

Table 6. Measurements of the duration of the TAI scale interval

TAI is a realization of coordinate time TT. The following tables give the fractional deviation d of the scale interval of TAI from that of TT (in practice the SI second on the geoid), i.e. the fractional frequency deviation of TAI with the opposite sign: $d = -y_{\text{TAI}}$.

In Table 6A, d is obtained on the given periods of estimation by comparison of the TAI frequency with that of the individual primary frequency standards (PFS) IT-CsF2, NIM5, PTB-CS1, PTB-CS2, PTB-CSF1, PTB-CSF2, SU-CsFO2 and SYRTE-FO2 reported on the year 2017.

In Table 6B, d is obtained on the given periods of estimation by comparison of the TAI frequency with that of the individual secondary frequency standards (SFS) SYRTE-FORb, SYRTE-Sr2 and SYRTE-SrB reported on the year 2017.

Previous calibrations are available in the successive annual reports of the BIPM Time Section volumes 1 to 18 and in the BIPM Annual Report on Time Activities volumes 1 to 11 (web only since volume 4 for 2009).

Each comparison is provided with the following information:

u_A is the uncertainty originating in the instability of the PFS,

u_B is the combined uncertainty from systematic effects,

$u_{\text{link/lab}}$ is the uncertainty in the link between the PFS and the clock participating to TAI, including the uncertainty due to dead-time,

$u_{\text{link/TAI}}$ is the uncertainty in the link to TAI, computed using the standard uncertainty of [UTC-UTC(k)],

u is the quadratic sum of all four uncertainty values.

In addition, Table 6B includes the following information:

u_{SRep} is the recommended uncertainty of the secondary representation of the second, as specified in the CIPM Recommendation identified under Ref(u_S).

In these tables, a frequency over a time interval is defined as the ratio of the end-point phase difference to the duration of the interval.

The typical characteristics of the calibrations of the TAI frequency provided by the different primary and secondary standards reported in 2017 are indicated below. Reports of individual evaluations may be found at ftp://ftp2.bipm.org/pub/tai/data/PSFS_reports. Ref(u_B) is a reference giving information on the value of u_B as stated in the 2017 reports, $u_B(\text{Ref})$ is the u_B value stated in this reference. Note that the current u_B values are generally not the same as the peer reviewed values given in Ref(u_B).

Primary Standard	Type /selection	Type B std. uncertainty/ 10^{-15}	$u_B(\text{Ref})/10^{-15}$	Ref(u_B)	Comparison with	Number/typical duration of comp.
IT-CsF2	Fountain	0.17	0.18	[1]	H maser	3 / 20 d to 30 d
NIM5	Fountain	1.4, then 0.9	1.4	[2]	H maser	3 / 15 d to 20 d
PTB-CS1	Beam /Mag.	8	8.	[3]	TAI	12 / 25 d to 35 d
PTB-CS2	Beam /Mag.	12	12.	[4]	TAI	12 / 25 d to 35 d
PTB-CSF1	Fountain	0.35 to 0.40	1.4	[5]	H maser	7 / 15 d to 30 d
PTB-CSF2	Fountain	0.20 to 0.24	0.41	[6]	H maser	12 / 20 d to 35 d
SU-CsFO2	Fountain	0.24	0.50	[7]	H maser	6 / 15 d to 35 d
SYRTE-FO2	Fountain	0.24 to 0.37	0.23	[8]	H maser	9 / 10 d to 35 d

Secondary Standard	Type	Type B std. uncertainty/ 10^{-15}	$u_B(\text{Ref})/10^{-15}$	Ref(u_B)	Comparison with	Number/typical duration of comp.
SYRTE-FORb	Fountain	0.28 to 0.30	0.32	[9]	H maser	9 / 10 d to 35 d
SYRTE-Sr2	Lattice	0.04 or 0.20	0.05	[10]	H maser	4 / 10 d to 20 d
SYRTE-SrB	Lattice	0.05	0.05	[10]	H maser	1 / 15 d

More detailed information on the characteristics and operation of individual PFS and SFS may be found in the annexes supplied by the individual laboratories.

