

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

(File available on <https://webtai.bipm.org/ftp/pub/tai/other-products/utai/>)

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 primary frequency standards (PFS) IT-CsF2, METAS-FOC2, NIM5, NPL-CsF2, NRC-FCs2, PTB-CS1, PTB-CS2, PTB-CSF1, PTB-CSF2, SU-CsFO2, SYRTE-FO1, SYRTE-FO2 and SYRTE-FOM reported on the year 2020.

In Table 6B, d is obtained on the given periods of estimation by comparison of the TAI frequency with that of the secondary frequency standards (SFS) NICT-Sr1, NMIJ-Yb1 and SYRTE-FORb reported on the year 2020.

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 14 (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 (including the relativistic frequency shift),

$u_{A/\text{lab}}$ and $u_{B/\text{lab}}$ represent the uncertainty in the link between the standard and the clock participating in TAI, respectively from statistical fluctuations including the uncertainty due to the dead-time for $u_{A/\text{lab}}$, and from systematic effects for $u_{B/\text{lab}}$,

$u_{\text{link/TAI}}$ 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.

U_{ptime} is the percentage of the period of estimation when the frequency of the standard is actually measured.

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_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 2020 are indicated below. Reports of individual evaluations may be found at https://webtai.bipm.org/ftp/pub/tai/data/PSFS_reports/. Ref(u_B) is a reference giving information on the value of u_B as stated in the 2020 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 0.36	0.19	[1]	H maser	9 / 10 d to 35 d
METAS-FOC2	Fountain	1.4	1.99	[2]	H maser	4 / 25 d to 30 d
NIM5	Fountain	0.9	1.4	[3]	H maser	8 / 20 d to 30 d
NPL-CsF2	Fountain	0.24 to 0.48 then 0.20	0.23	[4]	UTC(NPL)	12 / 15 d to 35 d
NRC-FCs2	Fountain	0.21 to 0.54	0.23	[5]	H maser	14 / 25 d to 35 d
PTB-CS1	Beam /Mag.	8	8.	[6]	TAI	12 / 25 d to 35 d
PTB-CS2	Beam /Mag.	12	12.	[7]	TAI	12 / 25 d to 35 d
PTB-CSF1	Fountain	0.24 to 0.40	0.28	[8]	H maser	10 / 15 d to 35 d
PTB-CSF2	Fountain	0.17	0.17	[8]	H maser	14 / 10 d to 25 d
SU-CsFO2	Fountain	0.22	0.50	[9]	H maser	11 / 15 d to 35 d
SYRTE-FO1	Fountain	0.31 to 0.35	0.37	[10]	H maser	12 / 10 d to 35 d
SYRTE-FO2	Fountain	0.21 to 0.23	0.23	[10]	H maser	12 / 15 d to 30 d
SYRTE-FOM	Fountain	0.57 to 0.66	0.7	[10]	H maser	8 / 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.
NICT-Sr1	Lattice	0.07	0.06	[11]	H maser	1 / 20 d
NMIJ-Yb1	Lattice	0.40 then 0.22	0.36	[12]	UTC(NMIJ)	12 / 5 d to 35 d
SYRTE-FORb	Fountain	0.25 to 0.26	0.34	[13]	H maser	12 / 10 d to 35 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

Until Circular T388, $u_{A/lab}$ and $u_{B/lab}$ were not reported separately and the total value of $u_{link/lab}$ appears under $u_{A/lab}$. The value of Uptime was not reported either.

