

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

(File available at <ftp://62.161.69.5/pub/tai/scale/utai12.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) NIST-F1, NPL-CSF2, PTB-CS1, PTB-CS2, PTB-CSF1, PTB-CSF2, SYRTE-FO1, SYRTE-FO2 and SYRTE-FOM for the year 2012.

Previous calibrations are available in the successive BIPM annual reports of the BIPM Time Section volumes 1 to 18 and in the BIPM annual report on time activities volume 1 to 6.

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 for the year 2012. Calibrations for earlier periods, that were submitted in 2012, are also included.

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,

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

$u_{\text{link}/\text{TAI}}$ 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 $\text{Ref}(u_s)$.

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 over 2012 are indicated below. Reports of individual evaluations may be found at ftp://62.161.69.5/pub/tai/data/PFS_reports. $\text{Ref}(u_B)$ is a reference giving information on the value of u_B as stated in the 2012 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 $\text{Ref}(u_B)$.

Primary Standard	Type /selection	Type B std. uncertainty	$u_B(\text{Ref})/10^{-15}$	$\text{Ref}(u_B)$	Comparison with	Number/typical duration of comp.
NIST-F1	Fountain	0.31	0.35	[1]	H maser	5 / 25 d to 30 d
NPL-CSF2	Fountain	0.23	0.23	[2]	H maser	10 / 10 d to 35 d
PTB-CS1	Beam /Mag.	8	8.	[3]	TAI	12 / 30 d
PTB-CS2	Beam /Mag.	12	12.	[4]	TAI	12 / 30 d
PTB-CSF1	Fountain	0.74	1.4	[5]	H maser	9 / 15 d to 30 d
PTB-CSF2	Fountain	(0.34 to 0.44)	0.41	[6]	H maser	7 / 15 d to 25 d
SYRTE-F01	Fountain	(0.42 to 0.55)	0.72	[7]	H maser	11 / 15 d to 30 d
SYRTE-F02	Fountain	(0.24 to 0.33)	0.65	[7]	H maser	13 / 15 d to 30 d
SYRTE-FOM	Fountain	0.60	0.80	[8]	H maser	6 / 15 d to 30 d

Secondary Standard	Type /selection	Type B std. uncertainty	$u_B(\text{Ref})/10^{-15}$	$\text{Ref}(u_B)$	Comparison with	Number/typical duration of comp.
SYRTE-FORb	Fountain	(0.32 to 0.43)	0.45	[9]	H maser	14 / 15 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 6. (Cont.)

