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BUREAU INTERNATIONAL DES POIDS ET MESURES
ORGANISATION INTERGOUVERNEMENTALE DE LA CONVENTION DU METRE
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1 - Coordinated Universal Time UTC and its local realizations UTC(k). Computed values of [*UTC-UTC*(*k*)].
From 1999 January 1, 0h UTC, *TAI-UTC* = 32 s.

Date 2004 0h UTC	MAR 30	APR 4	APR 9	APR 14	APR 19	APR 24	APR 29	
MJD	53094	53099	53104	53109	53114	53119	53124	
Laboratory *k*				[*UTC-UTC*(*k*)]/ns				
AOS (Borowiec)	-72.9	-81.8	-91.8	-95.9	-89.1	-87.8	-84.1	
APL (Laurel)	4.1	17.2	18.4	15.0	9.8	4.0	-0.9	
AUS (Sydney)	-425.1	-426.5	-439.1	-449.0	-448.0	-451.9	-449.5	
BEV (Wien)	90.6	93.6	93.2	92.0	-11.1	-12.4	-6.3	(1)
BIRM (Beijing)	1868.6	1891.3	1905.0	1928.3	1949.8	1957.1	1952.6	
CAO (Cagliari)	-3928.3	-3916.5	-3907.8	-3883.0	-3867.3	-3870.3	-3851.0	
CH (Bern)	6.8	0.3	-6.1	-11.3	-9.5	-3.1	2.9	
CNM (Queretaro)	14.6	10.9	7.5	4.9	4.4	0.6	2.2	
CNMP (Panama)	-2905.7	-2946.9	-3019.8	-3066.5	-3113.0	-3178.7	-3244.0	
CSIR (Pretoria)	2130.9	2060.7	1993.6	1905.4	1841.2	1778.4	1715.8	
DLR (Oberpfaffenhofen)	30.8	39.6	45.9	42.5	43.4	52.4	49.7	
DTAG (Darmstadt)	205.0	204.3	208.9	209.9	216.4	226.6	222.7	
HKO (Hong Kong)	-	1323.0	1402.5	1473.6	1549.7	1620.7	1694.1	(2)
IEN (Torino)	-8.9	-5.3	2.8	2.7	8.8	17.4	18.2	
IFAG (Wettzell)	-2836.9	-2851.2	-2863.5	-2880.8	-2890.2	-2903.9	-2910.0	
IGMA (Buenos Aires)	-91.1	-99.3	-95.7	-101.0	-108.6	-105.7	-97.9	
INPL (Jerusalem)	-9669.8	-9686.6	-9702.2	-9723.0	-9747.7	-9768.0	-9795.3	
JATC (Lintong)	-11013.0	-11014.8	-11007.2	-10995.4	-10984.5	-10977.4	-10969.7	
JV (Kjeller)	-9401.0	-9466.4	-9336.9	-9269.6	-9273.2	-9219.7	-9202.0	
KRIS (Daejon)	-11.7	-7.0	-7.4	-4.8	-2.9	-2.7	-2.0	
LDS (Leeds)	5234.9	5263.8	5291.7	-	272.4	309.2	345.2	
LT (Vilnius)	158.4	152.9	134.6	138.3	159.4	165.4	163.4	
MSL (Lower Hutt)	13.2	7.1	11.9	22.8	15.5	21.4	45.2	
NAO (Mizusawa)	-131.2	-134.7	-147.9	-150.2	-161.0	-169.8	-165.6	
NICT (Tokyo)	2.8	4.5	7.4	7.3	10.3	17.3	15.7	(3)
NIM (Beijing)	-2658.8	-2662.9	-2662.4	-2658.8	-2663.8	-2668.7	-2665.3	
NIMB (Bucharest)	-317.3	-305.0	-319.4	-321.7	-325.2	-339.0	-312.9	
NIMT (Bangkok)	-1031.0	-1046.6	-1061.7	-1079.9	-1107.8	-1127.7	-1154.9	
NIST (Boulder)	6.2	6.7	7.5	6.9	7.3	7.5	10.3	
NMC (Sofiya)	-3771.7	-3787.3	-3806.3	-3790.2	-3826.8	-3844.9	-3858.5	