Standard	Period of estimation		$d/10^{-15}$	$u_A/10^{-15}$	$u_B/10^{-15}$	$u_{A/lab}/10^{-15}$	$u_{B/lab}/10^{-15}$	$u_{link/TAI}/10^{-15}$	$u/10^{-15}$	Uptime %	Note
IT-CsF2	58899	58914	-0.79	0.64	0.17	0.36		0.37	0.84		
IT-CsF2	58919	58934	0.05	0.71	0.17	0.51		0.37	0.96		
IT-CsF2	58939	58954	0.03	0.64	0.17	0.18		0.37	0.78		
IT-CsF2	58964	58974	-0.76	0.66	0.17	0.22	0.01	0.53	0.89	83.0	
IT-CsF2	58989	58999	-1.80	0.67	0.17	0.14	0.01	0.53	0.88	90.0	
IT-CsF2	59019	59029	-0.58	0.56	0.17	0.10	0.01	0.53	0.79	97.0	
IT-CsF2	59029	59054	-1.11	0.29	0.17	0.14	0.01	0.23	0.43	89.0	
IT-CsF2	59089	59119	-0.96	0.37	0.17	0.22	0.01	0.20	0.50	78.0	
IT-CsF2	59179	59214	0.54	0.17	0.36	0.18	0.01	0.17	0.47	87.0	
METAS-FOC2	58939	58969	-1.61	0.06	1.42	0.04		0.20	1.44		
METAS-FOC2	58969	58999	-1.85	0.06	1.40	0.01	0.04	0.20	1.42	99.3	
METAS-FOC2	59064	59089	-2.37	0.08	1.38	0.02	0.04	0.23	1.40	98.2	
METAS-FOC2	59149	59179	-1.71	0.09	1.36	0.26	0.04	0.20	1.40	65.3	
NIM5	58819	58849	-0.58	0.20	0.90	0.20		0.20	0.96		
NIM5	58849	58879	-0.65	0.20	0.90	0.20		0.20	0.96		
NIM5	58879	58899	-1.46	0.20	0.90	0.20		0.28	0.98		
NIM5	58909	58939	-0.97	0.46	0.90	0.10		0.20	1.03		
NIM5	58939	58969	-0.76	0.41	0.90	0.10	0.00	0.20	1.01	92.6	
NIM5	58969	58999	-0.35	0.48	0.90	0.10	0.00	0.20	1.04	89.3	
NIM5	59029	59059	0.06	0.46	0.90	0.10	0.00	0.20	1.03	91.7	
NIM5	59064	59089	-0.80	0.47	0.90	0.10	0.00	0.23	1.05	96.3	
NPL-CsF2	58829	58844	-0.22	0.14	0.41	0.15	0.00	0.37	0.59	84.5	
NPL-CsF2	58844	58879	-0.88	0.09	0.26	0.07	0.00	0.17	0.33	92.0	
NPL-CsF2	58879	58904	-0.25	0.11	0.25	0.06	0.00	0.23	0.36	91.4	
NPL-CsF2	58904	58924	-0.24	0.15	0.40	0.16	0.00	0.28	0.54	58.8	
NPL-CsF2	58984	58994	-0.97	0.29	0.29	0.10	0.00	0.53	0.67	94.8	
NPL-CsF2	58999	59029	-0.27	0.17	0.48	0.25	0.00	0.20	0.60	85.8	
NPL-CsF2	59029	59059	-0.50	0.14	0.24	0.04	0.00	0.20	0.34	99.4	
NPL-CsF2	59059	59074	0.00	0.23	0.20	0.15	0.00	0.37	0.50	88.6	
NPL-CsF2	59089	59119	-0.77	0.12	0.20	0.05	0.00	0.20	0.31	91.4	
NPL-CsF2	59119	59149	-0.11	0.12	0.20	0.25	0.00	0.20	0.39	82.7	
NPL-CsF2	59149	59179	0.24	0.14	0.20	0.04	0.00	0.20	0.32	96.8	
NPL-CsF2	59179	59214	0.17	0.13	0.20	0.04	0.00	0.17	0.30	97.7	
NRC-FCs2	58754	58784	-0.33	0.10	0.21	0.10	0.00	0.20	0.32	98.0	
NRC-FCs2	58784	58814	-0.43	0.10	0.22	0.10	0.00	0.20	0.33	98.0	
NRC-FCs2	58814	58844	-0.97	0.10	0.33	0.12	0.00	0.20	0.41	85.0	
NRC-FCs2	58844	58879	-0.65	0.08	0.35	0.10	0.00	0.17	0.41	97.0	
NRC-FCs2	58879	58904	-0.74	0.09	0.31	0.11	0.00	0.23	0.41	96.0	
NRC-FCs2	58904	58939	-0.51	0.09	0.39	0.12	0.00	0.17	0.45	87.3	
NRC-FCs2	58939	58969	-0.70	0.11	0.54	0.12	0.00	0.20	0.60	90.7	
NRC-FCs2	58969	58994	-0.13	0.11	0.39	0.11	0.00	0.23	0.48	95.7	
NRC-FCs2	58999	59029	-0.62	0.13	0.39	0.13	0.00	0.20	0.47	84.4	
NRC-FCs2	59029	59059	-0.27	0.13	0.25	0.13	0.00	0.20	0.37	85.3	
NRC-FCs2	59059	59089	-0.89	0.12	0.34	0.13	0.00	0.20	0.43	84.9	
NRC-FCs2	59089	59119	-0.46	0.12	0.37	0.10	0.00	0.20	0.45	98.6	
NRC-FCs2	59119	59149	-0.39	0.11	0.40	0.10	0.00	0.20	0.47	98.1	
NRC-FCs2	59194	59214	0.04	0.15	0.46	0.10	0.00	0.28	0.57	99.6	

