96	49.45	-0.25
RO12-BP21 via BP2D	2025.6	190.50	140.80		50.34	0.64	49.85	0.15

4.4 Provisional INTDLY Values of Visited Systems

Tables 15 16 17 list INTDLY values of the visited systems. These values are provisional and based on INTDLY values for BP21(C1=30.6 ns; P1=28.4 ns; P2=27.3 ns; E1=30.7 ns; E5=30.9 ns; BC=30.4 ns; B5=30.3 ns) from 1001-2022, as described in [BIPM Technical Memorandum 266](#). Final INTDLY values will be based on minimizing changes between 1001-2022 and 1001-2025, as described in [BIPM Technical Memorandum 266](#), and will be reported in the global report of the trip 1001-2025 available [here](#).

Since two results can be computed from Tables 12 13 14, using either BP2G or BP2D as traveling system, the values in Tables 15 16 17 are the average of the two results, and the difference between the two is indicated. We note that the difference $\Delta(\text{BP2G-BP2D})$ is typically of order X.X ns. It is taken into account in component ub,1 of the uncertainty budget in Tables 18,19 and 20.

Table 15: Provisional GPS INTDLY values of Visited systems (all values in ns).

Pair	Date	Note	C1 INTDLY _v	P1 INTDLY _v	P2 INTDLY _v	P3 INTDLY _v
IT20 vs BP21	2025.8		30.82	28.31	26.17	31.60
$\Delta(\text{BP2G-BP2D})$			0.33	0.34	0.11	0.69
IT21 vs BP21	2025.8		30.47	28.05	25.68	31.71
$\Delta(\text{BP2G-BP2D})$			0.25	0.28	0.09	0.59
IT07 vs BP21	2025.8		29.37	26.98	27.21	26.63
$\Delta(\text{BP2G-BP2D})$			0.24	0.25	0.10	0.49
IT05 vs BP21	2025.8		28.26	25.77	24.14	28.27
$\Delta(\text{BP2G-BP2D})$			0.26	0.27	0.06	0.59
IT16 vs BP21	2025.8		29.49	27.32	25.04	30.85
$\Delta(\text{BP2G-BP2D})$			0.30	0.32	0.09	0.66
IT11 vs BP21	2025.8		57.42	56.00	54.65	58.09
$\Delta(\text{BP2G-BP2D})$			0.25	0.27	0.09	0.54
OP70 vs BP21	2025.5		29.71	27.51	26.18	29.56
$\Delta(\text{BP2G-BP2D})$			0.34	0.32	0.41	0.17
OP73 vs BP21	2025.5		31.59	29.42	25.98	34.75
$\Delta(\text{BP2G-BP2D})$			0.35	0.33	0.42	0.18
OPM9 vs BP21	2025.5		39.17	37.13	34.20	41.65
$\Delta(\text{BP2G-BP2D})$			0.32	0.32	0.40	0.21
OP75 vs BP21	2025.5		32.37	30.03	25.35	37.27
$\Delta(\text{BP2G-BP2D})$			0.35	0.33	0.42	0.19
PT09 vs BP21	2025.6		56.55	55.11	54.64	55.84
$\Delta(\text{BP2G-BP2D})$			-0.35	-0.37	-0.31	-0.47
PT15 vs BP21	2025.6		38.92	35.72	28.71	46.55
$\Delta(\text{BP2G-BP2D})$			-0.35	-0.40	-0.35	-0.48
PT10 vs BP21	2025.6		32.78	30.75	24.46	40.48
$\Delta(\text{BP2G-BP2D})$			-0.40	-0.41	-0.32	-0.56
PT13 vs BP21	2025.6		32.85	30.83	28.57	34.32
$\Delta(\text{BP2G-BP2D})$			-0.35	-0.41	-0.34	-0.51
PT07 vs BP21	2025.6		-35.82	-37.10	-25.06	-55.69
$\Delta(\text{BP2G-BP2D})$			-0.37	-0.53	-0.24	-0.98

RO10 vs BP21	2025.6	30.75	28.88	25.40	34.26
$\Delta(\text{BP2G-BP2D})$		0.42	0.35	0.67	-0.13
RO13 vs BP21	2025.6	30.29	28.35	26.15	31.75
$\Delta(\text{BP2G-BP2D})$		0.43	0.39	0.70	-0.09
RO_7 vs BP21	2025.6	55.94	54.61	53.96	55.63
$\Delta(\text{BP2G-BP2D})$		0.44	0.43	0.70	0.03
RO_9 vs BP21	2025.6	56.58	55.07	54.20	56.43
$\Delta(\text{BP2G-BP2D})$		0.43	0.44	0.71	0.01
RO_8 vs BP21	2025.6	31.13	29.05	27.70	31.13
$\Delta(\text{BP2G-BP2D})$		0.43	0.41	0.82	-0.23
RO12 vs BP21	2025.6	31.25	29.04	28.19	30.36
$\Delta(\text{BP2G-BP2D})$		0.42	0.36	0.67	-0.13
RO_6 vs BP21	2025.6	55.84	54.25	53.48	55.44
$\Delta(\text{BP2G-BP2D})$		0.43	0.39	0.69	-0.07

Table 16: Provisional Galileo INTDLY values of Visited systems (all values in ns).

