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BUREAU INTERNATIONAL DES POIDS ET MESURES

Circular T 82 (1994 November 28)

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

(From 1994 July 1, 0h UTC, TAI-UTC = 29 s)

Date 1994 0h UTC		Sep 24	Oct 4	Oct 14	Oct 24
MJD		49619	49629	49639	49649
Laboratory k		UTC-UTC(k) (Unit = 1 microsecond)			
AOS (Borowiec)		-1.245	-1.159	-1.347	-1.470
APL (Laurel)		0.786	0.776	0.757	0.759
AUS (Canberra)		-0.037	-0.080	-0.158	-0.226
BEV (Wien)		-16.48	-16.85	-17.13	-17.34
CAO (Cagliari)		-2.753	-3.046	-3.274	-3.515
CH (Bern)		-0.117	-0.121	-0.120	-0.117
CRL (Tokyo)		1.601	1.576	1.564	1.539
CSAO (Lintong)		-0.402	-0.514	-0.470	-0.456
CSIR (Pretoria)	(2)	-2.455	-2.279	-2.813	-2.816
FTZ (Darmstadt)		0.113	0.102	0.099	0.105
GUM (Warszawa)		-0.324	0.249	0.757	1.002
IEN (Torino)		0.594	0.575	0.578	0.587
IFAG (Wettzell)		-0.189	-0.436	-0.897	-1.383
IGMA (Buenos Aires)		-3.19	-3.13	-2.92	-2.78
INPL (Jerusalem)		0.022	0.122	0.232	0.282
JATC (Lintong)		0.364	0.079	0.038	0.036
KRIS (Taejon)		-0.238	-0.205	-0.167	-0.151
LDS (Leeds)		-0.526	-0.573	-0.591	-0.612
MSL (Lower Hutt)		-1.968	-2.145	-2.367	-2.428
NAOM (Mizusawa)		-1.593	-1.638	-1.654	-1.678
NAOT (Tokyo)		-2.175	-2.136	-2.070	-2.014
NIM (Beijing)		8.25	-	-	-
NIST (Boulder)		-0.019	-0.026	-0.036	-0.041
NMC (Sofiya)		-	-	-	-
NPL (Teddington)		-0.048	-0.054	-0.043	-0.043
NPLI (New-Delhi)		-	-	-	-
NRC (Ottawa)		5.773	5.689	5.593	5.514
NRLM (Tsukuba)		-12.170	-11.993	-11.828	-11.666
OMH (Budapest)		6.604	6.637	6.753	6.891
ONBA (Buenos Aires)		0.27	0.32	0.43	0.53
ONRJ (Rio de Janeiro)		-21.143	-21.425	-21.573	-21.409
OP (Paris)		-0.051	-0.061	-0.072	-0.065
ORB (Bruxelles)		-0.189	-0.226	-0.197	-0.219
PTB (Braunschweig)		2.600	2.597	2.594	2.588
RC (Habana)		-	-0.71	-0.45	-0.25
ROA (San Fernando)		1.948	1.975	2.012	2.057
SCL (Hong Kong)		-0.343	-0.480	-0.558	-0.671
SNT (Stockholm)		0.150	0.159	0.108	0.084
SO (Shanghai)		2.07	2.07	2.08	2.06
SU (Moskva)		-4.958	-5.054	-5.139	-5.230
TL (Chung-Li)		-1.843	-1.772	-1.699	-1.624
TP (Praha)		-0.895	-0.891	-0.875	-0.862
TUG (Graz)		-2.911	-2.801	-2.698	-2.595
UME (Gebze-Kocaeli)		-1.932	-2.009	-2.072	-2.134
USNO (Washington DC)(USNO MC)		-0.019	-0.014	-0.012	-0.005
VSL (Delft)		0.528	0.567	0.662	0.685