Standard	Period of estimation		$d/10^{-15}$	$u_A/10^{-15}$	$u_B/10^{-15}$	$u_{A/lab}/10^{-15}$	$u_{B/lab}/10^{-15}$	$u_{link/TAR}/10^{-15}$	$u/10^{-15}$	Uptime %	Note
PTB-CS1	58844	58879	-4.76	8.00	8.00	0.00		0.06	11.31		(1)
PTB-CS1	58879	58904	-7.22	8.00	8.00	0.00		0.08	11.31		
PTB-CS1	58904	58939	1.25	8.00	8.00	0.00		0.06	11.31		
PTB-CS1	58939	58969	2.80	8.00	8.00	0.00		0.07	11.31		
PTB-CS1	58969	58999	-3.26	8.00	8.00	0.00	0.00	0.07	11.31	100.0	
PTB-CS1	58999	59029	-7.27	8.00	8.00	0.00	0.00	0.07	11.31	100.0	
PTB-CS1	59029	59059	-9.20	8.00	8.00	0.00	0.00	0.07	11.31	100.0	
PTB-CS1	59059	59089	-12.86	8.00	8.00	0.00	0.00	0.07	11.31	100.0	
PTB-CS1	59089	59119	-11.50	8.00	8.00	0.00	0.00	0.07	11.31	100.0	
PTB-CS1	59119	59149	-8.49	8.00	8.00	0.00	0.00	0.07	11.31	100.0	
PTB-CS1	59149	59179	2.05	8.00	8.00	0.00	0.00	0.07	11.31	100.0	
PTB-CS1	59179	59214	8.47	8.00	8.00	0.00	0.00	0.06	11.31	100.0	
PTB-CS2	58844	58879	-5.82	5.00	12.00	0.00		0.06	13.00		(1)
PTB-CS2	58879	58904	-1.71	5.00	12.00	0.00		0.08	13.00		
PTB-CS2	58904	58939	-5.03	5.00	12.00	0.00		0.06	13.00		
PTB-CS2	58939	58969	-6.04	5.00	12.00	0.00		0.07	13.00		
PTB-CS2	58969	58999	-1.29	5.00	12.00	0.00	0.00	0.07	13.00	100.0	
PTB-CS2	58999	59029	1.25	5.00	12.00	0.00	0.00	0.07	13.00	100.0	
PTB-CS2	59029	59059	-1.52	5.00	12.00	0.00	0.00	0.07	13.00	100.0	
PTB-CS2	59059	59089	-4.87	5.00	12.00	0.00	0.00	0.07	13.00	100.0	
PTB-CS2	59089	59119	-8.65	5.00	12.00	0.00	0.00	0.07	13.00	100.0	
PTB-CS2	59119	59149	-2.31	5.00	12.00	0.00	0.00	0.07	13.00	100.0	
PTB-CS2	59149	59179	-0.49	5.00	12.00	0.00	0.00	0.07	13.00	100.0	
PTB-CS2	59179	59214	-0.79	5.00	12.00	0.00	0.00	0.06	13.00	100.0	
PTB-CSF1	58844	58874	-0.27	0.07	0.28	0.05		0.07	0.30		
PTB-CSF1	58904	58939	-0.63	0.07	0.31	0.06		0.06	0.33		
PTB-CSF1	58939	58969	-0.47	0.07	0.30	0.02		0.07	0.32		
PTB-CSF1	58969	58999	-0.18	0.07	0.28	0.03	0.01	0.07	0.30	93.2	