Pair	Date	Note	E1 INTDLY _v	E5 INTDLY _v	E3 INTDLY _v
IT07 vs BP21	2025.8		29.40	30.84	27.59
$\Delta(\text{BP2G-BP2D})$			0.24	0.61	-0.23
IT20 vs BP21	2025.8		30.89	30.03	31.97
$\Delta(\text{BP2G-BP2D})$			0.31	0.55	0.01
IT05 vs BP21	2025.8		28.32	30.05	26.14
$\Delta(\text{BP2G-BP2D})$			0.25	0.63	-0.23
IT11 vs BP21	2025.8		57.01	63.65	48.64
$\Delta(\text{BP2G-BP2D})$			0.26	0.63	-0.21
IT16 vs BP21	2025.8		29.58	27.69	31.97
$\Delta(\text{BP2G-BP2D})$			0.29	0.59	-0.08
IT21 vs BP21	2025.8		30.51	29.70	31.54
$\Delta(\text{BP2G-BP2D})$			0.24	0.62	-0.23
OP70 vs BP21	2025.5		29.75	30.02	29.42
$\Delta(\text{BP2G-BP2D})$			0.27	0.16	0.41
OPM9 vs BP21	2025.5		40.41	34.23	48.21
$\Delta(\text{BP2G-BP2D})$			0.25	0.23	0.26
OP73 vs BP21	2025.5		31.61	31.29	32.01
$\Delta(\text{BP2G-BP2D})$			0.25	0.55	-0.11
OP75 vs BP21	2025.5		32.40	31.30	33.78
$\Delta(\text{BP2G-BP2D})$			0.26	0.54	-0.10
PT15 vs BP21	2025.6		39.41	32.12	48.60
$\Delta(\text{BP2G-BP2D})$			-0.41	-0.37	-0.46
PT13 vs BP21	2025.6		32.91	32.79	33.07
$\Delta(\text{BP2G-BP2D})$			-0.40	-0.40	-0.40
PT09 vs BP21	2025.6		56.14	65.08	44.87
$\Delta(\text{BP2G-BP2D})$			-0.41	-0.36	-0.48
PT10 vs BP21	2025.6		34.10	23.02	48.07
$\Delta(\text{BP2G-BP2D})$			-0.43	-0.37	-0.50

RO_9 vs BP21	2025.6	56.09	65.19	44.63
$\Delta(\text{BP2G-BP2D})$		0.37	-0.30	1.21
RO10 vs BP21	2025.6	30.87	29.85	32.15
$\Delta(\text{BP2G-BP2D})$		0.32	-0.34	1.15
RO13 vs BP21	2025.6	30.42	31.53	29.03
$\Delta(\text{BP2G-BP2D})$		0.35	-0.26	1.13
RO_7 vs BP21	2025.6	55.53	64.20	44.59
$\Delta(\text{BP2G-BP2D})$		0.36	-0.32	1.22
RO12 vs BP21	2025.6	31.37	30.89	31.97
$\Delta(\text{BP2G-BP2D})$		0.33	-0.42	1.28
RO_8 vs BP21	2025.6	32.39	24.44	42.43
$\Delta(\text{BP2G-BP2D})$		0.33	-0.24	1.05

Table 17: Provisional Beidou INTDLY values of Visited systems (all values in ns).

