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BUREAU INTERNATIONAL DES POIDS ET MESURES

Circular T 80 (1994 September 26)

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	Jul 26	Aug 5	Aug 15	Aug 25
MJD	49559	49569	49579	49589
Laboratory k	UTC-UTC(k) (Unit = 1 microsecond)			
AOS (Borowiec)	-1.490	-1.108	-1.155	-1.492
APL (Laurel)	1.165	1.163	1.150	1.056
AUS (Canberra)	0.198	0.205	0.165	0.116
BEV (Wien)	-	-	-	-
CAO (Cagliari)	-1.379	-1.648	-1.885	-2.106
CH (Bern)	0.598	0.484	0.372	0.252
CRL (Tokyo)	1.746	1.720	1.699	1.672
CSAO (Lintong)	-0.334	-0.329	-0.343	-0.361
CSIR (Pretoria)	-4.235	-4.249	-4.110	-3.585
FTZ (Darmstadt)	0.220	0.194	0.191	0.157
GUM (Warszawa)	0.956	1.033	1.056	0.517
IEN (Torino)	0.732	0.827	0.846	0.763
IFAG (Wettzell)	2.363	2.955	3.540	3.946
IGMA (Buenos Aires)	-3.08	-3.10	-3.15	-3.17
INPL (Jerusalem)	-0.731	-0.609	-0.538	-0.390
JATC (Lintong)	-0.228	-0.535	-0.147	0.291
KRIS (Taejon)	-0.197	-0.201	-0.177	-0.189
LDS (Leeds)	-0.495	-0.484	-0.499	-0.507
MSL (Lower Hutt)	-1.099	-1.157	-1.292	-1.540
NAOM (Mizusawa)	-1.662	-1.650	-1.651	-1.633
NAOT (Tokyo)	-2.547	-2.406	-2.276	-2.141
NIM (Beijing)	8.69	8.42	8.21	8.18
NIST (Boulder)	-0.046	-0.030	-0.015	-0.008
NMC (Sofiya)	-	-	-	-
NPL (Teddington)	0.024	0.006	-0.009	-0.026
NPLI (New-Delhi)	-	-	-	-
NRC (Ottawa)	6.223	6.141	6.070	5.994
NRLM (Tsukuba)	-13.135	-12.979	-12.819	-12.666
OMH (Budapest)	6.603	6.588	6.617	6.616
ONBA (Buenos Aires)	2.67	1.95	1.51	1.03
ONRJ (Rio de Janeiro) (2)	-19.401	-19.744	-20.111	-20.418
OP (Paris)	-0.024	-0.016	-0.027	-0.029
ORB (Bruxelles)	-0.204	-0.187	-0.206	-0.184
PTB (Braunschweig)	2.671	2.652	2.639	2.627
RC (Habana)	-	-	-	-
ROA (San Fernando)	2.339	2.249	2.164	2.114
SCL (Hong Kong)	0.029	-0.047	-0.256	-0.267
SNT (Stockholm)	0.094	0.099	0.160	0.179
SO (Shanghai)	2.07	2.07	2.04	2.04
SU (Moskva)	-4.410	-4.501	-4.593	-4.685
TL (Chung-Li)	-2.282	-2.211	-2.122	-2.068
TP (Praha)	-0.987	-0.973	-0.972	-0.953
TUG (Graz)	-3.485	-3.393	-3.297	-3.200
USNO (Washington DC)(USNO MC)	0.033	0.022	0.013	0.000
VSL (Delft)	0.388	0.470	0.499	0.504

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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		Jul 26	Aug 5	Aug 15	Aug 25
MJD		49559	49569	49579	49589
Laboratory k		TAI-TA(k) (Unit = 1 microsecond)			
APL (Laurel)		2.628	2.626	2.613	2.519
AUS (Canberra)		-53.000	-53.196	-53.288	-53.532
CH (Bern)		-73.522	-73.376	-73.228	-73.088
CRL (Tokyo)		41.750	42.182	42.622	43.058
CSAO (Lintong)		13.579	13.437	13.250	13.059
F (Paris)		132.349	132.688	133.027	133.371
INPL (Jerusalem)		-218.512	-220.587	-222.690	-224.692
JATC (Lintong)		13.506	13.327	13.510	13.618
KRIS (Taejon)		-1.167	-1.001	-0.797	-0.589
NIM (Beijing)		-7.58	-7.84	-8.03	-8.04
NISA (Boulder)	(3)	-45116.041	-45116.449	-45116.864	-45117.287
NRC (Ottawa)		22.495	22.586	22.687	22.772
PTB (Braunschweig)		-360.729	-360.748	-360.761	-360.773
RC (Habana)		-	-	-	-
SO (Shanghai)		-45.53	-45.54	-45.58	-45.55
SU (Moskva)	(4)	27245.590	27245.499	27245.407	27245.315
USNO (Washington DC)	(5)	-34703.934	-34704.612	-34705.287	-34705.961

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) ONRJ.

MJD	UTC-UTC(ONRJ)
49539	-18.610
49549	-18.965

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

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

(5) 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 $\sigma/\sqrt{N}$.

Date 1994 0h UTC	MJD	C0 (ns)	σ (ns)	$\sigma/\sqrt{N}$ (ns)
Jul 26	49559	52	50	22
Jul 27	49560	39	60	19
Jul 28	49561	27	39	12
Jul 29	49562	24	38	12
Jul 30	49563	28	44	9
Jul 31	49564	31	32	7
Aug 1	49565	31	39	8
Aug 2	49566	33	39	8
Aug 3	49567	33	38	8
Aug 4	49568	35	40	11
Aug 5	49569	40	44	10
Aug 6	49570	40	48	10
Aug 7	49571	41	36	8
Aug 8	49572	43	41	9
Aug 9	49573	44	42	9
Aug 10	49574	41	42	9
Aug 11	49575	37	50	11
Aug 12	49576	39	41	9
Aug 13	49577	42	61	13
Aug 14	49578	38	54	12
Aug 15	49579	33	48	10
Aug 16	49580	28	45	10
Aug 17	49581	20	62	13
Aug 18	49582	11	31	7
Aug 19	49583	10	37	8
Aug 20	49584	10	38	8
Aug 21	49585	13	43	9
Aug 22	49586	17	42	9
Aug 23	49587	19	35	8
Aug 24	49588	22	39	8
Aug 25	49589	25	42	9

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)
Jul 26	49559	-16.85	0.07
Aug 5	49569	-16.73	0.04
Aug 15	49579	-16.67	0.04
Aug 25	49589	-16.55	0.03

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

Interval of validity		f(EAL)-f(TAI)
1993 Apr. 22 - 1994 Aug. 25	49099-49589	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	49509-49519	-1.5	1.0
PTB-CS1	49529-49589	+0.5	3.0
PTB-CS2	49529-49589	+1.6	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 49529-49589 . 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.

* NIST-7 : primary frequency standard using optical pumping, developed at NIST.