BIPM

BUREAU INTERNATIONAL DES POIDS ET MESURES

Circular T 64 (1993 May 26)

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 MJD Laboratory k		Mar 23 49069	Apr 2 49079	Apr 12 49089	Apr 22 49099
		UTC-UTC(k)	(Unit =	1 microsecond)	
AOS (Borowiec)		0.993	0.204	-0.566	-0.542
APL (Laurel)		0.119	0.119	0.150	0.147
AUS (Canberra)		0.016	0.006	0.006	-0.006
BEV (Wien)	(2)	-9.34	-10.13	-11.02	7.99
CAO (Cagliari)		-29.884	-30.298	-30.685	-31.029
CH (Bern)		-0.231	-0.222	-0.216	-0.206
CRL (Tokyo)		2.620	2.653	2.690	2.689
CSAO (Lintong)		-0.563	-0.608	-0.546	-0.508
CSIR (Pretoria)	(3)	-18.240	-18.075	-17.892	-17.728
FTZ (Darmstadt)		-	-	0.048	0.088
IEN (Torino)		-0.504	-0.471	-0.456	-0.422
IFAG (Wettzell)		2.696	2.633	2.616	2.640
IGMA (Buenos Aires)		-0.36	-0.13	0.02	0.03
INPL (Jerusalem)		-0.886	-0.909	-0.913	-0.922
JATC (Lintong)		-1.154	-0.921	-0.622	-0.392
KRIS (Taejon)		-0.831	-0.684	-0.630	-0.709
LDS (Leeds)		-10.216	-11.345	-12.241	-13.338
MSL (Lower Hutt)		-3.041	-3.116	-3.076	-3.029
NAOM (Mizusawa)		-0.743	-0.815	-0.875	-0.954
NAOT (Tokyo)		-1.466	-1.566	-1.670	-1.788
NIM (Beijing)		7.70	7.64	7.61	7.56
NIST (Boulder)		-0.042	-0.019	0.008	0.031
NMC (Sofiya)		-	-	-	-
NPL (Teddington)		0.379	0.383	0.379	0.365
NPLI (New-Delhi)		-6.158	-6.054	-5.973	-5.917
NRC (Ottawa)		1.809	1.900	2.001	2.090
NRLM (Tsukuba)		0.269	0.048	-0.176	-0.405
OMH (Budapest)		-	-	-	-
ONBA (Buenos Aires)		-81.28	-83.65	-84.68	-84.62
ONRJ (Rio de Janeiro)		-1.995	-2.308	-2.257	-2.011
OP (Paris)		-0.652	-0.786	-0.694	-0.619
ORB (Bruxelles)		-0.349	-0.466	-0.535	-0.617
PKNM (Warszawa)		0.116	-0.090	-0.358	-0.282
PTB (Braunschweig)		2.869	2.884	2.891	2.890
RC (Habana)		-3.30	-3.29	-2.94	-2.97
ROA (San Fernando)		2.938	2.939	2.935	2.883
SCL (Hong Kong)	(4)	6.923	-0.018	-0.101	-0.176
SNT (Stockholm)		0.241	0.164	0.279	0.390
SO (Shanghai)		2.20	2.11	2.13	2.32
SU (Moskva)		0.077	-0.002	-0.091	-0.179
TL (Chung-Li)		-0.623	-0.798	-0.831	-0.864
TP (Praha)		-1.060	-1.066	-1.100	-1.035
TUG (Graz)		1.335	1.354	1.379	1.404
USNO (Washington DC)(USNO MC)		0.016	0.006	0.006	-0.006
VSL (Delft)		0.039	0.054	0.061	0.108

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.

			SD(ns)	
Date 1993 0hUTC	MJD	C0 (ns)	Block I	Block II
Mar 23	49069	108	12	43
Mar 24	49070	61	6	46
Mar 25	49071	42	-	45
Mar 26	49072	39	5	35
Mar 27	49073	29	8	45
Mar 28	49074	15	8	34
Mar 29	49075	7	5	45
Mar 30	49076	1	4	42
Mar 31	49077	-7	6	59
Apr 1	49078	-19	9	50
Apr 2	49079	-32	11	45
Apr 3	49080	-27	4	52
Apr 4	49081	-31	10	44
Apr 5	49082	-34	9	31
Apr 6	49083	-29	7	42
Apr 7	49084	-19	9	48
Apr 8	49085	-10	9	30
Apr 9	49086	-1	12	30
Apr 10	49087	8	4	37
Apr 11	49088	11	13	45
Apr 12	49089	13	7	57
Apr 13	49090	18	14	36
Apr 14	49091	24	10	41
Apr 15	49092	32	4	36
Apr 16	49093	42	11	49
Apr 17	49094	58	7	53
Apr 18	49095	72	5	61
Apr 19	49096	83	7	37
Apr 20	49097	88	3	41
Apr 21	49098	89	4	46
Apr 22	49099	87	6	60

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		Mar 23	Apr 2	Apr 12	Apr 22
MJD		49069	49079	49089	49099
Laboratory k		TAI-TA(k) (Unit = 1 microsecond)			
APL (Laurel)		1.582	1.582	1.613	1.610
AUS (Canberra)		-44.937	-45.114	-45.193	-45.340
CH (Bern)		-75.781	-75.853	-75.929	-76.001
CRL (Tokyo)		22.009	22.370	22.733	23.100
CSAO (Lintong)		19.919	19.787	19.763	19.715
F (Paris)		113.799	114.195	114.598	114.977
INPL (Jerusalem)		-128.507	-130.269	-132.032	-133.823
JATC (Lintong)		6.576	7.037	7.696	8.423
KRIS (Taejon)		-1.641	-1.754	-1.950	-2.279
NIM (Beijing)		-9.49	-9.52	-9.54	-9.57
NISA (Boulder)	(5)	-45097.439	-45097.796	-45098.149	-45098.506
NIST (Boulder)		-45209.241	-45209.863	-45210.480	-45211.098
NRC (Ottawa)		17.878	17.969	18.070	18.159
PTB (Braunschweig)		-360.531	-360.516	-360.509	-360.510
RC (Habana)	(6)	-318.75	-319.04	-318.91	-319.11
SO (Shanghai)		-45.39	-45.48	-45.43	-45.24
SU (Moskva)	(7)	27250.077	27249.998	27249.909	27249.821
USNO (Washington DC)	(8)	-34670.610	-34671.286	-34671.955	-34672.631

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) BEV . Time step of UTC(BEV) of - 20 µs on MJD = 49092.26

(3) CSIR. Council for Scientific and Industrial Research. Formerly DPT.

(4) SCL . Time step of UTC(SCL) of 7.600 µs on MJD = 49076.22

(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.

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)
Mar 23	49069	-13.52	0.04
Apr 2	49079	-13.68	0.04
Apr 12	49089	-13.81	0.04
Apr 22	49099	-13.94	0.10

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

Date	MJD	f(EAL)-f(TAI)
1992 Jun. 26 - 1993 Apr. 22	48799-49099	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	49039-49099	+1.2	3.0
PTB-CS2	49039-49099	-1.1	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 49039-49099 .