

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: $d = -y_{TAI}$.

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) CRL-O1, NIST-F1, PTB CS1, PTB CS2, PTB CSF1, SYRTE-FO2, SYRTE-FOM, and SYRTE-JPO for the year 2002.

Previous calibrations are available in the successive annual reports of the BIPM Time Section volumes 1 to 14.

Each comparison is provided with the following information:

u_B is the combined uncertainty from systematic effects,

Ref(u_B) is a reference giving information on the stated value of u_B ,

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

$u_{link/lab}$ 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,

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 2002 are indicated below.

Primary Standard	Type /selection	Typical type B std. uncertainty	Operation	Comparison with	Typical duration of comparison
CRL-O1	Beam /Opt.	4×10^{-15}	Discontinuous	UTC(CRL)	10 d
NIST-F1	Fountain	1×10^{-15}	Discontinuous	H maser	30 d
PTB CS1	Beam /Mag.	8×10^{-15}	Continuous	TAI	30 d
PTB CS2	Beam /Mag.	12×10^{-15}	Continuous	TAI	30 d
PTB CSF1	Fountain	1×10^{-15}	Discontinuous	H maser	15 to 30 d
SYRTE-FO2	Fountain	1×10^{-15}	Discontinuous	H maser	5 to 15 d
SYRTE-FOM	Fountain	1×10^{-15}	Discontinuous	H maser	30 d
SYRTE-JPO	Beam /Opt.	8×10^{-15}	Discontinuous	H maser	30 d

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

Standard	Period of estimation	d (10^{-15})	u_B (10^{-15})	Ref(u_B)	u_A (10^{-15})	$u_{\text{link/lab}}$ (10^{-15})	$u_{\text{link/TAI}}$ (10^{-15})	Notes	u (10^{-15})
CRL-01	52469-52479	+9.4	3.9	[1]	8.4	0.8	3.		9.8
CRL-01	52569-52579	-2.6	3.9		5.0	0.8	3.		7.1
NIST-F1	52304-52329	+11.4	0.6	[2]	1.1	0.3	1.2		1.8
NIST-F1	52514-52544	+8.4	0.9		1.1	0.5	1.0		1.8
PTB CS1	52274-52304	-4.4	8.	[3]	5.	0.	1.	(1)	9.
PTB CS1	52304-52329	+2.2	8.		5.	0.	1.		9.
PTB CS1	52329-52364	+3.7	8.		5.	0.	1.		9.
PTB CS1	52364-52394	+2.0	8.		5.	0.	1.		9.
PTB CS1	52394-52424	+3.3	8.		5.	0.	1.		9.
PTB CS1	52424-52454	-1.7	8.		5.	0.	1.		9.
PTB CS1	52454-52484	+5.8	8.		5.	0.	1.		9.
PTB CS1	52484-52514	-0.4	8.		5.	0.	1.		9.
PTB CS1	52514-52544	-1.6	8.		5.	0.	1.		9.
PTB CS1	52544-52574	4.7	8.		5.	0.	1.		9.
PTB CS1	52574-52604	-1.8	8.		5.	0.	1.		9.
PTB CS1	52604-52639	-2.2	8.		5.	0.	1.		9.
PTB CS2	52274-52304	+2.6	12.	[4]	3.	0.	1.	(1)	12.
PTB CS2	52304-52329	+7.8	12.		3.	0.	1.		12.
PTB CS2	52329-52364	+10.0	12.		3.	0.	1.		12.
PTB CS2	52364-52394	+4.3	12.		3.	0.	1.		12.
PTB CS2	52394-52424	+9.1	12.		3.	0.	1.		12.
PTB CS2	52424-52454	+1.4	12.		3.	0.	1.		12.
PTB CS2	52454-52484	+1.6	12.		3.	0.	1.		12.
PTB CS2	52484-52514	+6.9	12.		3.	0.	1.		12.
PTB CS2	52514-52544	+9.9	12.		3.	0.	1.		12.
PTB CS2	52544-52574	+7.8	12.		3.	0.	1.		12.
PTB CS2	52574-52604	+8.3	12.		3.	0.	1.		12.
PTB CS2	52604-52639	+4.1	12.		3.	0.	1.		12.
PTB CSF1	52329-52354	+11.5	1.0	[5]	1.0	0.	1.2		1.9
PTB CSF1	52384-52409	+10.7	1.0		1.0	0.	1.2		1.9
PTB CSF1	52454-52474	+13.6	0.9		1.0	0.	1.5		2.0
PTB CSF1	52604-52619	+12.7	0.9		1.0	0.	2.0		2.4
SYRTE-F02	52579-52584	+7.2	0.8	[6]	0.6	2.3	6.0	(2)	6.5
SYRTE-F02	52604-52619	+15.8	0.8		0.4	1.5	2.0		2.6
SYRTE-FOM	52564-52594	+10.1	0.8	[6]	0.2	1.6	1.0	(2)	2.1
SYRTE-JP0	52609-52639	+14.5	8.0	[7]	1.7	0.3	1.0	(3)	8.2

Notes:

- (1) Continuously operating as a clock participating to TAI.
- (2) BNM-SYRTE atomic Caesium fountain.
- (3) Previously reported as LPTF-JPO.

References:

- [1] The evaluation procedure the type B uncertainty of CRL-O1 is based on that of NIST-7: Lee W.D. et al., *IEEE Trans. IM-44*, 120, 1995.
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- [6] Marion H. et al. *Phys. Rev. Lett.*, 90, 150801, 2003.
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