Standard	Period of estimation		$d/10^{-15}$	$u_A/10^{-15}$	$u_B/10^{-15}$	$u_{\text{link/lab}}/10^{-15}$	$u_{\text{link/TAI}}/10^{-15}$	$u/10^{-15}$	Notes
NIST-F1	56009	56039	2.37	0.34	0.31	0.18	0.20	0.53	
NIST-F1	56089	56114	2.07	0.34	0.31	0.25	0.23	0.57	
NIST-F1	56134	56159	0.81	0.29	0.31	0.14	0.23	0.50	
NIST-F1	56189	56214	-0.04	0.40	0.31	0.16	0.23	0.58	
NIST-F1	56229	56254	0.01	0.32	0.31	0.21	0.23	0.54	
NPL-CsF2	55914	55939	3.18	0.23	0.23	0.12	0.27	0.44	
NPL-CsF2	55944	55954	4.36	0.34	0.23	0.03	0.53	0.67	
NPL-CsF2	55959	55974	3.08	0.26	0.23	0.03	0.37	0.50	
NPL-CsF2	55999	56014	4.38	0.26	0.23	0.04	0.37	0.51	
NPL-CsF2	56019	56044	2.90	0.20	0.23	0.01	0.23	0.38	
NPL-CsF2	56049	56074	2.95	0.21	0.23	0.05	0.23	0.39	
NPL-CsF2	56074	56104	2.76	0.19	0.23	0.05	0.20	0.36	
NPL-CsF2	56184	56219	0.57	0.18	0.23	0.07	0.17	0.35	
NPL-CsF2	56224	56254	-0.36	0.20	0.23	0.04	0.20	0.36	
NPL-CsF2	56264	56289	0.26	0.22	0.23	0.02	0.23	0.39	
PTB-CS1	55924	55954	-9.99	6.00	8.00	0.00	0.13	10.00	(1)
PTB-CS1	55954	55984	-7.52	6.00	8.00	0.00	0.13	10.00	
PTB-CS1	55984	56014	-6.67	6.00	8.00	0.00	0.10	10.00	
PTB-CS1	56014	56044	-5.20	6.00	8.00	0.00	0.07	10.00	
PTB-CS1	56044	56074	-8.06	6.00	8.00	0.00	0.07	10.00	
PTB-CS1	56074	56104	-10.48	6.00	8.00	0.00	0.07	10.00	
PTB-CS1	56104	56139	-14.58	6.00	8.00	0.00	0.06	10.00	
PTB-CS1	56139	56169	-10.67	6.00	8.00	0.00	0.07	10.00	
PTB-CS1	56169	56199	-10.67	6.00	8.00	0.00	0.07	10.00	
PTB-CS1	56199	56229	-2.02	6.00	8.00	0.00	0.07	10.00	
PTB-CS1	56229	56259	-3.03	6.00	8.00	0.00	0.07	10.00	
PTB-CS1	56259	56289	-10.55	6.00	8.00	0.00	0.07	10.00	
PTB-CS2	55924	55954	-0.19	3.00	12.00	0.00	0.13	12.37	(1)
PTB-CS2	55954	55984	-0.73	3.00	12.00	0.00	0.13	12.37	
PTB-CS2	55984	56014	-0.15	3.00	12.00	0.00	0.10	12.37	
PTB-CS2	56014	56044	1.74	3.00	12.00	0.00	0.07	12.37	
PTB-CS2	56044	56074	-3.50	3.00	12.00	0.00	0.07	12.37	
PTB-CS2	56074	56104	-3.96	3.00	12.00	0.00	0.07	12.37	
PTB-CS2	56104	56139	-0.93	3.00	12.00	0.00	0.06	12.37	
PTB-CS2	56139	56169	0.90	3.00	12.00	0.00	0.07	12.37	
PTB-CS2	56169	56199	-2.61	3.00	12.00	0.00	0.07	12.37	
PTB-CS2	56199	56229	3.30	3.00	12.00	0.00	0.07	12.37	
PTB-CS2	56229	56259	-8.62	3.00	12.00	0.00	0.07	12.37	
PTB-CS2	56259	56289	-8.27	3.00	12.00	0.00	0.07	12.37	
PTB-CSF1	55919	55949	4.34	0.20	0.74	0.05	0.13	0.78	
PTB-CSF1	55954	55974	3.52	0.24	0.73	0.05	0.19	0.79	
PTB-CSF1	55999	56014	4.62	0.18	0.74	0.02	0.12	0.77	
PTB-CSF1	56014	56044	3.07	0.17	0.74	0.02	0.07	0.76	
PTB-CSF1	56144	56169	1.77	0.22	0.74	0.02	0.08	0.78	
PTB-CSF1	56169	56199	0.99	0.22	0.74	0.01	0.07	0.77	
PTB-CSF1	56199	56214	0.50	0.26	0.74	0.02	0.12	0.79	
PTB-CSF1	56224	56244	0.04	0.14	0.74	0.10	0.09	0.77	
PTB-CSF1	56264	56279	-0.70	0.14	0.73	0.04	0.12	0.75	

Table 6. (Cont.)

Standard	Period of estimation		$d/10^{-15}$	$u_A/10^{-15}$	$u_B/10^{-15}$	$u_{\text{link/lab}}/10^{-15}$	$u_{\text{link/TAI}}/10^{-15}$	$u/10^{-15}$	Notes
PTB-CSF2	55919	55939	4.96	0.21	0.44	0.17	0.19	0.55	
PTB-CSF2	56004	56019	3.42	0.20	0.34	0.10	0.12	0.42	
PTB-CSF2	56024	56049	2.43	0.16	0.34	0.03	0.08	0.38	
PTB-CSF2	56089	56104	2.44	0.21	0.36	0.02	0.12	0.43	
PTB-CSF2	56124	56139	1.99	0.21	0.39	0.02	0.12	0.46	
PTB-CSF2	56149	56169	0.23	0.20	0.35	0.02	0.09	0.41	
PTB-CSF2	56214	56229	-0.80	0.22	0.38	0.02	0.12	0.46	
SYRTE-F01	55929	55949	2.11	0.20	0.44	0.41	0.28	0.69	
SYRTE-F01	55954	55969	1.82	0.40	0.43	0.29	0.37	0.75	
SYRTE-F01	56014	56029	2.46	0.20	0.44	0.23	0.37	0.65	
SYRTE-F01	56044	56074	2.28	0.20	0.43	0.23	0.20	0.56	
SYRTE-F01	56089	56104	2.19	0.25	0.44	0.20	0.37	0.66	
SYRTE-F01	56104	56129	2.05	0.30	0.55	0.12	0.23	0.68	
SYRTE-F01	56139	56169	0.48	0.20	0.42	0.14	0.20	0.52	
SYRTE-F01	56169	56199	0.18	0.40	0.43	0.10	0.20	0.63	
SYRTE-F01	56199	56229	-0.40	0.30	0.43	0.11	0.20	0.57	
SYRTE-F01	56229	56259	-0.17	0.30	0.43	0.11	0.20	0.57	
SYRTE-F01	56259	56289	-0.68	0.30	0.42	0.11	0.20	0.56	
SYRTE-F02	55924	55949	3.23	0.20	0.29	0.12	0.23	0.44	
SYRTE-F02	55954	55969	2.64	0.20	0.28	0.14	0.37	0.52	
SYRTE-F02	55969	55984	4.02	0.20	0.28	0.30	0.37	0.58	
SYRTE-F02	55984	56014	4.08	0.30	0.29	0.10	0.20	0.47	
SYRTE-F02	56014	56044	2.53	0.25	0.26	0.14	0.20	0.43	
SYRTE-F02	56044	56074	2.25	0.20	0.27	0.12	0.20	0.41	
SYRTE-F02	56074	56094	2.49	0.20	0.25	0.12	0.28	0.44	
SYRTE-F02	56099	56119	1.52	0.25	0.24	0.23	0.28	0.50	
SYRTE-F02	56119	56139	1.25	0.20	0.24	0.14	0.28	0.44	
SYRTE-F02	56139	56169	0.46	0.20	0.26	0.12	0.20	0.40	
SYRTE-F02	56174	56199	0.00	0.40	0.26	0.10	0.23	0.54	
SYRTE-F02	56234	56259	-0.52	0.40	0.33	0.12	0.23	0.58	
SYRTE-F02	56264	56289	-0.71	0.26	0.33	0.12	0.23	0.49	
SYRTE-F0M	55924	55949	2.63	0.30	0.60	0.20	0.23	0.74	
SYRTE-F0M	55954	55969	1.97	0.30	0.60	0.30	0.37	0.82	
SYRTE-F0M	55969	55984	3.38	0.25	0.60	0.30	0.37	0.80	
SYRTE-F0M	55984	56014	3.57	0.20	0.60	0.11	0.20	0.67	
SYRTE-F0M	56014	56044	2.22	0.25	0.60	0.16	0.20	0.70	
SYRTE-F0M	56154	56169	0.92	0.30	0.60	0.22	0.37	0.79	

