

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

(File available on <ftp://62.161.69.5/pub/tai/scale/UTAI/utail4.ar>)

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, NIST-F2, NPL-CSF2, NPLI-CsF1, PTB-CS1, PTB-CS2, PTB-CSF1, PTB-CSF2, SU-CsFO2, SYRTE-FO1 and SYRTE-FO2 reported on the year 2014.

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 standard (SFS) SYRTE-FORb reported on the year 2014.

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 8.

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:

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

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 2014 are indicated below. Reports of individual evaluations may be found at [ftp://62.161.69.5/pub/tai/data/PFS\\_reports](ftp://62.161.69.5/pub/tai/data/PFS_reports). Ref( $u_B$ ) is a reference giving information on the value of  $u_B$  as stated in the 2014 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 to 0.25)	0.18	[1]	H maser	15 / 10 d to 30 d
NIM5	Fountain	1.4	1.4	[2]	H maser	6 / 15 d to 30 d
NIST-F2	Fountain	0.15	0.11	[3]	H maser	3 / 25 d to 45 d
NPL-CSF2	Fountain	(0.20 to 0.27)	0.23	[4]	H maser	8 / 10 d to 30 d
NPLI-CsF1	Fountain	(2.36 to 3.01)	2.5	[5]	H maser	7 / 10 d to 20 d
PTB-CS1	Beam /Mag.	8	8.	[6]	TAI	12 / 30 d
PTB-CS2	Beam /Mag.	12	12.	[7]	TAI	12 / 30 d
PTB-CSF1	Fountain	(0.70 to 0.73)	1.4	[8]	H maser	6 / 10 d to 35 d
PTB-CSF2	Fountain	(0.28 to 0.35)	0.41	[9]	H maser	9 / 10 d to 35 d
SU-CsFO2	Fountain	0.50 then 0.25	0.50	[10]	H maser	9 / 20 d to 30 d
SYRTE-FO1	Fountain	(0.36 to 0.41)	0.37	[11]	H maser	10 / 15 d to 35 d
SYRTE-FO2	Fountain	(0.25 to 0.29)	0.23	[11]	H maser	11 / 20 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	(0.29 to 0.36)	0.32	[12]	H maser	10 / 10 d to 30 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		$d/10^{-15}$	$u_A/10^{-15}$	$u_B/10^{-15}$	$u_{\text{link/lab}}/10^{-15}$	$u_{\text{link/TAI}}/10^{-15}$	$u/10^{-15}$	Notes
IT-CsF2	56079	56099	2.38	0.32	0.25	0.20	0.28	0.53	
IT-CsF2	56194	56214	-0.11	0.42	0.21	0.20	0.28	0.58	
IT-CsF2	56234	56249	-0.93	0.31	0.18	0.10	0.37	0.52	
IT-CsF2	56394	56424	-0.20	0.34	0.18	0.20	0.20	0.48	
IT-CsF2	56614	56634	-1.31	0.33	0.18	0.20	0.28	0.51	
IT-CsF2	56634	56649	-0.74	0.41	0.18	0.20	0.37	0.61	
IT-CsF2	56724	56749	-1.08	0.33	0.19	0.14	0.23	0.47	
