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BIPM

BUREAU INTERNATIONAL DES POIDS ET MESURES

Circular T 66 (1993 July 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 = 27 s)
(From 1993 July 1, 0hUTC, until further notice, TAI-UTC = 28 s)

Date 1993 0hUTC		May 22	Jun 1	Jun 11	Jun 21
MJD		49129	49139	49149	49159
Laboratory k		UTC-UTC(k) (Unit = 1 microsecond)			
AOS (Borowiec)		-0.554	-0.505	-0.622	-0.748
APL (Laurel)		0.155	0.249	0.311	0.261
AUS (Canberra)		-0.028	-0.038	-0.060	-0.076
BEV (Wien)		4.80	3.81	2.77	1.75
CAO (Cagliari)		-32.155	-32.407	-32.656	-32.917
CH (Bern)		-0.093	-0.041	-0.004	0.044
CRL (Tokyo)		2.615	2.594	2.570	2.595
CSAO (Lintong)		-0.527	-0.521	-0.518	-0.597
CSIR (Pretoria)		-17.451	-17.352	-17.259	-17.109
FTZ (Darmstadt)	(2)	0.171	0.322	0.184	0.295
IEN (Torino)		-0.376	-0.361	-0.361	-0.358
IFAG (Wettzell)		3.085	3.327	3.618	3.895
IGMA (Buenos Aires)		-0.06	-0.04	-0.05	-0.08
INPL (Jerusalem)		-0.752	-0.635	-0.487	-0.299
JATC (Lintong)		-0.274	-0.330	-0.377	-0.656
KRIS (Taejon)		-0.657	-0.649	-0.660	-0.598
LDS (Leeds)		-17.750	-19.367	-20.428	-21.866
MSL (Lower Hutt)		-3.144	-3.412	-3.325	-3.393
NAOM (Mizusawa)		-1.153	-1.212	-1.286	-1.339
NAOT (Tokyo)		-2.252	-2.419	-2.624	-2.817
NIM (Beijing)		7.47	7.44	7.45	7.44
NIST (Boulder)		0.057	0.055	0.034	0.008
NMC (Sofiya)		-	-	-	-
NPL (Teddington)		0.310	0.285	0.250	0.214
NPLI (New-Delhi)		-5.684	-5.602	-5.549	-5.541
NRC (Ottawa)		2.449	2.561	2.674	2.752
NRLM (Tsukuba)		-1.091	-1.313	-1.565	-1.794
OMH (Budapest)		-	-	-	-
ONBA (Buenos Aires)		-84.44	-85.56	-86.53	-87.99
ONRJ (Rio de Janeiro)		-2.380	-3.033	-3.653	-4.213
OP (Paris)		-0.328	-0.294	-0.284	-0.223
ORB (Bruxelles)		-0.873	-0.990	-0.993	-0.988
PKNM (Warszawa)		0.346	0.297	0.414	0.492
PTB (Braunschweig)		2.883	2.886	2.863	2.853
RC (Habana)		-3.48	-3.63	-3.62	-3.56
ROA (San Fernando)		2.757	2.758	2.754	2.728
SCL (Hong Kong)	(3)	-0.306	-0.336	-0.084	-0.078
SNT (Stockholm)		0.313	0.205	0.364	0.334
SO (Shanghai)		2.25	2.32	2.37	2.37
SU (Moskva)		-0.443	-0.525	-0.634	-0.733
TL (Chung-Li)		-0.677	-0.720	-0.773	-0.624
TP (Praha)		-0.991	-0.965	-0.943	-0.932
TUG (Graz)		1.473	1.498	1.510	1.529
USNO (Washington DC)	(USNO MC)	-0.028	-0.038	-0.060	-0.076
VSL (Delft)		0.243	0.302	0.383	0.449

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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		May 22	Jun 1	Jun 11	Jun 21
MJD		49129	49139	49149	49159
Laboratory k		TAI-TA(k) (Unit = 1 microsecond)			
APL (Laurel)		1.618	1.712	1.774	1.724
AUS (Canberra)		-45.762	-45.994	-46.129	-46.342
CH (Bern)		-76.155	-76.192	-76.247	-76.291
CRL (Tokyo)		24.175	24.539	24.892	25.290
CSAO (Lintong)		19.436	19.355	19.272	19.106
F (Paris)		116.150	116.540	116.896	117.260
INPL (Jerusalem)		-139.133	-140.880	-142.609	-144.302
JATC (Lintong)		9.531	9.420	9.249	8.824
KRIS (Taejon)		-3.287	-3.689	-4.090	-4.428
NIM (Beijing)		-9.62	-9.64	-9.61	-9.60
NISA (Boulder)	(4)	-45099.578	-45099.940	-45100.311	-45100.687
NIST (Boulder)		-45212.946	-45213.577	-45214.210	-45214.851
NRC (Ottawa)		18.518	18.630	18.743	18.821
PTB (Braunschweig)		-360.517	-360.514	-360.537	-360.547
RC (Habana)	(5)	-320.31	-320.81	-321.15	-321.43
SO (Shanghai)		-45.32	-45.26	-45.21	-45.21
SU (Moskva)	(6)	27249.557	27249.475	27249.366	27249.267
USNO (Washington DC)	(7)	-33674.662	-33675.345	-33676.038	-33676.729

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) FTZ . Change of master clock on MJD = 49140.52

(3) SCL . Time step of UTC(SCL) of -0.300 μs on MJD = 49146.12

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

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

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

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

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

UTC - GPS time = -8 s + C0 (until 1993 July 1, 0hUTC)
UTC - GPS time = -9 s + C0 (from 1993 July 1, 0hUTC)
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, 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
May 22	49129	18	5	34
May 23	49130	12	6	40
May 24	49131	-1	8	30
May 25	49132	-18	11	34
May 26	49133	-27	5	37
May 27	49134	-37	7	56
May 28	49135	-47	8	33
May 29	49136	-48	4	51
May 30	49137	-47	6	38
May 31	49138	-50	10	41
Jun 1	49139	-49	9	54
Jun 2	49140	-32	9	45
Jun 3	49141	-4	5	39
Jun 4	49142	19	2	42
Jun 5	49143	35	9	63
Jun 6	49144	51	5	44
Jun 7	49145	68	6	46
Jun 8	49146	80	11	44
Jun 9	49147	85	4	48
Jun 10	49148	87	10	57
Jun 11	49149	90	7	46
Jun 12	49150	104	-	-
Jun 13	49151	112	-	-
Jun 14	49152	115	5	33
Jun 15	49153	115	6	32
Jun 16	49154	114	8	36
Jun 17	49155	114	2	54
Jun 18	49156	111	6	57
Jun 19	49157	101	5	40
Jun 20	49158	86	5	52
Jun 21	49159	73	4	51

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)
May 22	49129	-14.43	0.06
Jun 1	49139	-14.62	0.05
Jun 11	49149	-14.71	0.05
Jun 21	49159	-14.81	0.04

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

Interval of validity		f(EAL)-f(TAI)
1993 Apr. 22 - 1993 Jun. 21	49099-49159	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
* LPTF-JPO	49119-49129	+11	13
PTB-CS1	49099-49159	-0.8	3.0
PTB-CS2	49099-49159	+0.6	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 49099-49159 .

* LPTF - Jet à Pompage Optique : primary frequency standard using optical pumping developed at the LPTF (Observatoire de Paris, France).