Date 2004 0h UTC	MAR 30	APR 4	APR 9	APR 14	APR 19	APR 24	APR 29
MJD	53094	53099	53104	53109	53114	53119	53124
Laboratory *k*				[*UTC*-*UTC*(*k*)]/ns			
NMIJ (Tsukuba)	126.1	138.5	147.5	145.7	146.6	142.2	144.3
NMLS (Shah Alam)	406.6	-	-	-	-	-	-
NPL (Teddington)	45.9	46.2	46.8	46.7	48.4	49.5	53.2
NPLI (New-Delhi)	6954.7	6987.3	7037.5	7086.8	7144.5	7211.9	7255.8
NRC (Ottawa)	21.7	32.0	36.7	42.2	43.6	34.6	32.7
NTSC (Lintong)	-23.9	-32.4	-35.3	-40.5	-41.2	-35.8	-37.7
OMH (Budapest)	8957.1	8951.4	8963.5	8977.8	8994.4	9027.1	9032.0
ONBA (Buenos Aires)	-164.0	-	-	-	-	-	-370.2
ONRJ (Rio de Janeiro)	4173.1	4043.2	3913.3	3745.1	3574.4	3404.8	3200.4
OP (Paris)	22.4	23.7	23.5	23.5	20.9	18.7	17.4
ORB (Bruxelles)	-43.6	-42.2	-39.1	-34.7	-33.4	-31.7	-28.6
PL (Warszawa)	-141.0	-134.7	-134.3	-130.0	-132.9	-126.2	-120.9
PTB (Braunschweig)	-18.9	-17.8	-22.5	-21.5	-26.5	-30.8	-34.2
ROA (San Fernando)	-10.9	-13.8	-6.4	-10.1	-4.2	-11.9	-12.2
SCL (Hong Kong)	-13.0	-13.9	-6.6	-10.4	-6.8	-5.3	3.0
SG (Singapore)	98.8	91.6	84.6	86.7	78.0	62.3	49.7
SMU (Bratislava)	-9703.9	-9726.0	-9742.6	-9761.2	-9770.3	-9833.3	-9875.9
SP (Boras)	262.8	257.2	257.1	269.7	278.9	284.2	298.8
SU (Moskva)	-22.6	-24.8	-21.5	-21.3	-20.5	-16.8	-12.8
TCC (Concepcion)	-6613.7	-6676.4	-6731.8	-6805.6	-6871.3	-6911.1	-6981.4
TL (Chung-Li)	36.4	42.1	37.3	31.5	30.2	30.5	28.0
TP (Praha)	25.9	23.3	26.8	28.5	28.1	34.3	33.4
UME (Gebze-Kocaeli)	153.1	160.1	169.6	174.3	183.2	188.8	213.9
USNO (Washington DC)	-0.7	-1.9	-3.1	-4.8	-6.6	-5.8	-5.2
VSL (Delft)	-22.8	-10.2	-5.7	1.7	8.9	12.2	20.3

- Notes on section 1:

(1) BEV : Time step of UTC(BEV) of 100 ns on MJD = 53110.38
(2) HKO : Hong Kong Observatory, Hong Kong (China).
(3) NICT: National Institute of Information and Communications Technology, Tokyo (Japan), formerly CRL.

2 - International Atomic Time TAI and Local atomic time scales TA(k). Computed values of [*TAI*-*TA*(*k*)].

Date 2004 0h UTC	MAR 30	APR 4	APR 9	APR 14	APR 19	APR 24	APR 29	
MJD	53094	53099	53104	53109	53114	53119	53124	
Laboratory *k*				[*TAI*-*TA*(*k*)]/ns				
CH (Bern)	42167.0	42297.2	42427.6	42559.1	42697.6	42830.8	42963.5	
F (Paris)	169340.1	169335.0	169328.2	169324.4	169319.5	169313.6	169311.8	
IEN (Torino)	34912.7	35032.1	35156.1	35283.8	35411.3	35536.4	35655.3	
JATC (Lintong)	-34511.0	-34551.8	-34602.2	-34650.4	-34695.5	-34739.4	-34787.7	
KRIS (Taejon)	6972.0	6999.2	7021.2	7046.2	7070.5	7093.6	7117.2	
NICT (Tokyo)	185680.9	185883.7	186085.8	186288.1	186491.9	186700.0	186906.1	
NIST (Boulder)	-45262249.6	-45262446.1	-45262642.3	-45262839.9	-45263036.3	-45263232.4	-45263425.8	
NRC (Ottawa)	28799.2	28813.6	28822.7	28832.6	28838.1	28833.7	28836.1	
NTSC (Lintong)	452.6	452.7	456.6	462.1	469.4	477.7	481.5	
PL (Warszawa)	-2234.0	-2244.7	-2257.3	-2266.0	-2275.9	-2288.2	-2298.9	
PTB (Braunschweig)	-359204.0	-359198.0	-359197.6	-359191.5	-359191.5	-359190.8	-359189.4	
SU (Moskva)	27240977.4	27240975.2	27240978.5	27240978.7	27240979.5	27240983.2	27240987.2	(1)
USNO (Washington DC)	-34928797.4	-34929106.1	-34929414.3	-34929722.7	-34930031.0	-34930337.5	-34930644.5	