IT-CsF2	56749	56774	-0.98	0.35	0.19	0.14	0.23	0.48	
IT-CsF2	56779	56799	-0.78	0.33	0.19	0.10	0.28	0.48	
IT-CsF2	56814	56829	-1.50	0.31	0.18	0.17	0.37	0.54	
IT-CsF2	56839	56864	-1.14	0.28	0.18	0.18	0.23	0.44	
IT-CsF2	56939	56949	0.89	1.30	0.17	0.36	0.53	1.46	
IT-CsF2	56954	56964	0.78	1.30	0.17	0.32	0.62	1.49	
IT-CsF2	56964	56979	-0.24	1.00	0.17	0.22	0.49	1.15	
IT-CsF2	56994	57014	0.33	0.70	0.18	0.14	0.28	0.79	
NIM5	56669	56684	-1.25	0.60	1.40	0.20	0.85	1.76	
NIM5	56699	56714	-1.66	0.50	1.40	0.20	0.85	1.73	
NIM5	56729	56749	-0.64	0.80	1.40	0.10	0.66	1.74	
NIM5	56759	56779	0.43	0.80	1.40	0.10	0.66	1.74	
NIM5	56779	56809	0.21	0.60	1.40	0.20	0.35	1.58	
NIM5	56809	56824	1.53	0.90	1.40	0.20	0.37	1.72	
NIST-F2	56489	56534	-1.22	0.44	0.15	0.16	0.14	0.51	
NIST-F2	56804	56829	-1.85	0.53	0.15	0.23	0.23	0.64	
NIST-F2	56894	56929	-0.86	0.42	0.15	0.18	0.17	0.51	
NPL-CsF2	56654	56684	0.55	0.22	0.23	0.08	0.20	0.38	
NPL-CsF2	56684	56714	-0.33	0.21	0.21	0.03	0.20	0.36	
NPL-CsF2	56714	56744	-0.09	0.22	0.22	0.09	0.20	0.38	
NPL-CsF2	56744	56774	0.35	0.21	0.20	0.06	0.20	0.36	
NPL-CsF2	56774	56804	-1.34	0.24	0.20	0.13	0.20	0.39	
NPL-CsF2	56899	56929	0.57	0.36	0.27	0.14	0.20	0.51	
NPL-CsF2	56929	56949	0.70	0.37	0.21	0.05	0.28	0.51	
NPL-CsF2	56954	56964	0.61	0.91	0.24	0.42	0.62	1.20	
NPLI-CsF1	56419	56439	-0.27	0.53	2.60	0.13	0.28	2.67	
NPLI-CsF1	56514	56529	3.54	0.47	3.01	0.15	0.37	3.07	
NPLI-CsF1	56589	56599	0.97	0.90	2.65	0.20	0.53	2.85	
NPLI-CsF1	56604	56614	1.35	0.61	2.71	0.19	0.53	2.83	
NPLI-CsF1	56644	56654	-0.85	0.74	2.74	0.18	0.53	2.89	
NPLI-CsF1	56659	56669	1.02	0.75	2.36	0.18	0.53	2.54	
NPLI-CsF1	56679	56689	-0.27	0.93	2.36	0.19	0.53	2.60	
PTB-CS1	56654	56684	-7.69	6.00	8.00	0.00	0.07	10.00	(1)
PTB-CS1	56684	56714	-11.51	6.00	8.00	0.00	0.07	10.00	
PTB-CS1	56714	56744	-9.24	6.00	8.00	0.00	0.07	10.00	
PTB-CS1	56744	56774	-6.50	6.00	8.00	0.00	0.07	10.00	
PTB-CS1	56774	56804	-4.41	6.00	8.00	0.00	0.07	10.00	
PTB-CS1	56804	56834	-8.20	6.00	8.00	0.00	0.07	10.00	
PTB-CS1	56834	56869	-8.97	6.00	8.00	0.00	0.06	10.00	
PTB-CS1	56869	56899	-12.55	6.00	8.00	0.00	0.07	10.00	
PTB-CS1	56899	56929	-10.16	6.00	8.00	0.00	0.07	10.00	
PTB-CS1	56929	56959	-11.24	6.00	8.00	0.00	0.07	10.00	
PTB-CS1	56959	56989	-12.28	6.00	8.00	0.00	0.10	10.00	
PTB-CS1	56989	57019	-8.12	6.00	8.00	0.00	0.13	10.00	

Table 6A. (Cont.)

