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BUREAU INTERNATIONAL DES POIDS ET MESURES
ORGANISATION INTERNATIONALE 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 2003 0h UTC	MAR 31	APR 5	APR 10	APR 15	APR 20	APR 25	APR 30	
MJD	52729	52734	52739	52744	52749	52754	52759	
Laboratory *k*				[*UTC-UTC*(*k*)]/ns				
AOS (Borowiec)	-202.7	-206.9	-225.2	-234.4	-247.1	-250.2	-266.4	
AUS (Sydney)	-201.2	-217.0	-218.0	-220.3	-213.6	-217.8	-238.2	
BEV (Wien)	-13.5	-16.0	-14.9	-16.7	-15.5	-22.5	-20.1	
BIRM (Beijing)	890.5	907.0	922.2	925.5	931.0	942.1	-	
CAO (Cagliari)	-	-	-	-	-	-4005.4	-4011.8	
CH (Bern)	-1.2	-3.3	-7.6	-3.1	-0.3	-8.4	2.5	
CNM (Queretaro)	93.8	81.4	81.1	82.0	80.5	77.0	63.8	
CRL (Tokyo)	7.7	7.5	9.2	5.6	2.2	4.5	8.9	
CSIR (Pretoria)	-	-	-	-	-	-	-	
DLR (Oberpfaffenhofen)	-	-	-	-	-	-	-	
DTAG (Darmstadt)	485.6	487.6	471.4	468.9	458.4	429.9	425.8	
IEN (Torino)	0.1	8.2	11.7	20.5	26.7	37.6	50.2	
IFAG (Wettzell)	-1914.2	-1901.1	-1913.5	-1930.3	-1940.1	-1958.4	-1982.4	(1)
IGMA (Buenos Aires)	-82.2	-91.0	-91.3	-95.8	-92.6	-93.7	-91.0	
INPL (Jerusalem)	-7418.5	-7461.2	-7500.2	-7533.4	-7563.1	-7583.1	-7611.4	
IPQ (Monte de Caparica)	-	-	-	-	-	-	-	
JATC (Lintong)	-11936.7	-11912.5	-11888.5	-11877.1	-11862.5	-11856.6	-11829.8	
JV (Kjeller)	-6155.2	-6257.1	-6390.5	-6502.0	-6627.3	-6782.5	-6908.3	
KRIS (Daejon)	-22.5	-38.1	-48.1	-60.2	-53.9	-41.7	-53.2	
LDS (Leeds)	3213.3	3242.0	3265.1	3279.3	3290.3	3318.2	3340.7	
LT (Vilnius)	-169.0	-161.6	-176.0	-183.2	-173.8	-157.9	-172.1	
MSL (Lower Hutt)	-40.3	-24.4	14.9	50.7	50.9	61.1	81.4	
NAO (Mizusawa)	2.4	1.2	-2.1	-9.8	-18.1	-14.0	-10.5	
NIM (Beijing)	-2617.3	-2625.5	-2624.0	-2626.5	-2618.3	-2626.6	-2623.5	
NIMB (Bucharest)	83.8	39.5	63.2	32.9	17.0	32.1	11.6	