- Note on section 2:

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

3 - Difference between the normalized frequencies of EAL (free atomic time scale) and TAI.

	Interval of validity	*f*(*EAL*)-*f*(*TAI*)	
Steering correction	53094 - 53154	6.920×10^{-13}	(2004 MAR 30 - 2004 MAY 29)
New correction foreseen	53154 - 53184	6.910×10^{-13}	(2004 MAY 29 - 2004 JUN 28)

4 - 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 with τ in days: (1) a white frequency noise of $6.0 \times 10^{-15} / \sqrt{\tau}$, (2) a flicker frequency noise of 0.6×10^{-15} and (3) a random walk frequency noise of $1.6 \times 10^{-16} \times \sqrt{\tau}$. 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 Frequency Standards (PFS). In this table: u_A is the uncertainty originating in the instability of the PFS, 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, $u_{1/lab}$ is the uncertainty in the link between the PFS and the clock participating to TAI, including the uncertainty due to the dead-time, $u_{1/TAI}$ is the uncertainty in the link to TAI, u is the quadratic sum of all four uncertainty values. All values are expressed in 10^{-15}.

Standard	Period of Estimation	d	u_A	u_B	Ref(u_B)	$u_{1/Lab}$	$u_{1/Tai}$	u	Note
PTB-CS1	53094 53124	6.4	5.0	8.0	T148	0.0	1.0	9.5	(1)
PTB-CS2	53094 53124	11.6	3.0	12.0	T148	0.0	1.0	12.4	(1)

Note:
(1) Continuously operating as a clock participating to TAI.

The second table gives the BIPM estimate of d, based on all available PFS measurements over the period MJD 52734-53124, 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	
53094-53124	6.4×10^{-15}	2.7×10^{-15}	(2004 MAR 30 - 2004 APR 29)

5 - Relations of UTC and TAI with GPS time and GLONASS time.

[UTC-GPS time] = -13 s + C_0, [TAI-GPS time] = 19 s + C_0, global uncertainty is of order 10 ns.
[*UTC-GLONASS time*] = 0 s + C_1, [*TAI-GLONASS time*] = 32 s + C_1, global uncertainty is of order hundreds ns.

The C_0 values are obtained using the values [*UTC-UTC*(*OP*)] and the GPS data taken at the Paris Observatory, corrected for IGS precise orbits, clocks and ionosphere maps. The C_1 values are obtained using the values [*UTC-UTC*(*VSL*)] and the GLONASS data taken at the NMi Van Swinden Laboratorium (VSL). N_0 and N_1 are the numbers of measurements. The standard deviations σ_0 and σ_1 characterize the dispersion of individual measurements. The actual uncertainty of user's access to GPS and GLONASS times may differ from these values.
For this circular, σ_0 = 2.0 ns, σ_1 = 28.0 ns

