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

(File available on http://www.bipm.org under the name UTAI04.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) IEN-CSF1, NICT-O1, NIST-F1, NPL-CSF1, PTB-CS1, PTB-CS2, PTB-CSF1, SYRTE-FO2, SYRTE-FOM, and SYRTE-JPO for the year 2004.
Previous calibrations are available in the successive annual reports of the BIPM Time Section volumes 1 to 16.

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,
Ref($u_B$) is a reference giving information on the stated value of $u_B$,
$u_{link/lab}$ 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 2004 are indicated below.

| Primary Standard | Type /selection | Typical type B std. Uncertainty | Operation | Comparison with | Number/typical duration of comp. |
|---|---|---|---|---|---|
| IEN-CSF1 | Fountain | $1.1 \times 10^{-15}$ | Discontinuous | H maser | 4 /10 to 20 d |
| NICT-O1 | Beam /Opt. | $5 \times 10^{-15}$ | Discontinuous | UTC(NICT) | 2 / 15-20 d |
| NIST-F1 | Fountain | $0.3 \times 10^{-15}$ | Discontinuous | H maser | 1 / 60 d |
| NPL-CSF1 | Fountain | $1 \times 10^{-15}$ | Discontinuous | H maser | 4 / 30 d |
| PTB-CS1 | Beam /Mag. | $8 \times 10^{-15}$ | Continuous | TAI | 12 / 30 d |
| PTB-CS2 | Beam /Mag. | $12 \times 10^{-15}$ | Continuous | TAI | 12 / 30 d |
| PTB-CSF1 | Fountain | $1 \times 10^{-15}$ | Discontinuous | H maser | 1 / 15 d |
| SYRTE-FO2 | Fountain | $0.7 \times 10^{-15}$ | Discontinuous | H maser | 5 / 20 to 30 d |
| SYRTE-FOM | Fountain | $1.1 \times 10^{-15}$ | Discontinuous | H maser | 1 / 30 d |
| SYRTE-JPO | Beam /Opt. | $6 \times 10^{-15}$ | Discontinuous | H maser | 4 / 10 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 | $d$ ($10^{-15}$) | $u_A$ ($10^{-15}$) | $u_B$ ($10^{-15}$) | Ref($u_B$) | $u_{link/lab}$ ($10^{-15}$) | $u_{link/TAI}$ ($10^{-15}$) | $u$ ($10^{-15}$) | Notes |
|---|---|---|---|---|---|---|---|---|---|
| IEN-CSF1 | 53034 53044 | 7.8 | 0.4 | 1.2 | [1] | 0.4 | 3.0 | 3.3 | |
| IEN-CSF1 | 53089 53099 | 9.4 | 0.6 | 1.2 | | 0.4 | 3.0 | 3.3 | |
| IEN-CSF1 | 53154 53174 | 9.8 | 0.3 | 1.2 | | 0.3 | 1.5 | 2.0 | |
| IEN-CSF1 | 53304 53324 | 5.9 | 0.3 | 1.0 | | 0.4 | 1.5 | 1.9 | |
| NICT-O1 | 53019 53034 | -2.5 | 11.0 | 5.5 | [2] | 0.8 | 2.0 | 12.5 | (1) |
| NICT-O1 | 53064 53084 | 4.1 | 7.7 | 5.5 | | 0.8 | 1.5 | 9.6 | |
| NIST-F1 | 53109-53169 | 6.5 | 0.5 | 0.3 | [3] | 0.4 | 0.5 | 0.9 | |
| NPL-CSF1 | 53049 53084 | 4.1 | 0.6 | 1.0 | [4] | 0.4 | 0.9 | 1.5 | (2) |
| NPL-CSF1 | 53089 53119 | 2.1 | 0.6 | 1.0 | | 0.4 | 1.0 | 1.6 | |
| NPL-CSF1 | 53119 53149 | 1.7 | 0.5 | 1.0 | | 0.5 | 1.0 | 1.6 | |
| NPL-CSF1 | 53299 53329 | 1.6 | 0.5 | 1.0 | | 0.4 | 1.0 | 1.5 | |
| PTB-CS1 | 53004 53034 | 0.4 | 5.0 | 8.0 | [5] | 0.0 | 1.0 | 9.5 | (3) |
