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BUREAU INTERNATIONAL DES POIDS ET MESURES

Circular T 65 (1993 June 24)

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	Apr 22	May 2	May 12	May 22
MJD	49099	49109	49119	49129
Laboratory k	UTC-UTC(k) (Unit = 1 microsecond)			
AOS (Borowiec)	-0.542	-0.445	-0.273	-0.547
APL (Laurel)	0.147	0.142	0.139	0.162
AUS (Canberra)	-0.006	-0.012	-0.015	-0.021
BEV (Wien)	7.99	6.89	5.80	4.81
CAO (Cagliari)	-31.029	-31.364	-31.754	-32.148
CH (Bern)	-0.206	-0.179	-0.139	-0.086
CRL (Tokyo)	2.689	2.665	2.646	2.622
CSAO (Lintong)	-0.508	-0.531	-0.530	-0.520
CSIR (Pretoria)	-17.728	-17.588	-17.492	-17.444
FTZ (Darmstadt)	0.088	0.211	0.257	0.178
IEN (Torino)	-0.422	-0.396	-0.380	-0.369
IFAG (Wettzell)	2.640	2.756	2.904	3.092
IGMA (Buenos Aires)	0.03	0.01	0.00	-0.05
INPL (Jerusalem)	-0.922	-0.916	-0.860	-0.745
JATC (Lintong)	-0.392	-0.272	-0.305	-0.267
KRIS (Taejon)	-0.709	-0.685	-0.685	-0.650
LDS (Leeds)	-13.338	-14.821	-16.336	-17.743
MSL (Lower Hutt)	-3.029	-3.089	-3.221	-3.137
NAOM (Mizusawa)	-0.954	-1.013	-1.077	-1.146
NAOT (Tokyo)	-1.788	-1.937	-2.085	-2.245
NIM (Beijing)	7.56	7.64	7.52	7.47
NIST (Boulder)	0.031	0.052	0.061	0.064
NMC (Sofiya)	-	-	-	-
NPL (Teddington)	0.365	0.352	0.336	0.317
NPLI (New-Delhi)	-5.917	-5.819	-5.741	-5.677
NRC (Ottawa)	2.090	2.201	2.331	2.456
NRLM (Tsukuba)	-0.405	-0.633	-0.852	-1.084
OMH (Budapest)	-	-	-	-
ONBA (Buenos Aires)	-84.62	-84.74	-83.96	-84.44
ONRJ (Rio de Janeiro)	-2.011	-1.916	-1.948	-2.373
OP (Paris)	-0.619	-0.482	-0.370	-0.321
ORB (Bruxelles)	-0.617	-0.722	-0.796	-0.866
PKNM (Warszawa)	-0.282	-0.088	0.145	0.353
PTB (Braunschweig)	2.890	2.891	2.885	2.890
RC (Habana)	-2.97	-3.18	-3.33	-3.47
ROA (San Fernando)	2.883	2.816	2.802	2.764
SCL (Hong Kong)	-0.176	-0.226	-0.254	-0.299
SNT (Stockholm)	0.390	0.377	0.325	0.320
SO (Shanghai)	2.32	2.28	2.26	2.26
SU (Moskva)	-0.179	-0.267	-0.343	-0.436
TL (Chung-Li)	-0.864	-0.764	-0.661	-0.670
TP (Praha)	-1.035	-1.026	-0.998	-0.984
TUG (Graz)	1.404	1.428	1.456	1.480
USNO (Washington DC)(USNO MC)	-0.006	-0.012	-0.015	-0.021
VSL (Delft)	0.108	0.159	0.229	0.250

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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 1993 0hUTC		Apr 22	May 2	May 12	May 22
MJD		49099	49109	49119	49129
Laboratory k		TAI-TA(k) (Unit = 1 microsecond)			
APL (Laurel)		1.610	1.605	1.602	1.625
AUS (Canberra)		-45.340	-45.512	-45.665	-45.755
CH (Bern)		-76.001	-76.061	-76.110	-76.148
CRL (Tokyo)		23.100	23.463	23.828	24.182
CSAO (Lintong)		19.715	19.604	19.519	19.443
F (Paris)		114.977	115.358	115.762	116.157
INPL (Jerusalem)		-133.823	-135.619	-137.391	-139.126
JATC (Lintong)		8.423	8.843	9.194	9.538
KRIS (Taejon)		-2.279	-2.565	-2.925	-3.280
NIM (Beijing)		-9.57	-9.48	-9.59	-9.61
NISA (Boulder)	(2)	-45098.506	-45098.863	-45099.214	-45099.571
NIST (Boulder)		-45211.098	-45211.716	-45212.318	-45212.939
NRC (Ottawa)		18.159	18.270	18.400	18.525
PTB (Braunschweig)		-360.510	-360.509	-360.515	-360.510
RC (Habana)	(3)	-319.11	-319.49	-319.90	-320.30
SO (Shanghai)		-45.24	-45.27	-45.32	-45.31
SU (Moskva)	(4)	27249.821	27249.733	27249.656	27249.564
USNO (Washington DC)	(5)	-34672.631	-34673.306	-34673.977	-34674.655

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

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

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

(5) 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
Apr 22	49099	87	6	60
Apr 23	49100	90	8	22
Apr 24	49101	93	4	44
Apr 25	49102	97	6	35
Apr 26	49103	96	8	45
Apr 27	49104	87	12	44
Apr 28	49105	74	4	50
Apr 29	49106	64	11	48
Apr 30	49107	57	7	54
May 1	49108	50	12	52
May 2	49109	46	4	35
May 3	49110	40	5	47
May 4	49111	28	12	65
May 5	49112	11	8	43
May 6	49113	-5	10	55
May 7	49114	-17	0	45
May 8	49115	-21	3	48
May 9	49116	-18	8	40
May 10	49117	-14	5	28
May 11	49118	-10	3	46
May 12	49119	-1	5	48
May 13	49120	14	8	61
May 14	49121	25	7	45
May 15	49122	29	5	29
May 16	49123	27	9	50
May 17	49124	23	8	39
May 18	49125	17	10	42
May 19	49126	15	5	54
May 20	49127	19	12	59
May 21	49128	24	4	55
May 22	49129	24	5	34

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)
Apr 22	49099	-13.94	0.10
May 2	49109	-14.12	0.05
May 12	49119	-14.28	0.05
May 22	49129	-14.43	0.06

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

Date	MJD	f(EAL)-f(TAI)
1993 Apr. 22 - 1993 May. 22	49099-49129	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 s of the D value.

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

Standard	Obs. period	D	s
PTB-CS1	49069-49129	-0.7	3.0
PTB-CS2	49069-49129	-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:

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

in SI second on the rotating geoid, for the two-month interval 49069-49129 .