BIPM

ISSN 1143-1393

BUREAU INTERNATIONAL DES POIDS ET MESURES

Circular T 62 (1993 March 31)

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

(From 1992 July 1, 0hUTC, to 1993 July 1, 0hUTC, TAI-UTC=27s)
(From 1993 July 1, 0hUTC, until further notice, TAI-UTC=28s)

Date 1993 0hUTC	Jan 22	Feb 1	Feb 11	Feb 21
MJD	49009	49019	49029	49039
Laboratory k	UTC-UTC(k) (Unit = 1 microsecond)			
AOS (Borowiec)	1.832	1.717	2.644	2.587
APL (Laurel)	-0.161	-0.108	-0.065	-0.036
AUS (Canberra)	0.011	0.035	0.032	0.030
BEV (Wien)	0.17	-	-4.92	-6.09
CAO (Cagliari)	-27.585	-27.986	-28.405	-28.762
CH (Bern)	-0.232	-0.239	-0.245	-0.250
CRL (Tokyo)	2.458	2.478	2.506	2.529
CSAO (Lintong)	-0.545	-0.573	-0.563	-0.547
DPT (Pretoria)	-18.835	-18.756	-18.721	-18.606
FTZ (Darmstadt)	-	-	-	-
IEN (Torino)	0.128	-0.483	-0.501	-0.522
IFAG (Wettzell)	3.250	3.210	3.113	2.983
IGMA (Buenos Aires) (2)	-1.67	-1.41	-1.18	-0.94
INPL (Jerusalem)	-0.490	-0.539	-0.612	-0.698
JATC (Lintong)	-2.100	-2.266	-2.046	-1.774
KRIS (Taejon)	-0.449	-0.547	-0.632	-0.694
LDS (Leeds)	-3.224	-4.465	-5.704	-6.891
MSL (Lower Hutt)	-3.459	-3.386	-3.331	-3.338
NAOM (Mizusawa)	-0.368	-0.411	-0.464	-0.534
NAOT (Tokyo)	-0.963	-1.062	-1.171	-1.281
NIM (Beijing)	7.71	7.62	7.59	7.64
NIST (Boulder)	-0.242	-0.212	-0.173	-0.134
NMC (Sofiya)	-3.04	-3.41	-3.73	-3.84
NPL (Teddington)	0.297	0.343	0.375	0.374
NPLI (New-Delhi)	-6.775	-6.737	-6.566	-6.518
NRC (Ottawa)	1.019	1.199	1.362	1.477
NRLM (Tsukuba)	-14.062	-14.901	-15.784	-16.683
OMH (Budapest)	-	-	-	-
ONBA (Buenos Aires) (3)	-75.85	-77.18	-78.40	-79.04
ONRJ (Rio de Janeiro)	-1.222	-0.895	-0.759	-0.640
OP (Paris)	-0.390	-0.426	-0.454	-0.504
ORB (Bruxelles)	-0.179	-0.095	-0.091	-0.156
PKNM (Warszawa)	-0.018	0.232	0.218	0.092
PTB (Braunschweig)	2.830	2.842	2.840	2.840
RC (Habana)	-3.78	-3.76	-3.77	-3.68
ROA (San Fernando)	3.244	3.107	3.062	3.024
SCL (Wan Chai) (4)	-30.400	1.059	2.237	3.416
SNT (Stockholm)	-0.086	0.018	0.050	0.079
SO (Shanghai)	2.073	2.166	2.074	2.110
SU (Moskva)	0.566	0.489	0.414	0.328
TL (Chung-Li)	0.284	0.186	0.050	-0.100
TP (Praha)	-1.020	-1.016	-1.028	-1.023
TUG (Graz)	1.216	1.239	1.248	1.263
USNO (Washington DC)(USNO MC)	0.011	0.035	0.032	0.030
VSL (Delft)	-0.306	-0.301	-0.194	-0.089

