BUREAU INTERNATIONAL DES POIDS ET MESURES
ISSN 1143-1393

Circular T 182 (2003 March 19)
Circulaire T 182

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

(From 1999 January 1, 0h UTC, *TAI-UTC* = 32 s)

Date 2003 0h UTC		Jan 30	Feb 4	Feb 9	Feb 14
MJD		52669	52674	52679	52684
Laboratory *k*			[*UTC-UTC*(*k*)]/ns		
AOS (Borowiec)		-71	-78	-98	-113
AUS (Sydney)		-145	-145	-168	-168
BEV (Wien)		104	105	107	112
BIRM (Beijing)		800	-	-	-
CAO (Cagliari)		-	-	-	-
CH (Bern)		-16	-9	-5	-7
CNM (Queretaro)		136	129	123	116
CRL (Tokyo)		-18	-17	-10	-1
CSIR (Pretoria)		-	-	-	-
DLR (Oberpfaffenhofen)		-	-	-	-
DTAG (Darmstadt)		408	414	435	440
IEN (Torino)		4	10	10	7
IFAG (Wettzell)		-1781	-1828	-1837	-1827
IGMA (Buenos Aires)	(1)	-92	-93	-80	-91
INPL (Jerusalem)		-6834	-6877	-6916	-6976
IPQ (Monte de Caparica)		-	-	-	-
JATC (Lintong)		-12009	-12020	-12055	-12045
KRIS (Daejon)		-	-12	-12	-12
LDS (Leeds)		2870	2917	2945	2968
LT (Vilnius)		-223	-214	-205	-192
MSL (Lower Hutt)		-66	-78	-79	-81
NAO (Mizusawa)		-17	-16	-14	-14
NIM (Beijing)		-2616	-2611	-2613	-2617
NIMB (Bucharest)		258	238	210	187
NIMT (Bangkok)		-476	-487	-501	-526
NIST (Boulder)		2	4	7	5
NMC (Sofiya)		-2470	-2478	-2477	-2495
NMIJ (Tsukuba)		233	222	212	203
NMLS (Shah Alam)		222	218	208	181
NPL (Teddington)		33	35	37	36
NPLI (New-Delhi)		3246	3304	3348	3383
NRC (Ottawa)		47	42	45	41
NTSC (Lintong)		-13	-10	-5	-7
OMH (Budapest)		7649	7640	7659	7679
ONBA (Buenos Aires)		-679	-470	-483	-475
ONRJ (Rio de Janeiro)		5243	5254	5272	5282
OP (Paris)		-31	-37	-35	-40
ORB (Bruxelles)		-25	-20	-13	-11
PL (Warszawa)		43	50	51	56
PTB (Braunschweig)		-14	-12	-10	-8
ROA (San Fernando)		85	89	93	89
SCL (Hong Kong)		29	16	6	11
SG (Singapore)		-70	-74	-78	-82
SMU (Bratislava)		-7655	-7694	-7707	-7736
SP (Boras)		-170	-182	-174	-171
SU (Moskva)		23	21	25	25
TCC (Concepcion)		-2004	-2048	-2103	-2154
TL (Chung-Li)		-26	-36	-51	-52
TP (Praha)		-49	-45	-51	-46
UME (Gebze-Kocaeli)		-828	-836	-834	-842
USNO (Washington DC)(USNO MC)		4	5	6	4
VSL (Delft)		-34	-41	-35	-30

PAVILLON DE BRETEUIL F-92312 SÈVRES CEDEX TÉL. + 33 1 45 07 70 70 FAX + 33 1 45 34 20 21

1 - Coordinated Universal Time UTC. (Cont.)

Date 2003 0h UTC	Feb 19	Feb 24
MJD	52689	52694
Laboratory *k*	[*UTC*-*UTC*(*k*)]/ns	
AOS (Borowiec)	-113	-128
AUS (Sydney)	-163	-170
BEV (Wien)	121	124
BIRM (Beijing)	-	-
CAO (Cagliari)	-	-
CH (Bern)	-10	-11
CNM (Queretaro)	112	107
CRL (Tokyo)	4	3
CSIR (Pretoria)	-	-
DLR (Oberpfaffenhofen)	-	-
DTAG (Darmstadt)	447	435
IEN (Torino)	13	11
IFAG (Wettzell)	-1836	-1838
IGMA (Buenos Aires)	-87	-84
INPL (Jerusalem)	-7023	-7079
IPQ (Monte de Caparica)	-	-
JATC (Lintong)	-12034	-12023
KRIS (Daejon)	7	-7
LDS (Leeds)	3002	3031
LT (Vilnius)	-177	-165
MSL (Lower Hutt)	-63	-62
NAO (Mizusawa)	-14	-16
NIM (Beijing)	-2610	-2615
NIMB (Bucharest)	213	190
NIMT (Bangkok)	-555	-584
NIST (Boulder)	8	8
NMC (Sofiya)	-2504	-2514
NMIJ (Tsukuba)	197	190
NMLS (Shah Alam)	173	149
NPL (Teddington)	39	40
NPLI (New-Delhi)	3449	3497
NRC (Ottawa)	30	22
NTSC (Lintong)	-6	-14
OMH (Budapest)	7665	7673
ONBA (Buenos Aires)	-585	-705
ONRJ (Rio de Janeiro)	5288	5300
OP (Paris)	-42	-50
ORB (Bruxelles)	-6	-5
PL (Warszawa)	68	68
PTB (Braunschweig)	-5	-4
ROA (San Fernando)	98	94
SCL (Hong Kong)	10	4
SG (Singapore)	-87	-90
SMU (Bratislava)	-7754	-7760
SP (Boras)	-173	-170
SU (Moskva)	28	28
TCC (Concepcion)	-2204	-2262
TL (Chung-Li)	-40	-47
TP (Praha)	-43	-39
UME (Gebze-Kocaeli)	-849	-855
USNO (Washington DC)(USNO MC)	5	5
VSL (Delft)	-33	-31