Pair	Date	Note	BC INTDLY _v	B5 INTDLY _v	B3 INTDLY _v
IT16 vs BP21	2025.8		29.28	27.08	32.05
$\Delta(\text{BP2G-BP2D})$			0.29	0.60	-0.10
IT05 vs BP21	2025.8		28.17	29.53	26.45
$\Delta(\text{BP2G-BP2D})$			0.07	0.52	-0.50
IT21 vs BP21	2025.8		30.29	29.19	31.68
$\Delta(\text{BP2G-BP2D})$			0.17	0.47	-0.21
IT07 vs BP21	2025.8		29.26	30.29	27.97
$\Delta(\text{BP2G-BP2D})$			0.15	0.55	-0.36
IT20 vs BP21	2025.8		30.53	29.40	31.96
$\Delta(\text{BP2G-BP2D})$			0.33	0.57	0.02
OP70 vs BP21	2025.5		29.65	29.41	29.94
$\Delta(\text{BP2G-BP2D})$			0.36	0.17	0.61
OP73 vs BP21	2025.5		31.47	30.70	32.45
$\Delta(\text{BP2G-BP2D})$			0.36	0.60	0.05
OP75 vs BP21	2025.5		32.18	30.72	34.02
$\Delta(\text{BP2G-BP2D})$			0.36	0.60	0.06
PT13 vs BP21	2025.6		32.73	32.24	33.34
$\Delta(\text{BP2G-BP2D})$			-0.40	-0.50	-0.28
RO13 vs BP21	2025.6		30.33	30.93	29.58
$\Delta(\text{BP2G-BP2D})$			0.37	-0.25	1.14
RO10 vs BP21	2025.6		30.72	29.23	32.59
$\Delta(\text{BP2G-BP2D})$			0.30	-0.39	1.17
RO12 vs BP21	2025.6		31.20	30.25	32.39
$\Delta(\text{BP2G-BP2D})$			0.32	-0.41	1.23

5 Uncertainty Estimation

In this section, we determine the uncertainty of the differential calibration process i.e. we estimate all components that can affect the accuracy. We determine a value U_{CAL0} that is to be used as the accuracy of all P3/PPP links (Visited – Reference) at the epoch of calibration.

$$u_{CAL0} = \sqrt{u_a^2 + u_b^2} \quad (4)$$

with the statistical uncertainty u_a and the systematic uncertainty u_b . (all are 1-sigma). For frequency dependent error the error are estimated for the single channel. In case a values for the ionofree combination can not be directly derived an upper bound considering the most unfavourable correlation is computed as:

$$u_{if} = \sqrt{(\alpha u_1)^2 + (\beta u_2)^2 + 2\alpha\beta \min(u_1, u_2)} \quad (5)$$

where α and β are the ionofree coefficients ($\alpha = 2.5457$, $\beta = 1.5457$ for GPS and $\alpha = 2.2606$, $\beta = 1.2606$ for Galileo and Beidou).

The statistical uncertainty u_a originates from RAWDIF (see section 3) and is given by the statistical analysis of the raw code differences for (Traveling-Reference) and (Traveling-Visited).

The systematic uncertainty is given by $u_b = \sqrt{\sum_n u_{b,n}^2}$ where all possible terms to be considered in the sum are listed in Table 18 for GPS, Table 19 for Galileo and 20 for Beidou and some detail on their estimation is provided at the end of this section. Values appear separately for each code and for the difference of the two codes (e.g. P1, P2 for GPS) so as to compute a value u_{CAL} applicable to P3 links. We choose to compute U_{CAL} using for u_b the uncertainty u_{bSYS} of $\Delta SYSDLY_{V-R}$ from equation 2¹. Tables 18,19,20 presents all components of the uncertainty budget along with the uncertainty u_{bSYS} of $\Delta SYSDLY_{V-R}$ from equation 2 and the resulting uncertainty value U_{CAL} . The values u_{CAL} from Tables 18,19,20 are applicable either to single frequency code (C1,P1,E1 and BC) or dual-frequency code or PPP links (P3,E3 and B3). Final values of u_{CAL} are consistent with the conventional value of 1.5 ns for dual-frequency links between G1 laboratories, as used in UTC computation.

The components in Tables 18, 19 and 20 are separated in several categories:

- The u_a value for P3, E3, B3 is conservatively estimated from the linear combination of P1, E1, BC and P2, E5, B5 values. Lower values would be obtained from a statistical analysis of P3,E3,B3 RAWDIF.
- $u_{b,1}$ accounts for possible variations of the delays of the traveling systems during the trip. This is evaluated on the one hand by the observed misclosure (see Tables 6,7 and 8).
- $u_{b,11}$ and $u_{b,12}$ account for errors in the differential position (Travel – Local). They are conservatively estimated to be 1.5 cm (50 ps) to account for possible sub-nominal behavior of the baseline determination occasionally observed in the DCLRINEX software. The L5,E5 baseline used for Galileo processing is determined from L5,E5 data.
- $u_{b,13}$ and $u_{b,14}$ account for multipaths. This is difficult to estimate and 0.2 ns is conventionally used, following a discussion in the CCTF working group on GNSS in 2017.
- $u_{b,21}$ and $u_{b,22}$ account for the measurement between the reference point of the traveling system and the local UTC(k). They include at least one measurement with a TIC and are taken to be 0.5 ns.

¹It is somewhat arbitrary to choose SYSDLY to estimate the link accuracy. This reflects the fact that the REFDLY is subject to change e.g. with change of reference clock and that its uncertainty should better be taken into account.

Table 18: Uncertainty contributions.