PAVILLON DE BRETEUIL F - 92312 SÈVRES CEDEX

TÉL. (CENTRAL) : + 33 1 45 07 70 70 TELEX : BIPM 631351 F TÉLÉCOPIE : + 33 1 45 34 20 21

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 1993 0hUTC		Jan 22	Feb 1	Feb 11	Feb 21
MJD		49009	49019	49029	49039
Laboratory k		TAI-TA(k) (Unit = 1 microsecond)			
APL (Laurel)		1.302	1.355	1.398	1.427
AUS (Canberra)		-44.078	-44.290	-44.426	-44.561
CH (Bern)		-75.291	-75.381	-75.470	-75.560
CRL (Tokyo)		19.890	20.237	20.595	20.945
CSAO (Lintong)		20.456	20.341	20.265	20.194
F (Paris)		111.416	111.819	112.235	112.622
INPL (Jerusalem)		-118.054	-119.749	-121.477	-123.230
JATC (Lintong)		4.681	4.982	5.235	5.570
KRIS (Taejon)		-0.619	-0.727	-0.882	-1.004
NIM (Beijing)		-9.59	-9.66	-9.68	-9.61
NISA (Boulder)	(5)	-45095.332	-45095.682	-45096.033	-45096.384
NIST (Boulder)		-45205.567	-45206.175	-45206.787	-45207.398
NRC (Ottawa)		17.088	17.268	17.431	17.546
PTB (Braunschweig)		-360.570	-360.558	-360.560	-360.560
RC (Habana)	(6)	-317.23	-317.31	-317.69	-317.99
SO (Shanghai)		-45.481	-45.399	-45.526	-45.482
SU (Moskva)	(7)	27250.566	27250.489	27250.414	27250.328
USNO (Washington DC)	(8)	-34666.563	-34667.227	-34667.905	-34668.580

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) IGMA. Corrected values of UTC-UTC(IGMA) :

MJD	UTC-UTC(IGMA)
48989	-2.07
48999	-1.87

Apparent time step of UTC-UTC(IGMA) between MJD=48979 and MJD=48989.

(3) ONBA.

MJD	UTC-UTC(ONBA)
48989	-73.58
48999	-74.50

Apparent time step of UTC-UTC(ONBA) between MJD=48979 and MJD=48989.

(4) SCL . Change of master clock on MJD = 49015.17

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

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

UTC - GPS time = -8s + C0 (until 1993 July 1, 0hUTC)
UTC - GPS time = -9s + C0 (from 1993 July 1, 0hUTC)
TAI - GPS time = 19s + C0.

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

This procedure also allows the computation of daily standard deviations obtained from Block I and Block II data as observed at Paris Observatory according to the International GPS Common-View Schedule, and after correction for the measured ionospheric delays. They are given in the following table in order to show the quality of the dissemination of GPS time from Block I and Block II satellites.

Date 1993 0hUTC	MJD	C0 (ns)	SD(ns) Block I	SD(ns) Block II
Jan 22	49009	48	8	46
Jan 23	49010	64	6	34
Jan 24	49011	79	4	36
Jan 25	49012	89	2	43
Jan 26	49013	95	3	39
Jan 27	49014	97	4	63
Jan 28	49015	98	5	45
Jan 29	49016	103	4	39
Jan 30	49017	109	7	32
Jan 31	49018	113	4	32
Feb 1	49019	114	6	36
Feb 2	49020	117	5	38
Feb 3	49021	118	8	37
Feb 4	49022	114	7	22
Feb 5	49023	106	5	24
Feb 6	49024	100	4	33
Feb 7	49025	95	3	48
Feb 8	49026	88	6	50
Feb 9	49027	80	6	24
Feb 10	49028	70	6	45
Feb 11	49029	60	7	44
Feb 12	49030	52	2	37
Feb 13	49031	47	3	51
Feb 14	49032	39	3	36
Feb 15	49033	29	6	51
Feb 16	49034	24	6	29
Feb 17	49035	26	7	43
Feb 18	49036	30	8	26
Feb 19	49037	32	7	32
Feb 20	49038	32	6	41
Feb 21	49039	32	4	35

5 - UTC - GLONASS time.

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

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 SD of his daily GLONASS data. C1 is then derived using UTC - GPS time of section 4.

Date 1993 0hUTC	MJD	C1 (μs)	SD (μs)
Jan 22	49009	-13.07	0.05
Feb 1	49019	-13.15	0.04
Feb 11	49029	-13.22	0.04
Feb 21	49039	-13.34	0.05

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

Interval of validity	f(EAL)-f(TAI)
1992 Jun. 26 - 1993 Feb. 21 (48799-49039)	7.35×10^{-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 s of the D value.

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

Standard	Obs. period	D	s
PTB-CS1	48979-49039	+0.4	3.0
PTB-CS2	48979-49039	-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, 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 48979-49039 .