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

(File available at ftp://62.161.69.5/pub/tai/scale/UTAI/utai09.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: $d = -y_{TAI}$.

In this table, *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-CSF1, KRISS-1 NICT-CSF1, NIST-F1, NMIJ-F1, PTB-CS1, PTB-CS2, PTB-CSF1, PTB-CSF2, SYRTE-FO1, SYRTE-FO2, SYRTE-FOM and SYRTE-JPO for the year 2009. 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 volume 1 to 3.

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,
$u_{link/lab}$ is the uncertainty in the link between the PFS and the clock participating to TAI, including the uncertainty due to dead-time,
$u_{link/TAI}$ 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 this table, 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 standards over 2009 are indicated below. Reports of individual PFS evaluations may be found at ftp://62.161.69.5/pub/tai/data/PFS_reports). Ref(u_B) is a reference giving information on the stated value of u_B, u_B(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	u_B(Ref)/10^{-15}	Ref(u_B)	Comparison with	Number/typical duration of comp.
IT-CSF1	Fountain	0.7×10^{-15}	0.5	[1]	H maser	2 / 20 d to 25 d
KRISS-1	Beam /Opt.	9.5×10^{-15}	9.5	[2]	H maser	3 / 10 d to 20 d
NICT-CSF1	Fountain	$(0.9 \text{ to } 1.3)\times10^{-15}$	1.9	[3]	UTC(NICT)	2 / 10 d to 25 d
NIST-F1	Fountain	$(0.3 \text{ to } 0.6)\times10^{-15}$	0.35	[4]	H maser	9 / 10 d to 20 d
NMIJ-F1	Fountain	3.9×10^{-15}	3.9	[5]	H maser	7 / 20 d to 30 d
PTB-CS1	Beam /Mag.	8×10^{-15}	8.	[6]	TAI	12 / 30 d
PTB-CS2	Beam /Mag.	12×10^{-15}	12.	[7]	TAI	12 / 30 d
PTB-CSF1	Fountain	$(0.8 \text{ to } 0.9)\times10^{-15}$	1.4	[8]	H maser	2 / 20 d to 30 d
PTB-CSF2	Fountain	$(0.7 \text{ to } 1.4)\times10^{-15}$	0.8	[9]	H maser	6 / 10 d to 20 d
SYRTE-FO1	Fountain	$(0.4 \text{ to } 0.5)\times10^{-15}$	0.72	[10]	H maser	10 / 10 d to 30 d
SYRTE-FO2	Fountain	$(0.4 \text{ to } 0.5)\times10^{-15}$	0.65	[10]	H maser	8 / 10 d to 30 d
SYRTE-FOM	Fountain	0.7×10^{-15}	0.80	[11]	H maser	4 / 15 d to 30 d
SYRTE-JPO	Beam /Opt.	6.3×10^{-15}	6.3	[12]	H maser	13 / 5 d to 30 d

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

Table 6. (Cont.)