Table 6A. Measurements of the duration of the TAI scale interval by Primary Frequency Standards

Standard	Period of estimation		$d/10^{-15}$	$u_A/10^{-15}$	$u_B/10^{-15}$	$u_{\text{link/lab}}/10^{-15}$	$u_{\text{link/TAI}}/10^{-15}$	$u/10^{-15}$	Note
IT-CsF2	57909	57934	-0.08	0.44	0.17	0.24	0.31	0.61	
IT-CsF2	58004	58024	-0.03	0.62	0.17	0.30	0.38	0.80	
IT-CsF2	58054	58084	0.87	0.56	0.17	0.27	0.30	0.71	
NIM5	57969	57989	-0.16	0.60	1.40	0.20	0.66	1.67	
NIM5	58009	58024	-0.55	0.30	0.90	0.20	0.85	1.29	
NIM5	58094	58114	0.28	0.30	0.90	0.20	0.38	1.04	
PTB-CS1	57749	57784	-12.14	6.00	8.00	0.00	0.11	10.00	(1)
PTB-CS1	57784	57809	-18.71	6.00	8.00	0.00	0.15	10.00	
PTB-CS1	57809	57839	-11.43	6.00	8.00	0.00	0.13	10.00	
PTB-CS1	57839	57869	-26.18	6.00	8.00	0.00	0.13	10.00	
PTB-CS1	57869	57904	0.14	6.00	8.00	0.00	0.11	10.00	
PTB-CS1	57904	57934	-11.57	6.00	8.00	0.00	0.13	10.00	
PTB-CS1	57934	57964	-3.31	6.00	8.00	0.00	0.13	10.00	
PTB-CS1	57964	57994	-7.51	6.00	8.00	0.00	0.17	10.00	
PTB-CS1	57994	58024	-5.51	6.00	8.00	0.00	0.17	10.00	
PTB-CS1	58024	58054	-6.13	6.00	8.00	0.00	0.13	10.00	
PTB-CS1	58054	58084	-9.06	6.00	8.00	0.00	0.13	10.00	
PTB-CS1	58084	58114	-15.27	6.00	8.00	0.00	0.13	10.00	
PTB-CS2	57749	57784	-10.16	3.00	12.00	0.00	0.11	12.37	(1)
PTB-CS2	57784	57809	-0.28	3.00	12.00	0.00	0.15	12.37	
PTB-CS2	57809	57839	-5.45	3.00	12.00	0.00	0.13	12.37	
PTB-CS2	57839	57869	-5.07	3.00	12.00	0.00	0.13	12.37	
PTB-CS2	57869	57904	0.50	3.00	12.00	0.00	0.11	12.37	
PTB-CS2	57904	57934	-12.07	3.00	12.00	0.00	0.13	12.37	
PTB-CS2	57934	57964	-5.05	3.00	12.00	0.00	0.13	12.37	
PTB-CS2	57964	57994	-0.15	3.00	12.00	0.00	0.17	12.37	
PTB-CS2	57994	58024	-6.40	3.00	12.00	0.00	0.17	12.37	
PTB-CS2	58024	58054	-3.54	3.00	12.00	0.00	0.13	12.37	
PTB-CS2	58054	58084	-10.21	3.00	12.00	0.00	0.13	12.37	
PTB-CS2	58084	58114	-5.24	3.00	12.00	0.00	0.13	12.37	
PTB-CSF1	57739	57764	-1.55	0.08	0.35	0.02	0.15	0.39	
PTB-CSF1	57854	57869	0.57	0.11	0.39	0.04	0.24	0.47	
PTB-CSF1	57979	57994	0.12	0.09	0.40	0.05	0.37	0.55	
PTB-CSF1	58004	58024	0.12	0.07	0.38	0.02	0.19	0.43	
PTB-CSF1	58024	58054	-0.34	0.06	0.39	0.02	0.13	0.42	
PTB-CSF1	58054	58084	0.10	0.06	0.39	0.05	0.13	0.42	
PTB-CSF1	58084	58114	-0.16	0.06	0.39	0.05	0.13	0.42	
PTB-CSF2	57749	57774	-1.72	0.12	0.20	0.04	0.15	0.28	
PTB-CSF2	57779	57809	-1.36	0.09	0.20	0.03	0.13	0.26	
PTB-CSF2	57809	57839	-0.83	0.15	0.20	0.03	0.13	0.28	
PTB-CSF2	57839	57869	-0.69	0.10	0.20	0.10	0.13	0.28	
PTB-CSF2	57869	57904	0.27	0.10	0.20	0.10	0.11	0.27	
PTB-CSF2	57904	57934	-0.20	0.20	0.20	0.03	0.13	0.31	
PTB-CSF2	57934	57954	-0.22	0.20	0.24	0.02	0.19	0.37	
PTB-CSF2	57974	57994	-0.18	0.11	0.20	0.05	0.28	0.37	
PTB-CSF2	57994	58024	-0.42	0.10	0.20	0.10	0.17	0.30	
PTB-CSF2	58024	58054	-0.43	0.10	0.20	0.03	0.13	0.26	
PTB-CSF2	58054	58084	-0.16	0.10	0.20	0.03	0.13	0.26	
PTB-CSF2	58084	58114	-0.20	0.09	0.20	0.04	0.13	0.26	
SU-CsFO2	57749	57779	-2.10	0.22	0.24	0.23	0.91	1.00	
SU-CsFO2	57784	57799	-2.12	0.26	0.24	0.11	1.71	1.74	
SU-CsFO2	57809	57839	0.25	0.22	0.24	0.11	0.91	0.98	
SU-CsFO2	57869	57904	0.51	0.21	0.24	0.11	0.77	0.84	
SU-CsFO2	57904	57934	0.40	0.33	0.24	0.11	0.85	0.95	
SU-CsFO2	58024	58054	0.04	0.29	0.24	0.11	0.85	0.93	
SYRTE-FO2	57749	57769	-1.16	0.40	0.37	0.11	0.28	0.62	