Unc.	Value C1/P1 (ns)	Value P2 (ns)	Value P3 (ns)	Description
$u_a(\text{T-V})$	0.1	0.1	0.1	RAWDIF (traveling - visited)
$u_a(\text{T-R})$	0.1	0.1	0.1	RAWDIF (traveling - reference)
u_a	0.15	0.15	0.15	See text below
Misclosures				
$u_{b,1}$	0.1	0.3	0.4	observed misclosures
Systematic components related to RAWDIF				
$u_{b,11}$	0.05	0.05	0.2	Position error at reference
$u_{b,12}$	0.05	0.05	0.2	Position error at visited
$u_{b,13}$	0.2	0.2	0.4	Multipaths at reference
$u_{b,14}$	0.2	0.2	0.4	Multipaths at visited
Link of the Traveling system to the local UTC(k)				
$u_{b,21}$	0.5	0.5	0.5	REFDLY _T (at ref lab)
$u_{b,22}$	0.5	0.5	0.5	REFDLY _T (at visted lab)
$u_{b,TOT}$	0.8	0.8	1.0	
Link of the Reference system to its local UTC(k)				
$u_{b,31}$	0.5	0.5	0.5	REFDLY _R (at ref lab)
Link of the Visited system to its local UTC(k)				
$u_{b,32}$	0.5	0.5	0.5	REFDLY _V (at visited lab)
$u_{b,SYs}$	1.1	1.1	1.3	Components of equation 2
u_{CAL}	1.1		1.3	Composed of u_a and $u_{b,SYs}$

- $u_{b,31}$ and $u_{b,32}$ account similarly for the measurement between the reference point of the local system and the local UTC(k). They include at least one measurement with a TIC and are taken to be 0.5 ns.

Table 19: Uncertainty contribution.

Unc.	Value E1 (ns)	Value E5 (ns)	Value E3 (ns)	Description
$u_a(\text{T-V})$	0.1	0.1	0.1	RAWDIF (traveling - visited)
$u_a(\text{T-R})$	0.1	0.1	0.1	RAWDIF (traveling - reference)
u_a	0.15	0.15	0.15	See text below
Misclosures				
$u_{b,1}$	0.1	0.4	0.6	observed misclosures
Systematic components related to RAWDIF				
$u_{b,11}$	0.05	0.05	0.2	Position error at reference
$u_{b,12}$	0.05	0.05	0.2	Position error at visited
$u_{b,13}$	0.2	0.2	0.4	Multipaths at reference
$u_{b,14}$	0.2	0.2	0.4	Multipaths at visited
Link of the Traveling system to the local UTC(k)				
$u_{b,21}$	0.5	0.5	0.5	REFDLY _T (at ref lab)
$u_{b,22}$	0.5	0.5	0.5	REFDLY _T (at visited lab)
$u_{b,TOT}$	0.8	0.9	1.1	
Link of the Reference system to its local UTC(k)				
$u_{b,31}$	0.5	0.5	0.5	REFDLY _R (at ref lab)
Link of the Visited system to its local UTC(k)				
$u_{b,32}$	0.5	0.5	0.5	REFDLY _V (at visited lab)
$u_{b,SYS}$	1.0	1.1	1.3	Components of equation 2
u_{CAL}	1.1		1.4	Composed of u_a and $u_{b,SYS}$

Table 20: Uncertainty contributions.

Unc.	Value BC (ns)	Value B5 (ns)	Value B3 (ns)	Description
$u_a(\text{T-V})$	0.1	0.1	0.1	RAWDIF (traveling - visited)
$u_a(\text{T-R})$	0.1	0.1	0.1	RAWDIF (traveling - reference)
u_a	0.15	0.15	0.15	See text below
Misclosures				
$u_{b,1}$	0.1	0.3	0.6	observed misclosures
Systematic components related to RAWDIF				
$u_{b,11}$	0.05	0.05	0.2	Position error at reference
$u_{b,12}$	0.05	0.05	0.2	Position error at visited
$u_{b,13}$	0.2	0.2	0.4	Multipaths at reference
$u_{b,14}$	0.2	0.2	0.4	Multipaths at visited
Link of the Traveling system to the local UTC(k)				
$u_{b,21}$	0.5	0.5	0.5	REFDLY _T (at ref lab)
$u_{b,22}$	0.5	0.5	0.5	REFDLY _T (at visited lab)
$u_{b,TOT}$	0.8	0.8	1.1	
Link of the Reference system to its local UTC(k)				
$u_{b,31}$	0.5	0.5	0.5	REFDLY _R (at ref lab)
Link of the Visited system to its local UTC(k)				
$u_{b,32}$	0.5	0.5	0.5	REFDLY _V (at visited lab)
$u_{b,SY S}$	1.0	1.1	1.3	Components of equation 2
u_{CAL}	1.1		1.3	Composed of u_a and $u_{b,SY S}$