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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 1994 0h UTC		Sep 24	Oct 4	Oct 14	Oct 24
MJD		49619	49629	49639	49649
Laboratory k		TAI-TA(k) (Unit = 1 microsecond)			
APL (Laurel)		2.249	2.239	2.220	2.222
AUS (Canberra)		-54.344	-54.597	-54.861	-55.222
CH (Bern)		-72.743	-72.597	-72.446	-72.293
CRL (Tokyo)		44.361	44.797	45.238	45.668
CSAO (Lintong)		12.500	12.228	12.143	12.027
F (Paris)		134.425	134.786	135.155	135.523
INPL (Jerusalem)		-230.588	-232.551	-234.517	-236.553
JATC (Lintong)		13.559	13.542	13.695	13.786
KRIS (Taejon)		-0.088	0.065	0.143	0.229
NIM (Beijing)		-7.92	-	-	-
NISA (Boulder)	(3)	-45118.565	-45118.992	-45119.422	-45119.847
NRC (Ottawa)		23.082	23.171	23.248	23.340
PTB (Braunschweig)		-360.800	-360.803	-360.806	-360.812
RC (Habana)	(4)	-	-324.95	-324.72	-324.58
SO (Shanghai)		-45.57	-45.58	-45.58	-45.63
SU (Moskva)	(5)	27245.042	27244.946	27244.861	27244.770
USNO (Washington DC)	(6)	-34707.974	-34708.643	-34709.317	-34709.987

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) CSIR. Change of master clock on MJD = 49636.0

(3) NIST. 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) USNO. TA(USNO) designates the scale A1(MEAN) of USNO.

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

[UTC - GPS time] = -10 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, for highest elevation, are first corrected for precise satellite ephemerides and for measured ionospheric delays, and then smoothed to obtain daily values of [UTC(OP) - GPS time] at 0h UTC; daily values of C0 are derived from them using linear interpolation of [UTC - UTC(OP)].

For a given day, where N measurements are used for estimation of C0 :
- the dispersion of individual measurements is characterized by a standard deviation σ,
- the daily C0 value is characterized by the standard deviation of the mean σ/√N.

Date 1994 0h UTC	MJD	C0 (ns)	σ (ns)	σ/√N (ns)
Sep 24	49619	15	35	7
Sep 25	49620	17	47	10
Sep 26	49621	15	52	11
Sep 27	49622	7	36	8
Sep 28	49623	-1	61	13
Sep 29	49624	2	33	10
Sep 30	49625	12	65	22
Oct 1	49626	18	26	8
Oct 2	49627	16	37	12
Oct 3	49628	8	81	31
Oct 4	49629	-2	26	8
Oct 5	49630	-7	73	28
Oct 6	49631	-3	50	13
Oct 7	49632	8	45	10
Oct 8	49633	12	50	11
Oct 9	49634	9	38	8
Oct 10	49635	6	43	9
Oct 11	49636	2	46	10
Oct 12	49637	0	54	12
Oct 13	49638	3	38	8
Oct 14	49639	1	45	10
Oct 15	49640	-8	40	8
Oct 16	49641	-12	47	10
Oct 17	49642	-7	43	10
Oct 18	49643	-4	44	9
Oct 19	49644	-4	38	8
Oct 20	49645	0	40	8
Oct 21	49646	7	33	7
Oct 22	49647	14	36	7
Oct 23	49648	15	40	8
Oct 24	49649	15	35	7

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 σ of his daily GLONASS data. C1 is then derived using [UTC - GPS time] of section 4.

Date 1994 0h UTC	MJD	C1 (μs)	σ (μs)
Sep 24	49619	-16.22	0.05
Oct 4	49629	-16.16	0.04
Oct 14	49639	-16.06	0.04
Oct 24	49649	-15.97	0.04

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

Interval of validity		f(EAL)-f(TAI)
1993 Apr. 22 - 1994 Oct. 24	49099-49649	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
*	NIST-7	49629-49639	+0.6	1.0
	PTB-CS1	49589-49649	-0.6	3.0
	PTB-CS2	49589-49649	+0.7	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 49589-49649 .

* The frequencies of the primary frequency standards Cs1 from CRL, JPO from LPTF, and NIST-7 from NIST, are corrected for the black body radiation shift.