Standard	Period of estimation		$d/10^{-15}$	$u_A/10^{-15}$	$u_B/10^{-15}$	$u_{link/lab}/10^{-15}$	$u_{link/TAI}/10^{-15}$	$u/10^{-15}$	Notes
IT-CsF1	55139	55159	3.99	0.40	0.70	0.22	0.47	0.96	
IT-CsF1	55164	55189	3.57	0.70	0.70	0.40	0.38	1.13	
KRISS-1	54654	54669	-4.8	3.0	9.5	1.0	0.9	10.0	
KRISS-1	54699	54709	-6.9	4.0	9.5	1.0	2.6	10.7	
KRISS-1	54719	54739	2.3	2.0	9.5	1.0	1.4	9.9	
NICT-CsF1	55134	55144	1.73	1.00	1.30	0.30	0.53	1.75	
NICT-CsF1	55159	55184	3.83	1.00	0.90	0.30	0.23	1.40	
NIST-F1	54844	54859	5.3	0.3	0.3	0.6	0.6	0.9	
NIST-F1	54864	54879	5.8	0.3	0.3	0.5	0.6	0.9	
NIST-F1	54904	54919	4.1	0.3	0.3	0.6	0.6	1.0	
NIST-F1	54924	54939	6.8	0.3	0.3	0.4	0.6	0.9	
NIST-F1	54969	54979	6.9	0.3	0.3	0.3	0.9	1.0	
NIST-F1	54994	55009	5.93	0.30	0.32	0.53	0.61	0.92	
NIST-F1	55114	55134	6.35	0.43	0.31	0.24	0.47	0.75	
NIST-F1	55134	55149	4.20	0.33	0.37	0.28	0.61	0.83	
NIST-F1	55184	55194	4.06	0.56	0.31	0.32	1.05	1.27	
NMIJ-F1	54839	54859	2.6	0.8	3.9	0.3	0.7	4.0	
NMIJ-F1	54859	54889	5.8	0.7	3.9	0.3	0.5	4.0	
NMIJ-F1	54889	54919	6.2	0.7	3.9	0.3	0.5	4.0	
NMIJ-F1	54919	54949	6.2	0.7	3.9	0.3	0.5	4.0	
NMIJ-F1	54949	54979	5.6	0.7	3.9	0.3	0.5	4.0	
NMIJ-F1	54979	55009	5.69	0.70	3.90	0.30	0.46	4.00	
NMIJ-F1	55009	55039	4.82	0.70	3.90	0.30	0.46	4.00	
PTB-CS1	54829	54859	-9.8	5.0	8.0	0.0	0.2	9.4	(1)
PTB-CS1	54859	54889	-13.0	5.0	8.0	0.0	0.2	9.4	
PTB-CS1	54889	54919	-9.6	5.0	8.0	0.0	0.1	9.4	
PTB-CS1	54919	54949	6.9	5.0	8.0	0.0	0.1	9.4	
PTB-CS1	54949	54979	-6.4	5.0	8.0	0.0	0.1	9.4	
PTB-CS1	54979	55009	2.61	5.00	8.00	0.00	0.13	9.43	
PTB-CS1	55009	55039	-8.31	5.00	8.00	0.00	0.13	9.43	
PTB-CS1	55039	55074	-0.80	5.00	8.00	0.00	0.11	9.43	
PTB-CS1	55074	55104	-5.26	5.00	8.00	0.00	0.13	9.43	
PTB-CS1	55104	55134	-11.55	5.00	8.00	0.00	0.13	9.43	
PTB-CS1	55134	55164	-12.08	5.00	8.00	0.00	0.13	9.43	
PTB-CS1	55164	55194	2.04	5.00	8.00	0.00	0.13	9.43	
PTB-CS2	54829	54859	3.7	3.0	12.0	0.0	0.2	12.4	(1)
PTB-CS2	54859	54889	3.6	3.0	12.0	0.0	0.2	12.4	
PTB-CS2	54889	54919	1.4	3.0	12.0	0.0	0.1	12.4	
PTB-CS2	54919	54949	5.5	3.0	12.0	0.0	0.1	12.4	
PTB-CS2	54949	54979	4.3	3.0	12.0	0.0	0.1	12.4	
PTB-CS2	54979	55009	9.28	3.00	12.00	0.00	0.13	12.37	
PTB-CS2	55009	55039	3.03	3.00	12.00	0.00	0.13	12.37	
PTB-CS2	55039	55074	7.17	3.00	12.00	0.00	0.11	12.37	
PTB-CS2	55074	55104	-1.40	3.00	12.00	0.00	0.13	12.37	
PTB-CS2	55104	55134	0.80	3.00	12.00	0.00	0.13	12.37	
PTB-CS2	55134	55164	5.74	3.00	12.00	0.00	0.13	12.37	
PTB-CS2	55164	55194	1.58	3.00	12.00	0.00	0.13	12.37	
PTB-CSF1	54839	54859	5.9	0.1	0.9	0.0	0.3	1.0	
PTB-CSF1	55019	55049	7.64	0.13	0.76	0.01	0.13	0.78	

Table 6. (Cont.)