Standard	Period of estimation		$d/10^{-15}$	$u_A/10^{-15}$	$u_B/10^{-15}$	$u_{\text{link/lab}}/10^{-15}$	$u_{\text{link/TAI}}/10^{-15}$	$u/10^{-15}$	(1)
PTB-CS2	56654	56684	0.02	3.00	12.00	0.00	0.07	12.37	(1)
PTB-CS2	56684	56714	3.38	3.00	12.00	0.00	0.07	12.37	
PTB-CS2	56714	56744	-0.83	3.00	12.00	0.00	0.07	12.37	
PTB-CS2	56744	56774	-1.37	3.00	12.00	0.00	0.07	12.37	
PTB-CS2	56774	56804	-7.08	3.00	12.00	0.00	0.07	12.37	
PTB-CS2	56804	56834	-7.85	3.00	12.00	0.00	0.07	12.37	
PTB-CS2	56834	56869	-5.27	3.00	12.00	0.00	0.06	12.37	
PTB-CS2	56869	56899	-5.07	3.00	12.00	0.00	0.07	12.37	
PTB-CS2	56899	56929	-3.41	3.00	12.00	0.00	0.07	12.37	
PTB-CS2	56929	56959	-3.10	3.00	12.00	0.00	0.07	12.37	
PTB-CS2	56959	56989	-5.07	3.00	12.00	0.00	0.10	12.37	
PTB-CS2	56989	57019	-2.02	3.00	12.00	0.00	0.13	12.37	
PTB-CSF1	56729	56739	-0.12	0.13	0.73	0.02	0.18	0.76	
PTB-CSF1	56794	56809	-1.00	0.14	0.73	0.02	0.12	0.75	
PTB-CSF1	56814	56834	-0.88	0.12	0.71	0.02	0.09	0.73	
PTB-CSF1	56834	56869	-0.27	0.09	0.71	0.02	0.06	0.72	
PTB-CSF1	56869	56884	0.70	0.13	0.70	0.02	0.12	0.72	
PTB-CSF1	56889	56899	0.50	0.16	0.70	0.02	0.18	0.74	
PTB-CSF2	56649	56679	0.45	0.13	0.33	0.01	0.07	0.36	
PTB-CSF2	56689	56709	0.54	0.15	0.31	0.01	0.09	0.36	
PTB-CSF2	56729	56739	0.02	0.16	0.35	0.02	0.18	0.42	
PTB-CSF2	56739	56754	-0.25	0.17	0.33	0.02	0.12	0.39	
PTB-CSF2	56859	56879	0.52	0.16	0.30	0.02	0.09	0.35	
PTB-CSF2	56879	56899	0.69	0.17	0.28	0.02	0.09	0.34	
PTB-CSF2	56904	56924	0.59	0.16	0.29	0.03	0.09	0.35	
PTB-CSF2	56929	56949	0.36	0.16	0.32	0.02	0.09	0.37	
PTB-CSF2	56999	57019	0.94	0.17	0.31	0.04	0.19	0.40	
SU-CsF02	56379	56409	-0.06	0.36	0.50	0.11	0.65	0.90	
SU-CsF02	56409	56439	0.49	0.28	0.50	0.10	0.65	0.87	
SU-CsF02	56439	56469	0.79	0.26	0.50	0.10	0.65	0.87	
SU-CsF02	56484	56504	0.41	0.33	0.50	0.11	0.94	1.12	
SU-CsF02	56504	56534	-0.73	0.30	0.50	0.11	0.65	0.88	
SU-CsF02	56684	56714	-0.50	0.29	0.50	0.10	0.33	0.67	
SU-CsF02	56899	56929	0.85	0.24	0.25	0.10	0.33	0.49	
SU-CsF02	56929	56959	0.13	0.22	0.25	0.11	0.33	0.48	
SU-CsF02	56959	56989	0.53	0.23	0.25	0.11	0.33	0.48	
SYRTE-F01	56694	56714	-0.49	0.42	0.41	0.10	0.28	0.66	
SYRTE-F01	56714	56744	-0.84	0.25	0.40	0.11	0.20	0.52	
SYRTE-F01	56744	56774	-1.00	0.20	0.36	0.11	0.20	0.47	
SYRTE-F01	56774	56804	-0.74	0.20	0.39	0.11	0.20	0.49	
SYRTE-F01	56804	56834	-0.90	0.30	0.37	0.10	0.20	0.52	
SYRTE-F01	56834	56869	-0.45	0.25	0.39	0.10	0.17	0.50	
SYRTE-F01	56869	56899	-0.02	0.20	0.38	0.10	0.20	0.48	
SYRTE-F01	56899	56924	-0.39	0.30	0.38	0.11	0.23	0.55	
SYRTE-F01	56944	56959	-0.03	0.32	0.39	0.10	0.37	0.63	
SYRTE-F01	56999	57019	0.67	0.20	0.37	0.10	0.28	0.52	
SYRTE-F02	56689	56714	-0.88	0.20	0.29	0.10	0.23	0.43	
SYRTE-F02	56719	56744	-1.63	0.20	0.27	0.11	0.23	0.42	
SYRTE-F02	56744	56774	-0.97	0.26	0.25	0.11	0.20	0.42	
SYRTE-F02	56774	56794	-0.56	0.20	0.26	0.13	0.28	0.45	
SYRTE-F02	56804	56834	-0.57	0.30	0.27	0.10	0.20	0.46	

