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BUREAU INTERNATIONAL DES POIDS ET MESURES

Circular T 77 (1994 June 24)

1 - Coordinated Universal Time UTC. Computed values of UTC-UTC(k) (1).

(From 1993 July 1, 0h UTC, to 1994 July 1, 0h UTC, TAI-UTC = 28 s)
(From 1994 July 1, 0h UTC, until further notice, TAI-UTC = 29 s)

Date 1994 0h UTC		Apr 27	May 7	May 17	May 27
MJD		49469	49479	49489	49499
Laboratory k		UTC-UTC(k) (Unit = 1 microsecond)			
AOS (Borowiec)		-1.701	-1.591	-1.185	-1.095
APL (Laurel)		1.061	1.054	1.114	1.203
AUS (Canberra)		0.408	0.357	0.335	0.296
BEV (Wien)		-	-	-	-
CAO (Cagliari)	(2)	-7.483	-7.706	-7.993	-0.289
CH (Bern)		1.693	1.603	1.506	1.381
CRL (Tokyo)		2.025	1.983	1.959	1.926
CSAO (Lintong)		-0.402	-0.441	-0.441	-0.369
CSIR (Pretoria)		-2.826	-2.856	-2.853	-2.926
FTZ (Darmstadt)		0.228	0.306	0.280	0.295
GUM (Warszawa)	(3)	0.212	0.301	0.184	0.085
IEN (Torino)		0.177	0.254	0.296	0.335
IFAG (Wettzell)		-0.522	-0.392	-0.262	0.010
IGMA (Buenos Aires)		-3.15	-3.11	-3.06	-3.02
INPL (Jerusalem)		-1.474	-1.521	-1.572	-1.587
JATC (Lintong)		0.365	0.783	0.825	0.991
KRIS (Taejon)		-0.251	-0.244	-0.203	-0.192
LDS (Leeds)		-0.356	-0.353	-0.386	-0.403
MSL (Lower Hutt)		-0.346	-0.395	-0.513	-0.501
NAOM (Mizusawa)		-1.539	-1.573	-1.589	-1.599
NAOT (Tokyo)		-1.262	-1.486	-1.629	-1.827
NIM (Beijing)		7.80	7.84	7.91	7.96
NIST (Boulder)		-0.094	-0.103	-0.102	-0.109
NMC (Sofiya)		-	-	-	-
NPL (Teddington)		0.113	0.100	0.089	0.086
NPLI (New-Delhi)		-3.182	-3.023	-2.992	-2.940
NRC (Ottawa)		5.567	5.662	5.768	5.873
NRLM (Tsukuba)		-10.521	-10.836	-11.118	-11.410
OMH (Budapest)		6.559	6.562	6.571	6.585
ONBA (Buenos Aires)		5.48	5.55	5.47	5.50
ONRJ (Rio de Janeiro)		-	-	-	-
OP (Paris)		0.005	0.002	-0.001	0.007
ORB (Bruxelles)		-1.755	-1.796	-1.802	-1.862
PTB (Braunschweig)		2.772	2.757	2.738	2.735
RC (Habana)		-2.80	-	-	-
ROA (San Fernando)		2.637	2.600	2.572	2.553
SCL (Hong Kong)		0.424	0.664	0.904	1.006
SNT (Stockholm)		0.067	0.092	0.079	0.083
SO (Shanghai)		2.14	2.10	2.10	2.13
SU (Moskva)		-3.624	-3.712	-3.801	-3.884
TL (Chung-Li)		-2.914	-2.844	-2.773	-2.703
TP (Praha)		-1.069	-1.073	-1.080	-1.069
TUG (Graz)	(4)	4.739	4.834	4.921	-3.994
USNO (Washington DC)	(USNO MC)	0.057	0.061	0.060	0.063
VSL (Delft)		0.174	0.217	0.222	0.216

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2 - International Atomic Time TAI and local atomic time scales TA(k).

The following table gives the computed values of TAI-TA(k) (1).

Date 1994 0h UTC		Apr 27	May 7	May 17	May 27
MJD		49469	49479	49489	49499
Laboratory k		TAI-TA(k) (Unit = 1 microsecond)			
APL (Laurel)		2.524	2.517	2.577	2.666
AUS (Canberra)		-51.273	-51.526	-51.716	-51.835
CH (Bern)		-74.767	-74.597	-74.434	-74.299
CRL (Tokyo)		37.948	38.361	38.793	39.208
CSAO (Lintong)		14.678	14.509	14.380	14.322
F (Paris)		128.987	129.366	129.737	130.111
INPL (Jerusalem)		-200.492	-202.523	-204.583	-206.632
JATC (Lintong)		11.488	11.271	12.067	12.324
KRIS (Taejon)		-2.811	-2.574	-2.353	-2.142
NIM (Beijing)		-8.66	-8.59	-8.50	-8.44
NISA (Boulder)	(5)	-45112.417	-45112.818	-45113.217	-45113.624
NRC (Ottawa)		21.636	21.731	21.837	21.942
PTB (Braunschweig)		-360.628	-360.643	-360.662	-360.665
RC (Habana)	(6)	-326.42	-	-	-
SO (Shanghai)		-45.45	-45.49	-45.47	-45.46
SU (Moskva)	(7)	27246.376	27246.288	27246.199	27246.116
USNO (Washington DC)	(8)	-34697.880	-34698.552	-34699.224	-34699.894

3 - Notes on sections 1 and 2.