Standard	Period of estimation		$d/10^{-15}$	$u_A/10^{-15}$	$u_B/10^{-15}$	$u_{link/lab}/10^{-15}$	$u_{link/TAI}/10^{-15}$	$u/10^{-15}$	Notes
PTB-CSF2	54819	54829	4.21	0.70	1.06	0.11	0.53	1.38	
PTB-CSF2	54839	54854	4.29	0.70	0.67	0.06	0.37	1.04	
PTB-CSF2	54884	54899	5.35	0.70	0.82	0.30	0.24	1.15	
PTB-CSF2	55029	55049	5.83	0.70	1.07	0.03	0.19	1.29	
PTB-CSF2	55064	55084	6.03	0.70	1.02	0.03	0.19	1.25	
PTB-CSF2	55099	55109	4.24	0.70	1.35	0.03	0.35	1.56	
SYRTE-FO1	54829	54839	5.7	0.3	0.4	0.1	0.9	1.0	
SYRTE-FO1	54849	54859	5.2	0.2	0.4	0.1	0.9	1.0	
SYRTE-FO1	54859	54884	5.1	0.3	0.4	0.1	0.4	0.6	
SYRTE-FO1	54894	54919	4.3	0.3	0.4	0.1	0.4	0.6	
SYRTE-FO1	54919	54949	4.7	0.3	0.4	0.1	0.3	0.6	
SYRTE-FO1	54949	54979	4.6	0.3	0.5	0.1	0.3	0.6	
SYRTE-FO1	55054	55074	4.20	0.20	0.43	0.11	0.66	0.82	
SYRTE-FO1	55074	55104	4.88	0.20	0.47	0.11	0.40	0.66	
SYRTE-FO1	55104	55134	2.63	0.20	0.42	0.11	0.33	0.58	
SYRTE-FO1	55134	55164	2.79	0.20	0.41	0.11	0.33	0.57	
SYRTE-FO2	54829	54859	6.5	0.3	0.5	0.1	0.3	0.7	
SYRTE-FO2	54934	54949	5.1	0.5	0.5	0.1	0.6	0.9	
SYRTE-FO2	54969	54979	4.4	0.6	0.5	0.1	0.9	1.2	
SYRTE-FO2	55044	55074	5.31	0.50	0.45	0.11	0.46	0.82	
SYRTE-FO2	55074	55104	6.05	0.20	0.45	0.11	0.40	0.64	
SYRTE-FO2	55104	55134	3.90	0.20	0.45	0.10	0.33	0.60	
SYRTE-FO2	55139	55164	3.97	0.20	0.48	0.11	0.38	0.66	
SYRTE-FO2	55164	55194	4.54	0.40	0.39	0.11	0.36	0.67	
SYRTE-FOM	54919	54944	6.1	0.2	0.7	2.0	0.4	2.2	(2)
SYRTE-FOM	55044	55074	5.70	0.20	0.71	2.00	0.46	2.18	(2)
SYRTE-FOM	55074	55104	5.07	0.20	0.71	0.35	0.40	0.91	(2)
SYRTE-FOM	55104	55119	2.38	0.20	0.71	0.56	0.61	1.11	(2)
SYRTE-JPO	54839	54859	13.6	0.9	6.3	0.3	0.5	6.4	
SYRTE-JPO	54869	54889	8.1	0.8	6.3	0.3	0.5	6.4	
SYRTE-JPO	54889	54919	5.7	0.8	6.3	0.3	0.3	6.4	
SYRTE-JPO	54919	54949	4.3	0.7	6.3	0.3	0.3	6.4	
SYRTE-JPO	54949	54979	5.2	0.6	6.3	0.3	0.3	6.3	
SYRTE-JPO	54979	55009	5.63	0.65	6.30	0.30	0.33	6.35	
SYRTE-JPO	55009	55039	3.90	0.61	6.30	0.30	0.33	6.34	
SYRTE-JPO	55039	55044	4.59	1.39	6.30	0.30	1.99	6.76	
SYRTE-JPO	55069	55074	1.78	1.44	6.30	0.30	2.29	6.86	
SYRTE-JPO	55074	55104	3.54	0.56	6.30	0.30	0.40	6.34	
SYRTE-JPO	55104	55134	1.31	0.54	6.30	0.30	0.33	6.34	
SYRTE-JPO	55134	55164	1.57	0.53	6.30	0.30	0.33	6.34	
SYRTE-JPO	55164	55194	2.49	0.53	6.30	0.30	0.36	6.34	

Notes:
(1) Continuously operating as a clock participating to TAI.
(2) Operated in Toulouse (France)

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