PTB-CSF1	58999	59029	-0.52	0.07	0.27	0.05	0.00	0.07	0.29	91.0	
PTB-CSF1	59029	59044	-0.30	0.11	0.24	0.05	0.00	0.12	0.30	91.3	
PTB-CSF1	59089	59119	-0.62	0.08	0.40	0.05	0.00	0.07	0.42	88.6	
PTB-CSF1	59119	59149	-0.55	0.07	0.35	0.03	0.00	0.07	0.36	93.5	
PTB-CSF1	59149	59179	0.04	0.07	0.29	0.01	0.00	0.07	0.31	97.0	
PTB-CSF1	59179	59204	-0.23	0.08	0.31	0.05	0.00	0.08	0.33	89.2	
PTB-CSF2	58834	58844	-0.87	0.17	0.17	0.01		0.18	0.30		
PTB-CSF2	58844	58874	-0.56	0.10	0.17	0.01		0.07	0.21		
PTB-CSF2	58874	58904	-0.55	0.11	0.17	0.01		0.07	0.21		
PTB-CSF2	58904	58939	-0.61	0.11	0.17	0.01		0.06	0.21		
PTB-CSF2	58939	58969	-0.29	0.11	0.17	0.01		0.07	0.21		
PTB-CSF2	58969	58999	-0.45	0.11	0.17	0.02	0.01	0.07	0.21	94.7	
PTB-CSF2	58999	59029	-0.79	0.11	0.17	0.01	0.00	0.07	0.21	97.8	
PTB-CSF2	59029	59044	-0.52	0.15	0.17	0.01	0.00	0.12	0.26	98.5	
PTB-CSF2	59044	59059	-0.88	0.15	0.17	0.02	0.00	0.12	0.26	93.0	
PTB-CSF2	59059	59089	-0.72	0.10	0.17	0.01	0.00	0.07	0.21	97.7	
PTB-CSF2	59089	59119	-0.56	0.11	0.17	0.02	0.00	0.07	0.21	94.7	
PTB-CSF2	59119	59149	-0.34	0.10	0.17	0.01	0.00	0.07	0.21	97.8	
PTB-CSF2	59149	59179	-0.15	0.11	0.17	0.01	0.00	0.07	0.21	97.2	
PTB-CSF2	59179	59204	-0.46	0.13	0.17	0.05	0.00	0.08	0.23	89.2	
SU-CsFO2	58844	58859	-0.45	0.25	0.22	0.11		0.85	0.92		
SU-CsFO2	58859	58879	-0.04	0.44	0.22	0.11		0.66	0.83		
SU-CsFO2	58879	58904	-0.01	0.25	0.22	0.10		0.54	0.64		
SU-CsFO2	58904	58939	0.01	0.19	0.22	0.11		0.40	0.50		
SU-CsFO2	58969	58999	-0.11	0.32	0.22	0.13	0.00	0.46	0.61	36.0	
SU-CsFO2	58999	59029	-0.53	0.20	0.22	0.11	0.00	0.46	0.56	73.9	
SU-CsFO2	59029	59059	-0.23	0.18	0.22	0.10	0.00	0.46	0.55	93.9	
SU-CsFO2	59059	59089	-1.08	0.21	0.22	0.11	0.00	0.46	0.56	73.3	
SU-CsFO2	59119	59149	-0.05	0.24	0.22	0.11	0.00	0.35	0.49	95.9	
SU-CsFO2	59149	59179	-0.10	0.24	0.22	0.12	0.00	0.20	0.40	83.6	
SU-CsFO2	59179	59214	-1.24	0.19	0.22	0.10	0.00	0.17	0.35	77.8	