(1) Values UTC-UTC(k) and TAI-TA(k) are published within 1 ns except for laboratories which are not linked through GPS common views.

(2) CAO . Time step of UTC(CAO) of - 8.00 μs on MJD = 49495.

(3) GUM . Główny Urzad Miar, (Central Office of Measures), Warszawa, Polska. Formerly PKNM.

(4) TUG . Time step of UTC(TUG) of 9.00 μs on MJD = 49496.51

(5) NIST. TA(NISA) designates the scale AT1 of NIST.

(6) RC . Listed values are TAI-TA(RC) - 18 seconds.

(7) SU . Listed values are TAI-TA(SU) - 2.80 seconds.

(8) USNO. TA(USNO) designates the scale A1(MEAN) of USNO.

4 - [UTC - GPS time] and [TAI - GPS time].

[UTC - GPS time] = -9 s + C0 (until 1994 July 1, 0h UTC)
[UTC - GPS time] = -10 s + C0 (from 1994 July 1, 0h UTC)
[TAI - GPS time] = 19 s + C0.

Daily values of C0 are given in the following table. They are obtained as follows: the GPS data taken at the Paris Observatory, for highest elevation, are first corrected for precise satellite ephemerides and for measured ionospheric delays, and then smoothed to obtain daily values of [UTC(OP) - GPS time] at 0h UTC; daily values of C0 are derived from them using linear interpolation of [UTC - UTC(OP)].

For a given day, where N measurements are used for estimation of C0 :
- the dispersion of individual measurements is characterized by a standard deviation σ,
- the daily C0 value is characterized by the standard deviation of the mean $\sigma/\sqrt{N}$.

Date 1994 0h UTC	MJD	C0 (ns)	σ (ns)	$\sigma/\sqrt{N}$ (ns)
Apr 27	49469	73	42	10
Apr 28	49470	66	36	9
Apr 29	49471	67	27	7
Apr 30	49472	71	41	10
May 1	49473	74	34	9
May 2	49474	74	45	12
May 3	49475	73	52	16
May 4	49476	78	34	9
May 5	49477	80	43	12
May 6	49478	83	48	14
May 7	49479	87	33	10
May 8	49480	88	48	13
May 9	49481	90	41	12
May 10	49482	99	45	12
May 11	49483	108	40	12
May 12	49484	104	38	10
May 13	49485	94	38	11
May 14	49486	94	31	10
May 15	49487	99	27	8
May 16	49488	96	54	14
May 17	49489	87	28	8
May 18	49490	80	33	9
May 19	49491	78	44	12
May 20	49492	79	44	13
May 21	49493	80	34	10
May 22	49494	82	41	11
May 23	49495	80	20	5
May 24	49496	75	37	11
May 25	49497	73	35	9
May 26	49498	74	42	13
May 27	49499	74	26	8

5 - [UTC - GLONASS time].

[UTC - GLONASS time] = C1 (modulo 1 s).

From his current observations of both the GPS and GLONASS satellite systems Prof. P. Daly, University of Leeds, establishes and reports [GPS time - GLONASS time] at ten-day intervals, together with the standard deviation σ of his daily GLONASS data. C1 is then derived using [UTC - GPS time] of section 4.

Date 1994 0h UTC	MJD	C1 (μs)	σ (μs)
Apr 27	49469	-17.81	0.04
May 7	49479	-17.70	0.03
May 17	49489	-17.57	0.03
May 27	49499	-17.46	0.04

6 - Difference between the normalized frequencies of EAL and TAI.

Interval of validity		f(EAL)-f(TAI)
1993 Apr. 22 - 1994 May. 27	49099-49499	7.40×10^{-13}

7 - Duration of the TAI scale interval.

The following table gives the departure D of the duration of the TAI scale interval from the SI second on the rotating geoid as realized by a given primary standard occasionally evaluated or continuously operating as a clock. In the later case the chosen two-month period of observation is also indicated. The last communicated estimate of the inaccuracy of the standard provides the uncertainty σ of the D value.

D and σ are expressed in units of 10^{-14} second.

Standard	Obs. period	D	σ
PTB-CS1	49439-49499	-0.3	3.0
PTB-CS2	49439-49499	+0.3	1.5

The estimate of the duration of the TAI scale interval, computed by the BIPM, from all the available measurements of the TAI frequency, obtained by comparison with primary frequency standards continuously observed or occasionally evaluated (CRL, LPTF, NIST, NRC, PTB, SU), is:

$$1 + 0 \times 10^{-14} \pm 2 \times 10^{-14}$$

in SI second on the rotating geoid, for the two-month interval 49439-49499 .