Date 2004	0h UTC	MJD	C_0/ns	N_0	C_1/ns	N_1
MAR	30	53094	-8.7	27	212.1	74
MAR	31	53095	-9.1	41	213.6	69
APR	1	53096	-9.2	40	212.5	30
APR	2	53097	-13.2	45	195.6	22
APR	3	53098	-14.7	47	191.4	0
APR	4	53099	-16.3	45	195.6	36
APR	5	53100	-12.7	47	188.7	73
APR	6	53101	-11.3	46	180.4	70
APR	7	53102	-13.4	48	182.0	75
APR	8	53103	-12.4	47	215.0	71
APR	9	53104	-13.2	47	230.3	72
APR	10	53105	-10.7	47	199.9	62
APR	11	53106	-11.8	47	185.6	71
APR	12	53107	-12.3	47	180.8	72
APR	13	53108	-12.8	45	182.4	59
APR	14	53109	-15.6	40	196.8	49
APR	15	53110	-15.0	48	178.6	49
APR	16	53111	-16.6	45	186.2	61
APR	17	53112	-17.6	47	221.3	67
APR	18	53113	-19.5	46	230.2	66
APR	19	53114	-22.0	48	220.2	68
APR	20	53115	-19.9	46	219.4	55
APR	21	53116	-16.7	46	226.0	54
APR	22	53117	-17.8	45	231.4	68
APR	23	53118	-17.4	45	244.8	60
APR	24	53119	-20.1	45	258.2	62
APR	25	53120	-19.6	45	256.9	59
APR	26	53121	-18.0	45	259.2	47
APR	27	53122	-18.3	46	281.3	53
APR	28	53123	-16.4	46	300.7	23
APR	29	53124	-12.3	35	299.1	21

6 - Time links used for the computation of TAI and their uncertainties.

The time links used in the elaboration of this Circular T are listed in this section. The technique for the link is indicated as follows: GPS SC for GPS common-view single-channel C/A data; GPS MC for GPS common-view multi-channel C/A data; GPS P3 for GPS common-view multi-channel dual-frequency P code data; GPS GT for 'GPS time' observations; INT LK for internal cable link and TWSTFT for two-way satellite time and frequency transfer data.

For each link, the following uncertainties are provided: u_A is the statistical uncertainty evaluated by taking into account the level of phase noise in the raw data, the interpolation interval between data points and the effects with typical duration between 5 and 30 days. u_B is the uncertainty on the calibration, estimated by the BIPM.

The calibration type of the link is indicated as: GPS EC for GPS equipment calibration; TW EC for two-way equipment calibration; LC (technique) for a link calibrated using 'technique'; BC (technique) for a link calibrated using 'technique' to transfer a past equipment calibration through a discontinuity of link operation.

The calibration dates indicate: the most recent calibration results for the two laboratories in the case of EC and
the most recent calibration of the link in the case of LC and BC,
NA stands for not available, in this case estimated values are provided

Link	Type	u_A/ns	u_B/ns	Calibration Type	Calibration Dates
AOS /PTB	GPS MC	1.5	5.0	GPS EC /GPS EC	2003 Sep/2003 Aug
APL /USNO	GPS MC	1.5	5.0	GPS EC /GPS EC	2003 Dec/2003 Dec
AUS /NICT	GPS MC	3.0	5.0	GPS EC/GPS EC	2002 Sep/2003 Nov
BEV /PTB	GPS MC	1.5	5.0	GPS EC/GPS EC	2001 Dec/2003 Aug
BIRM/NICT	GPS MC	2.5	20.0	NA /GPS EC	NA /2003 Nov
CAO /PTB	GPS SC	7.0	20.0	NA /GPS EC	NA /2003 Aug
CH /PTB	GPS SC	2.5	5.0	GPS EC/GPS EC	2004 Jan/2003 Aug
CNM /NIST	GPS SC	5.0	20.0	NA /GPS EC	NA /2003 Dec
CNMP/USNO	GPS MC	4.0	7.0	GPS EC/GPS EC	2002 Oct/2003 Dec
CSIR/PTB	GPS MC	3.0	20.0	NA /GPS EC	NA /2003 Aug
DLR /PTB	GPS P3	0.7	5.0	GPS EC/GPS EC	2003 Apr/2003 Aug
DTAG/PTB	GPS SC	3.0	10.0	GPS EC/GPS EC	1998 May/2003 Aug
HKO /NICT	GPS MC	3.0	20.0	NA /GPS EC	NA /2003 Nov
IEN /PTB	TWSTFT	1.0	1.0	LC (TWSTFT)	2003 Jun
IFAG/PTB	GPS P3	0.7	5.0	GPS EC/GPS EC	2003 Jun/2003 Aug
IGMA/NIST	GPS GT	5.0	20.0	NA /GPS EC	NA /2003 Dec
INPL/PTB	GPS SC	4.0	10.0	GPS EC/GPS EC	1987 Jun/2003 Jun
JATC/NTSC	INT LK	0.2	20.0	NA	NA
JV /PTB	GPS GT	5.0	20.0	NA /GPS EC	NA /2003 Aug
KRIS/NICT	GPS MC	2.5	5.0	GPS EC/GPS EC	2003 Oct/2003 Nov