Standard	Period of estimation		$d/10^{-15}$	$u_A/10^{-15}$	$u_B/10^{-15}$	$u_{A/lab}/10^{-15}$	$u_{B/lab}/10^{-15}$	$u_{link/TAI}/10^{-15}$	$u/10^{-15}$	Uptime %	Note
SYRTE-FO1	58844	58879	-0.76	0.20	0.32	0.05		0.17	0.42		
SYRTE-FO1	58879	58904	-0.72	0.15	0.32	0.09		0.23	0.43		
SYRTE-FO1	58904	58939	-0.72	0.15	0.31	0.06		0.17	0.39		
SYRTE-FO1	58939	58969	-0.72	0.15	0.31	0.06		0.20	0.40		
SYRTE-FO1	58969	58989	-0.98	0.20	0.32	0.06	0.00	0.28	0.47	96.7	
SYRTE-FO1	59029	59059	-0.76	0.20	0.33	0.07	0.00	0.20	0.44	90.8	
SYRTE-FO1	59059	59089	-0.72	0.20	0.35	0.06	0.00	0.20	0.45	95.4	
SYRTE-FO1	59089	59119	-0.63	0.15	0.33	0.05	0.00	0.20	0.42	96.5	
SYRTE-FO1	59119	59134	-0.32	0.30	0.32	0.06	0.00	0.37	0.57	95.9	
SYRTE-FO1	59139	59149	-0.35	0.30	0.32	0.21	0.00	0.53	0.72	71.5	
SYRTE-FO1	59149	59179	-0.22	0.20	0.33	0.06	0.00	0.20	0.44	95.5	
SYRTE-FO1	59179	59204	-0.10	0.20	0.33	0.12	0.00	0.23	0.47	71.6	
SYRTE-FO2	58844	58869	-0.61	0.25	0.22	0.14		0.23	0.43		
SYRTE-FO2	58884	58899	-0.36	0.30	0.22	0.07		0.37	0.53		
SYRTE-FO2	58919	58939	-0.39	0.30	0.23	0.06		0.28	0.48		
SYRTE-FO2	58939	58969	-0.39	0.15	0.22	0.06		0.20	0.34		
SYRTE-FO2	58969	58999	-0.50	0.20	0.21	0.05	0.00	0.20	0.35	95.7	
SYRTE-FO2	58999	59029	-0.47	0.20	0.22	0.05	0.00	0.20	0.36	97.7	
SYRTE-FO2	59029	59059	-0.30	0.20	0.22	0.10	0.00	0.20	0.37	82.0	
SYRTE-FO2	59059	59089	-0.44	0.15	0.22	0.10	0.00	0.20	0.35	78.3	
SYRTE-FO2	59089	59109	-0.30	0.20	0.23	0.08	0.00	0.28	0.42	90.0	
SYRTE-FO2	59129	59149	0.00	0.20	0.22	0.06	0.00	0.28	0.41	96.4	
SYRTE-FO2	59149	59179	0.32	0.20	0.22	0.06	0.00	0.20	0.36	91.3	
SYRTE-FO2	59184	59204	0.16	0.20	0.23	0.06	0.00	0.28	0.42	94.7	
SYRTE-FOM	58844	58879	-0.86	0.20	0.66	0.06		0.17	0.71		
SYRTE-FOM	58879	58904	0.12	0.60	0.67	0.09		0.23	0.93		
SYRTE-FOM	58904	58929	-0.18	0.25	0.66	0.20		0.23	0.77		
SYRTE-FOM	59039	59059	-1.14	0.30	0.58	0.09	0.00	0.28	0.72	88.6	
SYRTE-FOM	59059	59069	-0.93	0.50	0.57	0.19	0.00	0.53	0.94	63.3	
SYRTE-FOM	59079	59089	-0.73	0.30	0.57	0.21	0.00	0.53	0.86	72.7	
SYRTE-FOM	59089	59119	-0.31	0.30	0.58	0.06	0.00	0.20	0.68	90.8	
SYRTE-FOM	59134	59149	-0.48	0.40	0.57	0.15	0.00	0.37	0.80	72.0	