Date 2003 0h UTC	MAR 31	APR 5	APR 10	APR 15	APR 20	APR 25	APR 30	
MJD	52729	52734	52739	52744	52749	52754	52759	
Laboratory *k*				[*UTC*-*UTC*(*k*)]/ns				
NIMT (Bangkok)	-745.3	-775.1	-795.0	-812.3	-828.5	-865.2	-893.3	
NIST (Boulder)	10.8	10.7	10.9	10.9	10.7	10.0	8.9	
NMC (Sofiya)	-2574.2	-2615.0	-2631.3	-2639.8	-2645.5	-2655.0	-2685.5	
NMIJ (Tsukuba)	151.4	149.0	143.1	133.4	111.1	100.8	89.2	
NMLS (Shah Alam)	15.3	31.9	288.7	299.2	301.4	300.6	281.6	(2)
NPL (Teddington)	42.8	37.1	36.3	34.3	32.0	32.1	31.6	
NPLI (New-Delhi)	3795.7	3852.8	3887.1	3942.7	4001.3	4040.4	4093.1	
NRC (Ottawa)	23.0	32.7	31.1	31.9	27.7	19.9	9.0	
NTSC (Lintong)	-23.6	-25.3	-19.3	-23.6	-28.1	-18.2	-6.1	
OMH (Budapest)	7761.1	7761.9	7758.1	7767.1	7775.6	7787.5	7808.6	
ONBA (Buenos Aires)	-570.6	-532.9	-491.5	-563.8	-526.8	-480.9	-450.9	
ONRJ (Rio de Janeiro)	5396.6	5391.4	5403.5	5414.6	5413.2	5434.4	5435.0	
OP (Paris)	-5.3	5.4	8.5	16.7	17.6	19.5	18.9	
ORB (Bruxelles)	-13.0	-15.1	-19.8	-20.8	-25.5	-29.5	-30.7	
PL (Warszawa)	121.4	128.4	136.4	145.1	141.3	137.7	124.1	
PTB (Braunschweig)	0.8	1.9	4.2	6.7	5.1	4.4	9.2	
ROA (San Fernando)	86.8	85.0	81.0	82.7	83.4	83.3	85.3	
SCL (Hong Kong)	-32.4	-25.7	-27.7	-39.0	-42.1	-39.8	-41.2	
SG (Singapore)	0.7	46.2	93.0	142.9	192.0	244.2	282.7	
SMU (Bratislava)	-7893.1	-7914.7	-7949.8	-7956.3	-7978.4	-7998.2	-8023.5	
SP (Boras)	-166.5	-163.1	-161.3	-161.0	-159.5	-157.4	-147.9	
SU (Moskva)	28.8	47.3	25.8	31.5	42.6	42.4	40.1	
TCC (Concepcion)	-2630.5	-2649.9	-2718.4	-2761.1	-2816.9	-2886.9	-2957.7	
TL (Chung-Li)	-54.1	-56.5	-48.2	-54.2	-57.4	-55.0	-54.9	
TP (Praha)	-35.5	-42.1	-36.6	-45.3	-40.5	-37.3	-24.5	
UME (Gebze-Kocaeli)	-926.8	-941.0	-945.6	-948.9	-962.8	-962.8	-967.4	
USNO (Washington DC)	3.0	2.0	0.9	-0.1	0.1	-0.2	-0.6	
VSL (Delft)	-8.8	-7.4	-3.4	-2.5	-7.7	-5.4	-5.9	

- Notes on section 1:

(1) IFAG: Change of master clock on MJD = 52729.5
(2) NMLS: Apparent time step of *UTC* - *UTC*(*NMLS*) between MJD = 52734 and MJD = 52739

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

Date 2003 0h UTC	MAR 31	APR 5	APR 10	APR 15	APR 20	APR 25	APR 30	
MJD	52729	52734	52739	52744	52749	52754	52759	
Laboratory *k*	[*TAI-TA*(*k*)]/ns							
AUS (Sydney)	-120327.2	-120406.0	-120510.0	-120612.3	-120672.6	-120760.8	-120864.2	
CH (Bern)	30644.9	30807.7	30968.4	31137.8	31305.5	31462.4	31638.2	
CRL (Tokyo)	170932.5	171137.5	171340.8	171540.1	171743.8	171944.9	172153.4	
F (Paris)	168935.1	168951.2	168962.6	168978.9	168993.1	169004.4	169014.6	
IEN (Torino)	26140.7	26258.8	26375.4	26499.3	26629.2	26760.0	26882.8	
JATC (Lintong)	-29011.7	-29117.5	-29228.5	-29342.1	-29451.5	-29552.6	-29649.8	
KRIS (Taejon)	6036.6	6022.6	6016.8	6007.3	6011.7	6023.1	6014.1	
NIST (Boulder)	-45247804.9	-45248005.0	-45248204.8	-45248404.8	-45248604.2	-45248803.7	-45249003.5	
NRC (Ottawa)	28484.9	28498.6	28501.4	28506.7	28506.5	28503.1	28496.8	
NTSC (Lintong)	-19.2	-17.5	-8.8	-9.4	-8.5	-6.0	6.3	
PL (Warszawa)	-1263.6	-1274.6	-1294.6	-1303.9	-1313.7	-1319.3	-1337.9	
PTB (Braunschweig)	-359549.4	-359543.2	-359535.7	-359528.1	-359524.9	-359520.4	-359510.5	
SU (Moskva)	27241028.8	27241047.3	27241025.8	27241031.5	27241042.6	27241042.4	27241040.1	(1)
USNO (Washington DC)	-34906243.6	-34906555.3	-34906864.9	-34907174.5	-34907485.2	-34907795.0	-34908105.3	

- 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*)
2003 Mar. 31 - 2003 May 30	52729-52789	6.970×10^{-13}
New steering correction foreseen for June and July 2003		
2003 May 30 - 2003 July 29	52789-52849	6.960×10^{-13}

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, $u_{l/lab}$ is the uncertainty in the link between the PFS and the clock participating to TAI, including the uncertainty due to the dead-time, $u_{l/TAI}$ 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)	$u_{l/lab}$	$u_{l/TAI}$	u	Note
SYRTE-FOM	52564-52594	10.1	0.2	0.8	[1]	1.6	1.0	2.1	(1)
SYRTE-JPO	52729-52744	7.8	1.0	8.0	T160	0.3	2.0	8.3	(2)
PTB CS1	52729-52759	7.9	5.	8.	T148	0.	1.	9.	(3)
PTB CS2	52729-52759	2.3	3.	12.	T148	0.	1.	12.	(3)

[1] Marion H. et al., *Phys. Rev. Lett.* 90, 150801, 2003.