2 - International Atomic Time TAI and local atomic time scales TA(*k*).

The following table gives the computed values of [*TAI-TA*(*k*)].

Date 2003 0h UTC		Jan 30	Feb 4	Feb 9	Feb 14
MJD		52669	52674	52679	52684
Laboratory *k*		[*TAI-TA*(*k*)]/ns			
AUS (Sydney)		-119344	-119431	-119523	-119615
CH (Bern)		28645	28821	28995	29162
CRL (Tokyo)		168496	168699	168905	169108
F (Paris)		168765	168781	168800	168812
IEN (Torino)		24699	24817	24937	25059
JATC (Lintong)		-27674	-27808	-27955	-28063
KRIS (Taejon)		-18	6071	6075	6081
NIST (Boulder)		-45245392	-45245592	-45245792	-45245996
NRC (Ottawa)		28457	28457	28464	28465
NTSC (Lintong)		-59	-59	-55	-53
PL (Warszawa)		-1151	-1156	-1168	-1179
PTB (Braunschweig)		-359624	-359617	-359610	-359603
SU (Moskva)	(2)	27241023	27241021	27241025	27241025
USNO (Washington DC)		-34902523	-34902831	-34903140	-34903452

Date 2003 0h UTC		Feb 19	Feb 24
MJD		52689	52694
Laboratory *k*		[*TAI-TA*(*k*)]/ns	
AUS (Sydney)		-119694	-119780
CH (Bern)		29329	29501
CRL (Tokyo)		169313	169514
F (Paris)		168826	168839
IEN (Torino)		25181	25297
JATC (Lintong)		-28167	-28278
KRIS (Taejon)		6092	6083
NIST (Boulder)		-45246196	-45246398
NRC (Ottawa)		28458	28454
NTSC (Lintong)		-43	-43
PL (Warszawa)		-1177	-1186
PTB (Braunschweig)		-359595	-359589
SU (Moskva)	(2)	27241028	27241028
USNO (Washington DC)		-34903762	-34904072

3 - Notes on sections 1 and 2.

(1) IGMA. Change of master clock on MJD = 52682

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

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

Interval of validity		$f(EAL)-f(TAI)$
2003 Jan. 30 - 2003 Mar. 31	52669-52729	6.980×10^{-13}
New steering correction foreseen for April 2003		
2003 Mar. 31 - 2003 Apr. 30	52729-52759	6.970×10^{-13}

5 - Duration of the TAI scale interval.

TAI is a realization of coordinate time TT. The following tables give the fractional deviation d of the scale interval of TAI from that of TT (the SI second on the geoid), i.e. the fractional frequency deviation of TAI with the opposite sign: $d = -y_{TAI}$. In this section, a frequency over a time interval is defined as the ratio of the end-point phase difference to the duration of the interval. Whenever needed, the instability of EAL should be expressed as the quadratic sum of three components:

- a white frequency noise $6.0 \times 10^{-15} / \sqrt{\tau}$,
- a flicker frequency noise 0.6×10^{-15},
- a random walk frequency noise $1.6 \times 10^{-16} \times \sqrt{\tau}$,

with τ in days. The relation between EAL and TAI is given in *Circular T* and the *Annual Report of the BIPM Time Section*.

In the first table, d is obtained, on the given periods of estimation by comparison of the TAI frequency with that of the given individual primary standards (PFS). In this table

- u_B is the combined uncertainty from systematic effects,
- Ref(u_B) is a reference giving information on the stated value of u_B or is the *Circular T* where this reference was first given,
- u_A is the uncertainty originating in the instability of the PFS,
- $u_{l/lab}$ is the uncertainty in the link between the PFS and the clock participating to TAI,
- $u_{l/TAI}$ is the uncertainty in the link to TAI,
- u is the quadratic sum of all four uncertainty values.