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

Until Circular T388, $u_{A/lab}$ and $u_{B/lab}$ were not reported separately and the total value of $u_{link/lab}$ appears under $u_{A/lab}$. The value of Uptime was not reported either.

Standard Note	Period of estimation		$d/10^{-15}$	$u_A/10^{-15}$	$u_B/10^{-15}$	$u_{A/lab}/10^{-15}$	$u_{B/lab}/10^{-15}$	$u_{link/TAI}/10^{-15}$	$u/10^{-15}$	$u_{SRep}/10^{-15}$	Ref(u_s)	Uptime %
NICT-Sr1	58914	58934	-0.26	0.01	0.07	0.09		0.28	0.30	0.4	[14]	
NMIJ-Yb1	58754	58779	-0.87	0.01	0.40	0.20	0.22	0.23	0.55	0.5	[14]	90.1
NMIJ-Yb1	58784	58814	-0.91	0.01	0.40	0.30	0.22	0.20	0.58	0.5	[14]	77.8
NMIJ-Yb1	58814	58844	-1.11	0.01	0.41	0.33	0.22	0.20	0.60	0.5	[14]	80.4
NMIJ-Yb1	58844	58879	-0.92	0.01	0.40	0.33	0.22	0.17	0.59	0.5	[14]	72.7
NMIJ-Yb1	58879	58894	-0.29	0.01	0.40	0.14	0.22	0.37	0.60	0.5	[14]	82.9
NMIJ-Yb1	58899	58904	-0.77	0.02	0.40	0.22	0.22	0.98	1.11	0.5	[14]	90.6
NMIJ-Yb1	58904	58939	-0.23	0.01	0.40	0.08	0.22	0.17	0.49	0.5	[14]	92.6
NMIJ-Yb1	58939	58969	-0.59	0.01	0.40	0.12	0.22	0.20	0.51	0.5	[14]	87.2
NMIJ-Yb1	58969	58999	-0.06	0.01	0.40	0.16	0.22	0.20	0.52	0.5	[14]	84.2
NMIJ-Yb1	58999	59029	0.17	0.01	0.40	0.28	0.22	0.20	0.57	0.5	[14]	69.8
NMIJ-Yb1	59169	59179	-0.28	0.01	0.22	0.42	0.10	0.53	0.72	0.5	[14]	78.9
NMIJ-Yb1	59179	59194	0.06	0.01	0.22	0.10	0.10	0.37	0.45	0.5	[14]	93.3
SYRTE-FORb	58844	58879	-0.47	0.20	0.25	0.06		0.17	0.37	0.6	[14]	
SYRTE-FORb	58879	58904	-0.50	0.21	0.25	0.06		0.23	0.40	0.6	[14]	
SYRTE-FORb	58904	58939	-0.18	0.15	0.25	0.06		0.17	0.34	0.6	[14]	
SYRTE-FORb	58939	58969	-0.15	0.20	0.26	0.13		0.20	0.40	0.6	[14]	
SYRTE-FORb	58999	59029	-0.33	0.30	0.26	0.05	0.00	0.20	0.45	0.6	[14]	98.2
SYRTE-FORb	59029	59059	-0.51	0.20	0.25	0.06	0.00	0.20	0.38	0.6	[14]	95.1
SYRTE-FORb	59059	59074	0.13	0.35	0.26	0.12	0.00	0.37	0.58	0.6	[14]	83.0
SYRTE-FORb	59079	59089	-0.25	0.25	0.26	0.09	0.00	0.53	0.64	0.6	[14]	86.8
SYRTE-FORb	59089	59119	-0.21	0.20	0.25	0.05	0.00	0.20	0.38	0.6	[14]	97.5
SYRTE-FORb	59119	59149	-0.10	0.20	0.25	0.05	0.00	0.20	0.38	0.6	[14]	97.8
SYRTE-FORb	59149	59179	0.05	0.20	0.26	0.06	0.00	0.20	0.39	0.6	[14]	95.2
SYRTE-FORb	59179	59204	0.17	0.20	0.26	0.06	0.00	0.23	0.41	0.6	[14]	95.7

References:

- [1] Levi F. *et al.*, *Metrologia* **51**, 270, 2014.
- [2] Jallageas A. *et al.*, [Metrologia 55, 366, 2018.](#)
- [3] Fang F. *et al.*, *Metrologia* **52**, 454, 2015.
- [4] Li R., Gibble K. and Szymaniec K., *Metrologia*, 48, pp. 283-289, 2011.
- [5] Beattie S. *et al.*, *Metrologia* 57, 035010, 2020.
- [6] Bauch A. *et al.*, [Metrologia 35, 829, 1998](#); Bauch A., [Metrologia 42, S43, 2005.](#)
- [7] Bauch A. *et al.*, *IEEE Trans. IM* **36**, 613, 1987; Bauch A., [Metrologia 42, S43, 2005.](#)
- [8] Weyers S. *et al.*, [Metrologia 55, 789, 2018.](#)
- [9] Domnin Y.S. *et al.*, *Measurement Techniques*, Vol. 55, No. 10, January, 2013.
- [10] Guéna J. *et al.*, *IEEE Trans. Ultr. Ferr. Freq. Contr.* **59** (3), 391-410, 2012.
- [11] Hachisu H. *et al.*, *Opt. Express* **25**, 8511, 2017.
- [12] Kobayashi T. *et al.*, *IEEE Trans. Ultrason., Ferroelectr., Freq. Control*, 65, 2449 2018.
- [13] Guéna J. *et al.*, *Metrologia*. **51**, 108, 2014.
- [14] CCTF Recommendation 2 (2017) : Updates to the CIPM list of standard frequencies in Consultative Committee for Time and Frequency Report of the 21st meeting (2017), 2017, 56 p.