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BIPM

BUREAU INTERNATIONAL DES POIDS ET MESURES

Circular T 63 (1993 April 27)

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	Feb 21	Mar 3	Mar 13	Mar 23
MJD	49039	49049	49059	49069
Laboratory k	UTC-UTC(k) (Unit = 1 microsecond)			
AOS (Borowiec)	2.588	2.301	1.474	0.998
APL (Laurel)	-0.035	0.013	0.081	0.124
AUS (Canberra)	0.031	0.033	0.029	0.021
BEV (Wien)	-6.09	-7.19	-8.41	-9.34
CAO (Cagliari)	-28.761	-29.133	-29.532	-29.879
CH (Bern)	-0.249	-0.237	-0.226	-0.226
CRL (Tokyo)	2.530	2.551	2.591	2.625
CSAO (Lintong)	-0.546	-0.562	-0.498	-0.558
DPT (Pretoria)	-18.605	-18.461	-18.378	-18.235
FTZ (Darmstadt)	-	-	-	-
IEN (Torino)	-0.521	-0.500	-0.502	-0.499
IFAG (Wettzell)	2.984	2.872	2.754	2.701
IGMA (Buenos Aires)	-0.94	-0.75	-0.55	-0.22
INPL (Jerusalem)	-0.697	-0.778	-0.831	-0.881
JATC (Lintong)	-1.773	-1.619	-1.316	-1.149
KRIS (Taejon)	-0.693	-0.804	-0.777	-0.826
LDS (Leeds)	-6.890	-8.047	-9.025	-10.211
MSL (Lower Hutt)	-3.337	-3.197	-3.049	-3.036
NAOM (Mizusawa)	-0.533	-0.603	-0.663	-0.738
NAOT (Tokyo)	-1.280	-1.379	-1.427	-1.461
NIM (Beijing)	7.64	7.69	7.65	7.70
NIST (Boulder)	-0.133	-0.093	-0.065	-0.037
NMC (Sofiya)	-3.84	-	-	-
NPL (Teddington)	0.375	0.383	0.377	0.384
NPLI (New-Delhi)	-6.517	-6.359	-6.272	-6.153
NRC (Ottawa)	1.478	1.595	1.696	1.814
NRLM (Tsukuba) (2)	-16.682	-17.607	-18.515	0.274
OMH (Budapest)	-	-	-	-
ONBA (Buenos Aires)	-79.04	-78.84	-79.91	-81.14
ONRJ (Rio de Janeiro)	-0.639	-1.070	-1.499	-1.990
OP (Paris)	-0.503	-0.514	-0.598	-0.647
ORB (Bruxelles)	-0.155	-0.039	-0.004	-0.344
PKNM (Warszawa)	0.093	-0.176	0.211	0.121
PTB (Braunschweig)	2.841	2.854	2.860	2.874
RC (Habana)	-3.68	-3.54	-3.45	-3.30
ROA (San Fernando)	3.025	2.951	2.921	2.943
SCL (Wan Chai)	3.417	4.599	5.785	6.928
SNT (Stockholm)	0.080	0.213	0.327	0.246
SO (Shanghai)	2.111	2.218	2.384	2.204
SU (Moskva)	0.329	0.240	0.155	0.082
TL (Chung-Li)	-0.099	-0.243	-0.415	-0.618
TP (Praha)	-1.022	-1.017	-1.037	-1.055
TUG (Graz)	1.264	1.291	1.316	1.340
USNO (Washington DC)(USNO MC)	0.031	0.033	0.029	0.021
VSL (Delft)	-0.088	-0.022	0.018	0.044

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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		Feb 21	Mar 3	Mar 13	Mar 23
MJD		49039	49049	49059	49069
Laboratory k		TAI-TA(k) (Unit = 1 microsecond)			
APL (Laurel)		1.428	1.476	1.544	1.587
AUS (Canberra)		-44.560	-44.661	-44.821	-44.932
CH (Bern)		-75.559	-75.625	-75.697	-75.776
CRL (Tokyo)		20.946	21.295	21.663	22.014
CSAO (Lintong)		20.195	20.093	20.070	19.924
F (Paris)		112.623	113.025	113.396	113.804
INPL (Jerusalem)		-123.229	-124.984	-126.732	-128.502
JATC (Lintong)		5.571	5.900	6.372	6.581
KRIS (Taejon)		-1.003	-1.194	-1.367	-1.636
NIM (Beijing)		-9.61	-9.53	-9.56	-9.48
NISA (Boulder)	(3)	-45096.383	-45096.730	-45097.082	-45097.434
NIST (Boulder)		-45207.397	-45208.007	-45208.621	-45209.236
NRC (Ottawa)		17.547	17.664	17.765	17.883
PTB (Braunschweig)		-360.559	-360.546	-360.540	-360.526
RC (Habana)	(4)	-317.99	-318.24	-318.56	-318.75
SO (Shanghai)		-45.481	-45.343	-45.184	-45.386
SU (Moskva)	(5)	27250.329	27250.240	27250.155	27250.082
USNO (Washington DC)	(6)	-34668.579	-34669.248	-34669.932	-34670.605

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) NRLM. Change of master clock on MJD = 49068.99

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

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

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

(6) 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
Feb 21	49039	32	5	35
Feb 22	49040	27	7	41
Feb 23	49041	21	12	46
Feb 24	49042	25	12	59
Feb 25	49043	40	20	48
Feb 26	49044	57	7	31
Feb 27	49045	75	5	42
Feb 28	49046	96	11	60
Mar 1	49047	117	5	23
Mar 2	49048	135	10	52
Mar 3	49049	156	15	44
Mar 4	49050	172	8	56
Mar 5	49051	185	7	50
Mar 6	49052	196	15	15
Mar 7	49053	207	5	13
Mar 8	49054	218	8	24
Mar 9	49055	224	10	41
Mar 10	49056	230	14	41
Mar 11	49057	239	14	25
Mar 12	49058	240	13	48
Mar 13	49059	237	18	44
Mar 14	49060	234	11	46
Mar 15	49061	226	17	48
Mar 16	49062	209	17	29
Mar 17	49063	192	8	47
Mar 18	49064	185	21	47
Mar 19	49065	183	6	45
Mar 20	49066	180	9	66
Mar 21	49067	174	11	59
Mar 22	49068	153	20	84
Mar 23	49069	112	12	42

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)
Feb 21	49039	-13.34	0.05
Mar 3	49049	-13.39	0.05
Mar 13	49059	-13.46	0.07
Mar 23	49069	-13.52	0.04

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

Interval of validity	f(EAL)-f(TAI)
1992 Jun. 26 - 1993 Mar. 23 (48799-49069)	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	49009-49069	+1.3	3.0
PTB-CS2	49009-49069	-0.8	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:

$$1 + 0 \times 10^{-14} \quad \text{+or-} \quad 2 \times 10^{-14}$$

in SI second on the rotating geoid, for the two-month interval 49009-49069 .