Standard	Period of estimation	$10^{15}d$	$10^{15}u_B$	Ref(u_B)	$10^{15}u_A$	$10^{15}u_{l/lab}$	$10^{15}u_{l/TAI}$	Notes	$10^{15}u$
SYRTE-JPO	52664-52694	5.8	8.	T160	1.7	0.3	1.		8.2
PTB CS1	52669-52694	-1.2	8.	T148	5.	0.	1.	(1)	9.
PTB CS2	52669-52694	0.6	12.	T148	3.	0.	1.	(1)	12.
NIST-F1	52679-52694	11.1	0.7	[1]	1.2	0.3	2.	(2)	2.5

[1] Jefferts S.R. et al., *Metrologia*, 2002, 39, 321-336.

Notes:

(1) Continuously operating as a clock participating to TAI.
(2) Report 26 February 2003 by NIST.

The second table gives the BIPM estimate of d, based on measurements of CRL-O1, SYRTE-JPO, NIST-F1, PTB CS1, PTB CS2 and PTBCSF1 over the period MJD 52304-52694, taking into account their individual uncertainties and characterizing the instability of EAL as noted above. u is the computed standard uncertainty of d.

Period of estimation	d	u
52669-52694	$+8.4 \times 10^{-15}$	1.9×10^{-15}

6 - [*UTC-GPS time*] and [*TAI-GPS time*].

[*UTC-GPS time*] = -13 s + C_0, [*TAI-GPS time*] = 19 s + C_0.

Daily values of C_0 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 C_0 are derived from them using linear interpolation of [*UTC-UTC*(*OP*)].
The global uncertainty of daily C_0 values is of order 10 ns.

In the following table, the standard deviation σ characterizes the dispersion of individual measurements, and N is the number of measurements used on a given day for estimation of the corresponding daily C_0 value.

Date 2003 0h UTC	MJD	C_0/ns	σ/ns	$(\sigma/\sqrt{N})$/ns
Jan 30	52669	-2	3	0
Jan 31	52670	-1	3	1
Feb 1	52671	1	3	0
Feb 2	52672	1	3	0
Feb 3	52673	-1	3	0
Feb 4	52674	-1	3	0
Feb 5	52675	-2	4	1
Feb 6	52676	-3	3	0
Feb 7	52677	-4	3	0
Feb 8	52678	0	2	0
Feb 9	52679	1	3	0
Feb 10	52680	-2	3	0
Feb 11	52681	-2	3	0
Feb 12	52682	-4	3	0
Feb 13	52683	-5	2	0
Feb 14	52684	-4	3	0
Feb 15	52685	-5	3	0
Feb 16	52686	-5	3	0
Feb 17	52687	-1	3	0
Feb 18	52688	-5	3	0
Feb 19	52689	-4	3	0
Feb 20	52690	-4	3	0
Feb 21	52691	-2	3	0
Feb 22	52692	-2	3	0
Feb 23	52693	1	3	0
Feb 24	52694	0	3	0

7 - [*UTC-GLONASS time*] and [*TAI-GLONASS time*].

[*UTC-GLONASS time*] = 0 s + C_1, [*TAI-GLONASS time*] = +32 s + C_1.

Daily values of C_1 are given in the following table. They are obtained as follows: the GLONASS data taken at the NMi Van Swinden Laboratorium, Delft, The Netherlands, for highest elevation, are smoothed to obtain daily values of [*UTC*(*VSL*)-*GLONASS time*] at 0h UTC; daily values of C_1 are then derived from them using linear interpolation of [*UTC-UTC*(*VSL*)]. The global uncertainty of daily C_1 values is of order several hundreds of nanoseconds.

In the following table, the standard deviation σ characterizes the dispersion of individual measurements, and N is the number of measurements used on a given day for estimation of the corresponding daily C_1 value.

Date 2003 0h UTC	MJD	C_1/ns	σ/ns	$(\sigma/\sqrt{N})$/ns
Jan 30	52669	55	38	12
Jan 31	52670	58	29	9
Feb 1	52671	86	20	6
Feb 2	52672	75	40	13
Feb 3	52673	77	60	19
Feb 4	52674	62	22	7
Feb 5	52675	100	15	5
Feb 6	52676	150	18	6
Feb 7	52677	150	12	4
Feb 8	52678	165	30	9
Feb 9	52679	137	45	14
Feb 10	52680	110	32	10
Feb 11	52681	128	24	7
Feb 12	52682	161	37	12
Feb 13	52683	163	30	10
Feb 14	52684	200	12	4
Feb 15	52685	206	22	7
Feb 16	52686	204	40	13
Feb 17	52687	210	39	12
Feb 18	52688	191	36	11
Feb 19	52689	175	18	6
Feb 20	52690	184	26	8
Feb 21	52691	210	15	5
Feb 22	52692	241	6	2
Feb 23	52693	234	13	4
Feb 24	52694	210	37	12