SYRTE-FO2	57784	57809	-1.30	0.40	0.32	0.11	0.32	0.61
SYRTE-FO2	57824	57839	-1.04	0.25	0.33	0.12	0.37	0.57
SYRTE-FO2	57844	57869	-0.58	0.30	0.26	0.11	0.38	0.56
SYRTE-FO2	57869	57904	0.77	0.24	0.25	0.10	0.26	0.44
SYRTE-FO2	57904	57924	0.68	0.25	0.24	0.11	0.38	0.52
SYRTE-FO2	57934	57944	0.73	0.60	0.24	0.11	0.70	0.96
SYRTE-FO2	57949	57964	0.02	0.24	0.24	0.10	0.49	0.60
SYRTE-FO2	57964	57984	-0.48	0.25	0.26	0.12	0.38	0.53

Note:

(1) Continuously operating as a clock participating in TAI.

Table 6B. Measurements of the duration of the TAI scale interval by Secondary Frequency Standards

Standard	Period of estimation		$d/10^{-15}$	$u_A/10^{-15}$	$u_B/10^{-15}$	$u_{\text{link/lab}}/10^{-15}$	$u_{\text{link/TAI}}/10^{-15}$	$u/10^{-15}$	$u_{\text{SRep}}/10^{-15}$	Ref(u_g)
SYRTE-FORb	57754	57784	-1.24	0.24	0.28	0.11	0.20	0.43	0.7	[11]
SYRTE-FORb	57784	57809	-0.91	0.20	0.29	0.11	0.32	0.49	0.7	
SYRTE-FORb	57809	57839	-0.28	0.24	0.28	0.10	0.27	0.47	0.7	
SYRTE-FORb	57844	57869	-0.22	0.20	0.29	0.11	0.38	0.53	0.7	
SYRTE-FORb	57869	57904	1.00	0.26	0.30	0.11	0.26	0.49	0.7	
SYRTE-FORb	57904	57924	0.99	0.25	0.28	0.11	0.38	0.54	0.7	
SYRTE-FORb	57934	57944	0.93	0.31	0.28	0.11	0.70	0.82	0.7	
SYRTE-FORb	57949	57964	0.89	0.33	0.28	0.10	0.49	0.66	0.7	
SYRTE-FORb	57964	57984	0.03	0.25	0.30	0.12	0.38	0.56	0.7	
SYRTE-SR2	56954	56964	0.81	0.20	0.04	0.10	0.53	0.57	0.5	[11]
SYRTE-SR2	57179	57199	0.46	0.20	0.04	0.10	0.28	0.36	0.5	
SYRTE-SR2	57469	57479	-1.39	0.25	0.20	0.11	0.53	0.63	0.5	
SYRTE-SR2	57539	57554	-1.24	0.30	0.04	0.11	0.37	0.49	0.5	
SYRTE-SRB	57539	57554	-1.22	0.25	0.05	0.10	0.37	0.46	0.5	[11]

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