| PTB-CS1 | 53034 53064 | 4.3 | 5.0 | 8.0 | | 0.0 | 1.0 | 9.5 | |
| PTB-CS1 | 53064 53094 | -5.9 | 5.0 | 8.0 | | 0.0 | 1.0 | 9.5 | |
| PTB-CS1 | 53094 53124 | 6.4 | 5.0 | 8.0 | | 0.0 | 1.0 | 9.5 | |
| PTB-CS1 | 53124 53154 | 3.5 | 5.0 | 8.0 | | 0.0 | 1.0 | 9.5 | |
| PTB-CS1 | 53154 53184 | 1.8 | 5.0 | 8.0 | | 0.0 | 1.0 | 9.5 | |
| PTB-CS1 | 53184 53214 | -1.3 | 5.0 | 8.0 | | 0.0 | 1.0 | 9.5 | |
| PTB-CS1 | 53214 53244 | 5.9 | 5.0 | 8.0 | | 0.0 | 1.0 | 9.5 | |
| PTB-CS1 | 53244 53274 | -4.0 | 5.0 | 8.0 | | 0.0 | 1.0 | 9.5 | |
| PTB-CS1 | 53274 53309 | -5.3 | 5.0 | 8.0 | | 0.0 | 0.9 | 9.5 | |
| PTB-CS1 | 53309 53339 | -3.9 | 5.0 | 8.0 | | 0.0 | 1.0 | 9.5 | |
| PTB-CS1 | 53339 53369 | -7.3 | 5.0 | 8.0 | | 0.0 | 1.0 | 9.5 | |
| PTB-CS2 | 53004 53034 | 4.6 | 3.0 | 12.0 | [6] | 0.0 | 1.0 | 12.4 | (3) |
| PTB-CS2 | 53034 53064 | 8.8 | 3.0 | 12.0 | | 0.0 | 1.0 | 12.4 | |
| PTB-CS2 | 53064 53094 | 9.1 | 3.0 | 12.0 | | 0.0 | 1.0 | 12.4 | |
| PTB-CS2 | 53094 53124 | 11.6 | 3.0 | 12.0 | | 0.0 | 1.0 | 12.4 | |
| PTB-CS2 | 53124 53154 | 1.5 | 3.0 | 12.0 | | 0.0 | 1.0 | 12.4 | |
| PTB-CS2 | 53154 53184 | 1.4 | 3.0 | 12.0 | | 0.0 | 1.0 | 12.4 | |
| PTB-CS2 | 53184 53214 | 8.2 | 3.0 | 12.0 | | 0.0 | 1.0 | 12.4 | |
| PTB-CS2 | 53214 53244 | 1.0 | 3.0 | 12.0 | | 0.0 | 1.0 | 12.4 | |
| PTB-CS2 | 53244 53274 | -2.4 | 3.0 | 12.0 | | 0.0 | 1.0 | 12.4 | |
| PTB-CS2 | 53274 53309 | 6.5 | 3.0 | 12.0 | | 0.0 | 0.9 | 12.4 | |
| PTB-CS2 | 53309 53339 | 4.5 | 3.0 | 12.0 | | 0.0 | 1.0 | 12.4 | |
| PTB-CS2 | 53339 53369 | 9.2 | 3.0 | 12.0 | | 0.0 | 1.0 | 12.4 | |
| PTB-CSF1 | 52999 53014 | 13.2 | 1.0 | 0.9 | [7] | 0.1 | 2.0 | 2.4 | |
| SYRTE-FO2 | 53014-53044 | 7.5 | 0.2 | 0.8 | [8,9] | 0.5 | 1.0 | 1.4 | |
| SYRTE-FO2 | 53109-53129 | 4.1 | 0.04 | 0.6 | | 0.2 | 1.5 | 1.6 | |
| SYRTE-FO2 | 53129-53149 | 4.9 | 0.04 | 0.6 | | 0.2 | 1.5 | 1.6 | |
| SYRTE-FO2 | 53199-53224 | 2.6 | 0.1 | 0.7 | | 0.2 | 1.2 | 1.4 | |
| SYRTE-FO2 | 53304-53329 | 3.9 | 0.2 | 0.7 | | 0.1 | 1.2 | 1.4 | |
| SYRTE-FOM | 53019-53049 | 6.6 | 0.3 | 1.1 | [8] | 0.7 | 1.0 | 1.7 | |

**Table 6. (Cont.)**

| Standard | Period of estimation | $d$ ($10^{-15}$) | $u_A$ ($10^{-15}$) | $u_B$ ($10^{-15}$) | Ref($u_B$) | $u_{link/lab}$ ($10^{-15}$) | $u_{link/TAI}$ ($10^{-15}$) | $u$ ($10^{-15}$) | Notes |
|---|---|---|---|---|---|---|---|---|---|
| SYRTE-JPO | 53004-53034 | 18.2 | 0.6 | 6.5 | [10] | 0.3 | 1.0 | 6.6 | |
| SYRTE-JPO | 53034-53059 | 17.7 | 0.5 | 6.5 | | 0.3 | 1.2 | 6.6 | |
| SYRTE-JPO | 53114-53124 | 4.9 | 0.7 | 6.5 | | 0.3 | 3.0 | 7.2 | |
| SYRTE-JPO | 53124-53144 | 8.0 | 0.5 | 6.5 | | 0.3 | 1.5 | 6.7 | |

**Notes**:

(1) Formerly CRL-O1.
(2) NPL atomic caesium fountain.
(3) Continuously operating as a clock participating to TAI.

**References**:


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