Notes:

- (1) Continuously operating as a clock participating to TAI.

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

Standard	Period of estimation		$d/10^{-15}$	$u_A/10^{-15}$	$u_B/10^{-15}$	$u_{1\text{ink}/\text{lab}}/10^{-15}$	$u_{1\text{ink}/\text{TAI}}/10^{-15}$	$u/10^{-15}$	u_{SRep}	Ref(u_S)
SYRTE-FORb	55164	55194	2.68	0.20	0.46	0.12	0.36	0.63	3.00	[10]
SYRTE-FORb	55194	55224	3.98	0.40	0.46	0.11	0.43	0.75	3.00	[10]
SYRTE-FORb	55224	55254	2.97	0.20	0.44	0.11	0.46	0.67	3.00	[10]
SYRTE-FORb	55254	55274	2.80	0.30	0.53	0.11	0.66	0.90	3.00	[10]
SYRTE-FORb	55354	55374	4.59	0.35	0.57	0.11	0.66	0.94	3.00	[10]
SYRTE-FORb	55409	55429	3.17	0.20	0.46	0.11	0.66	0.83	3.00	[10]
SYRTE-FORb	55854	55894	3.04	0.20	0.46	0.17	0.15	0.55	3.00	[10]
SYRTE-FORb	55894	55924	1.66	0.20	0.44	0.11	0.20	0.53	3.00	[10]
SYRTE-FORb	55924	55949	1.15	0.30	0.39	0.10	0.23	0.55	3.00	[10]
SYRTE-FORb	55954	55969	0.63	0.30	0.38	0.14	0.37	0.62	3.00	[10]
SYRTE-FORb	55969	55984	2.03	0.40	0.38	0.25	0.37	0.71	3.00	[10]
SYRTE-FORb	55984	56014	2.38	0.30	0.43	0.11	0.20	0.57	3.00	[10]
SYRTE-FORb	56014	56044	0.96	0.20	0.41	0.14	0.20	0.52	3.00	[10]
SYRTE-FORb	56044	56074	0.80	0.20	0.32	0.11	0.20	0.44	3.00	[10]
SYRTE-FORb	56074	56094	0.84	0.20	0.35	0.11	0.28	0.50	3.00	[10]
SYRTE-FORb	56099	56119	-0.14	0.20	0.34	0.18	0.28	0.52	3.00	[10]
SYRTE-FORb	56119	56139	-0.55	0.20	0.34	0.12	0.28	0.50	3.00	[10]
SYRTE-FORb	56139	56169	-1.51	0.20	0.33	0.12	0.20	0.45	3.00	[10]
SYRTE-FORb	56169	56199	-1.49	0.30	0.32	0.10	0.20	0.49	3.00	[10]
SYRTE-FORb	56199	56229	-2.25	0.20	0.36	0.14	0.20	0.48	3.00	[10]
SYRTE-FORb	56229	56259	-2.09	0.30	0.36	0.11	0.20	0.52	3.00	[10]
SYRTE-FORb	56259	56289	-2.37	0.20	0.36	0.11	0.20	0.47	3.00	[10]

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