Table 6A. (Cont.)

Standard	Period of estimation		$d/10^{-15}$	$u_A/10^{-15}$	$u_B/10^{-15}$	$u_{\text{link/lab}}/10^{-15}$	$u_{\text{link/TAI}}/10^{-15}$	$u/10^{-15}$
SYRTE-F02	56834	56869	0.23	0.25	0.28	0.10	0.17	0.42
SYRTE-F02	56869	56899	0.49	0.20	0.27	0.10	0.20	0.40
SYRTE-F02	56899	56929	-0.04	0.20	0.27	0.10	0.20	0.40
SYRTE-F02	56929	56959	0.57	0.20	0.27	0.10	0.20	0.40
SYRTE-F02	56959	56989	1.04	0.20	0.27	0.10	0.23	0.42
SYRTE-F02	56989	57019	0.27	0.25	0.27	0.10	0.20	0.43

**Notes:**

(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		$d/10^{-15}$	$u_A/10^{-15}$	$u_B/10^{-15}$	$u_{\text{link/lab}}/10^{-15}$	$u_{\text{link/TAI}}/10^{-15}$	$u/10^{-15}$	$u_{\text{SRep}}$	Ref( $u_S$ )
SYRTE-FORb	56689	56704	-0.57	0.20	0.29	0.10	0.37	0.52	1.30	[13]
SYRTE-FORb	56789	56804	0.18	0.60	0.36	0.12	0.37	0.80	1.30	[13]
SYRTE-FORb	56804	56829	-0.17	0.40	0.32	0.11	0.23	0.57	1.30	[13]
SYRTE-FORb	56854	56869	0.68	0.40	0.29	0.11	0.37	0.62	1.30	[13]
SYRTE-FORb	56869	56899	0.47	0.33	0.32	0.10	0.20	0.51	1.30	[13]
SYRTE-FORb	56899	56929	0.15	0.20	0.30	0.10	0.20	0.42	1.30	[13]
SYRTE-FORb	56929	56959	0.67	0.20	0.29	0.10	0.20	0.42	1.30	[13]
SYRTE-FORb	56959	56974	1.17	0.20	0.29	0.11	0.43	0.57	1.30	[13]
SYRTE-FORb	56979	56989	0.97	0.30	0.29	0.11	0.70	0.82	1.30	[13]
SYRTE-FORb	56989	57019	0.25	0.20	0.30	0.10	0.20	0.42	1.30	[13]

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