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BUREAU INTERNATIONAL DES POIDS ET MESURES

Circular T 69 (1993 October 27)

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

(From 1993 July 1, 0hUTC, TAI-UTC = 28 s)

Date 1993 0hUTC	Aug 30	Sep 9	Sep 19	Sep 29
MJD	49229	49239	49249	49259
Laboratory k	UTC-UTC(k) (Unit = 1 microsecond)			
AOS (Borowiec)	-1.388	-1.535	-1.429	-1.338
APL (Laurel)	0.376	0.450	0.525	0.598
AUS (Canberra)	-0.086	-0.074	-0.065	-0.061
BEV (Wien)	-5.84	-7.05	-8.16	-9.40
CAO (Cagliari)	-2.076	-2.278	-2.566	-2.773
CH (Bern)	0.422	0.465	0.498	0.523
CRL (Tokyo)	2.796	2.824	2.799	2.763
CSAO (Lintong)	-0.914	-0.909	-0.893	-0.854
CSIR (Pretoria)	-3.867	-3.771	-3.660	-3.559
FTZ (Darmstadt)	1.099	1.200	1.333	1.259
IEN (Torino)	-0.215	-0.197	-0.188	-0.174
IFAG (Wettzell)	4.996	4.993	5.005	5.030
IGMA (Buenos Aires)	-0.47	-0.55	-0.62	-
INPL (Jerusalem)	0.678	0.705	0.678	0.602
JATC (Lintong)	-0.782	-0.612	-0.820	-0.852
KRIS (Taejon)	0.060	-0.016	-0.071	-0.155
LDS (Leeds)	-	-	0.207	0.185
MSL (Lower Hutt)	-0.387	-0.510	-0.705	-0.760
NAOM (Mizusawa)	-1.741	-1.798	-1.831	-1.814
NAOT (Tokyo)	-4.026	-4.229	-4.391	-4.606
NIM (Beijing)	7.31	7.25	7.33	7.38
NIST (Boulder)	-0.120	-0.130	-0.140	-0.146
NMC (Sofiya)	-	-	-	-
NPL (Teddington)	0.101	0.095	0.094	0.074
NPLI (New-Delhi)	-4.979	-4.914	-4.841	-4.779
NRC (Ottawa)	3.300	3.367	3.444	3.522
NRLM (Tsukuba)	-3.633	-3.909	-4.181	-4.474
OMH (Budapest)	4.332	4.377	4.448	4.549
ONBA (Buenos Aires)	-96.71	-98.11	-99.53	-
ONRJ (Rio de Janeiro)	-7.542	-7.765	-8.176	-8.532
OP (Paris)	-0.234	-0.255	-0.264	-0.288
ORB (Bruxelles)	-1.598	-1.560	-1.545	-1.598
PKNM (Warszawa)	0.338	0.296	0.154	-0.078
PTB (Braunschweig)	2.815	2.809	2.802	2.781
RC (Habana)	-	-	-	-
ROA (San Fernando)	2.652	2.571	2.515	2.532
SCL (Hong Kong)	-1.314	-1.539	-1.754	-1.977
SNT (Stockholm)	0.443	0.509	0.445	0.499
SO (Shanghai)	2.09	2.04	2.04	2.05
SU (Moskva)	-1.420	-1.523	-1.624	-1.732
TL (Chung-Li) (2)	-1.463	-1.587	-1.804	-2.061
TP (Praha)	-1.059	-1.133	-1.182	-1.246
TUG (Graz) (3)	1.665	3.092	3.164	3.219
USNO (Washington DC)(USNO MC)	-0.086	-0.074	-0.065	-0.061
VSL (Delft)	1.359	1.514	1.602	1.707

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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		Aug 30	Sep 9	Sep 19	Sep 29
MJD		49229	49239	49249	49259
Laboratory k		TAI-TA(k) (Unit = 1 microsecond)			
APL (Laurel)		1.839	1.913	1.988	2.061
AUS (Canberra)		-47.490	-47.611	-47.804	-47.943
CH (Bern)		-76.458	-76.455	-76.462	-76.477
CRL (Tokyo)		28.133	28.539	28.960	29.366
CSAO (Lintong)		18.059	17.900	17.943	17.609
F (Paris)		119.844	120.216	120.587	120.956
INPL (Jerusalem)		-156.101	-157.806	-159.539	-161.294
JATC (Lintong)		8.522	9.015	9.146	9.295
KRIS (Taejon)		-5.950	-6.056	-6.131	-6.215
NIM (Beijing)		-9.59	-9.63	-9.53	-9.46
NISA (Boulder)	(4)	-45103.264	-45103.641	-45104.021	-45104.397
NIST (Boulder)		-45219.269	-45219.912	-45220.557	-45221.201
NRC (Ottawa)		19.369	19.436	19.513	19.591
PTB (Braunschweig)		-360.585	-360.591	-360.598	-360.619
RC (Habana)		-	-	-	-
SO (Shanghai)		-45.52	-45.60	-45.61	-45.60
SU (Moskva)	(5)	27248.580	27248.477	27248.376	27248.268
USNO (Washington DC)	(6)	-34681.532	-34682.222	-34682.913	-34683.608

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) TL . MJD UTC-UTC(TL)

49209 -1.203 µs
49219 -1.311 µs

(3) TUG . Time step of UTC(TUG) of - 1.367 µs on MJD = 49231.5 due to change of master clock.

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

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

(6) USNO. TA(USNO) designates the scale A1(MEAN) of USNO.
Erratum : add - 1000.000 µs to the published values of TAI-TA(USNO), from MJD = 49129 to MJD = 49219.

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

UTC - GPS time = -9 s + C0. 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
Aug 30	49229	-135	8	48
Aug 31	49230	-130	8	35
Sep 1	49231	-121	3	32
Sep 2	49232	-109	7	45
Sep 3	49233	-95	12	38
Sep 4	49234	-85	8	41
Sep 5	49235	-75	5	45
Sep 6	49236	-62	8	53
Sep 7	49237	-50	1	41
Sep 8	49238	-44	2	56
Sep 9	49239	-42	5	38
Sep 10	49240	-40	3	32
Sep 11	49241	-41	4	57
Sep 12	49242	-41	6	45
Sep 13	49243	-42	2	36
Sep 14	49244	-48	11	46
Sep 15	49245	-56	10	42
Sep 16	49246	-64	6	39
Sep 17	49247	-64	7	49
Sep 18	49248	-62	5	48
Sep 19	49249	-61	2	32
Sep 20	49250	-63	5	42
Sep 21	49251	-61	2	44
Sep 22	49252	-53	9	53
Sep 23	49253	-46	4	35
Sep 24	49254	-37	4	46
Sep 25	49255	-28	5	59
Sep 26	49256	-26	5	46
Sep 27	49257	-26	3	71
Sep 28	49258	-31	3	46
Sep 29	49259	-35	8	37

5 - UTC - GLONASS time.

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

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)
Aug 30	49229	-15.58	0.10
Sep 9	49239	-15.69	0.03
Sep 19	49249	-15.84	0.03
Sep 29	49259	-16.00	0.04

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

Interval of validity		f(EAL)-f(TAI)
1993 Apr. 22 - 1993 Sep. 29	49099-49259	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 σ of the D value.

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

Standard	Obs. period	D	σ
PTB-CS1	49199-49259	+0.7	3.0
PTB-CS2	49199-49259	+1.4	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:

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

in SI second on the rotating geoid, for the two-month interval 49199-49259 .