Notes:

(1) BNM-SYRTE atomic caesium fountain. Report 23 April by BNM-SYRTE.
(2) Report 7 May by BNM-SYRTE.
(3) 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 52369-52759, 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
52729-52759	$+7.3 \times 10^{-15}$	2.5×10^{-15}

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 and ionosphere maps. The C_1 vaules are obtained using the values [*UTC-UTC*(*VSL*)] and the GLONASS data taken at the NMi Van Swinden Laboratorium (VSL). The standard deviations σ_0 and σ_1 characterize the dispersion of individual measurements. N_0 and N_1 are the numbers of measurements.
For this circular, σ_0 = 2.8 ns, σ_1 = 31.4 ns

Date 2003 0h UTC	MJD	C_0/ns	N_0	C_1/ns	N_1
MAR 31	52729	-0.6	42	77.1	41
APR 1	52730	-0.9	42	98.1	26
APR 2	52731	-0.5	42	102.6	72
APR 3	52732	-3.4	41	95.3	51
APR 4	52733	-5.7	42	118.4	22
APR 5	52734	-7.2	41	118.1	53
APR 6	52735	-6.7	45	100.9	68
APR 7	52736	-6.4	45	104.8	37
APR 8	52737	-5.1	44	117.3	70
APR 9	52738	-6.5	42	126.7	46
APR 10	52739	-7.7	45	121.3	73
APR 11	52740	-9.9	43	95.5	48
APR 12	52741	-7.7	45	104.8	32
APR 13	52742	-7.4	45	102.7	50
APR 14	52743	-10.9	45	105.7	58
APR 15	52744	-10.2	42	111.7	61
APR 16	52745	-9.5	43	103.1	63
APR 17	52746	-10.8	44	91.9	67
APR 18	52747	-10.4	43	94.4	62
APR 19	52748	-7.3	43	94.9	61
APR 20	52749	-5.7	45	98.2	47
APR 21	52750	-7.8	44	99.8	60
APR 22	52751	-8.5	46	94.8	54
APR 23	52752	-7.5	45	109.9	69
APR 24	52753	-9.3	44	115.1	66
APR 25	52754	-7.7	44	102.0	54
APR 26	52755	-5.4	42	85.8	31
APR 27	52756	-3.7	45	122.4	50
APR 28	52757	-3.2	44	192.6	19
APR 29	52758	-4.1	44	223.5	60
APR 30	52759	-4.2	44	213.9	67

6 - Time links used for the computation of TAI.

The time links used in the elaboration of this *Circular T* are listed in this section. The type of 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 GT for 'GPS time' observations; INT LK for internal cable link and TWSTFT for two-way satellite time and frequency transfer data.

Link	Type
AOS /NPL	GPS MC
AUS /CRL	GPS MC
BEV /NPL	GPS MC
BIRM/CRL	GPS MC
CAO /PTB	GPS SC
CH /PTB	GPS SC
CNM /NIST	GPS SC
CRL /PTB	GPS SC
CSIR/NPL	GPS MC
DLR /PTB	GPS SC
DTAG/PTB	GPS SC
IEN /PTB	TWSTFT
IFAG/PTB	GPS SC
IGMA/NIST	GPS GT
INPL/PTB	GPS SC
IPQ /PTB	GPS SC
JATC/NTSC	INT LK
JV /PTB	GPS GT
KRIS/CRL	GPS SC
LDS /PTB	GPS SC
LT /NPL	GPS MC
MSL /CRL	GPS MC
NAO /CRL	GPS SC
NIM /CRL	GPS SC
NIMB/PTB	GPS GT
NIMT/CRL	GPS MC
NIST/PTB	TWSTFT
NMC /PTB	GPS GT
NMIJ/CRL	TWSTFT
NMLS/CRL	GPS MC

Link	Type
NPL /PTB	TWSTFT
NPLI/PTB	GPS SC
NRC /USNO	GPS SC
NTSC/CRL	TWSTFT
OMH /PTB	GPS SC
ONBA/USNO	GPS MC
ONRJ/NIST	GPS SC
ORB /PTB	GPS SC
PL /NPL	GPS MC
PTB /OP	GPS SC
ROA /PTB	TWSTFT
SCL /CRL	GPS SC
SG /CRL	GPS MC
SMU /PTB	GPS SC
SP /PTB	GPS SC
SU /PTB	GPS SC
TCC /NIST	GPS SC
TL /CRL	TWSTFT
TP /PTB	GPS SC
UME /PTB	GPS SC
USNO/PTB	TWSTFT
VSL /PTB	TWSTFT