Link	Type	u_A/ns	u_B/ns	Calibration Type	Calibration Dates
LDS /PTB	GPS SC	3.0	20.0	NA /GPS EC	NA /2003 Aug
LT /PTB	GPS MC	1.5	5.0	GPS EC/GPS EC	2001 Nov/2003 Aug
MSL /NICT	GPS MC	3.0	20.0	NA /GPS EC	NA /2003 Nov
NAO /NICT	GPS SC	3.0	20.0	NA /GPS EC	NA /2003 Nov
NICT/PTB	GPS MC	2.0	5.0	GPS EC/GPS EC	2003 Nov/2003 Aug
NIM /NICT	GPS SC	3.0	20.0	NA /GPS EC	NA /2003 Nov
NIMB/PTB	GPS SC	15.0	20.0	NA /GPS EC	NA /2003 Aug
NIMT/NICT	GPS MC	3.0	20.0	NA /GPS EC	NA /2003 Nov
NIST/PTB	TWSTFT	0.5	5.0	LC(GPS SC)	2003 Sep
NMC /PTB	GPS GT	5.0	20.0	NA /GPS EC	NA /2003 Aug
NMIJ/NICT	GPS SC	2.5	5.0	GPS EC/GPS EC	2002 Apr/2003 Oct
NMLS/NICT	GPS MC	3.0	20.0	NA /GPS EC	NA /2003 Nov
NPL /PTB	TWSTFT	0.5	5.0	LC(GPS SC)	1999 Nov
NPLI/PTB	GPS SC	3.0	20.0	NA /GPS EC	NA /2003 Aug
NRC /USNO	GPS SC	3.0	15.0	GPS EC/GPS EC	1982 /2003 Dec
NTSC/NICT	TWSTFT	1.5	5.0	LC(GPS SC)	2001 Oct
OMH /PTB	GPS SC	2.5	20.0	NA /GPS EC	NA /2003 Aug
ONBA/USNO	GPS MC	5.0	7.0	GPS EC/GPS EC	2000 Oct/2003 Dec
ONRJ/NIST	GPS SC	5.0	20.0	NA /GPS EC	NA /2003 Dec
OP /PTB	GPS SC	2.5	5.0	GPS EC/GPS EC	2004 Jan/2003 Aug
ORB /PTB	GPS P3	0.7	5.0	GPS EC/GPS EC	2003 Jul/2003 Aug
PL /PTB	GPS MC	1.5	5.0	GPS EC/GPS EC	2001 Oct/2003 Aug
ROA /PTB	TWSTFT	1.0	5.0	LC(GPS SC)	2001 Dec
SCL /NICT	GPS SC	4.0	10.0	GPS EC/GPS EC	1993 May/2003 Nov
SG /NICT	GPS MC	3.0	20.0	NA /GPS EC	NA /2003 Nov
SMU /PTB	GPS SC	5.0	20.0	NA /GPS EC	NA /2003 Aug
SP /PTB	GPS SC	3.0	10.0	GPS EC/GPS EC	1997 Oct/2003 Aug
SU /PTB	GPS SC	3.0	5.0	GPS EC/GPS EC	2003 Apr/2003 Aug
TCC /NIST	GPS SC	5.0	20.0	NA /GPS EC	NA /2003 Dec
TL /NICT	TWSTFT	1.5	5.0	LC(GPS SC)	2001 Oct
TP /PTB	GPS SC	2.5	5.0	GPS EC/GPS EC	2001 Oct/2003 Aug
UME /PTB	GPS SC	15.0	20.0	NA /GPS EC	NA /2003 Aug
USNO/PTB	TWSTFT	0.5	3.0	BC(GPS P3)	2003 Sep
VSL /PTB	TWSTFT	1.0	5.0	LC(GPS SC)	1999 Dec