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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 2003 0h UTC	OCT 27	NOV 1	NOV 6	NOV 11	NOV 16	NOV 21	NOV 26
MJD	52939	52944	52949	52954	52959	52964	52969
Laboratory *k*				[*UTC-UTC*(*k*)]/ns			
AOS (Borowiec)	42.6	42.1	40.4	42.3	36.3	28.0	22.5
AUS (Sydney)	-398.5	-395.7	-394.5	-403.7	-424.1	-419.2	-417.5
BEV (Wien)	-0.9	0.4	0.5	1.4	2.1	5.2	5.0
BIRM (Beijing)	1399.9	1409.2	1427.5	1441.7	1452.2	1462.4	1480.8
CAO (Cagliari)	-4209.0	-4219.8	-4219.8	-4232.4	-4259.6	-4262.6	-4267.7
CH (Bern)	4.2	9.1	20.3	23.0	28.2	26.6	30.6
CNM (Queretaro)	-11.7	-6.8	-15.0	-7.4	-15.0	-16.5	-7.3
CNMP (Panama)	-1186.6	-1246.1	-1294.7	-1355.0	-1413.5	-1477.4	-1523.7
CRL (Tokyo)	-13.4	-11.4	-8.3	-5.4	-5.5	-4.5	-2.3
CSIR (Pretoria)	4369.8	4298.8	4225.3	4164.5	4077.1	4002.0	3915.1
DLR (Oberpfaffenhofen)	12.3	11.8	5.9	5.8	5.7	5.3	4.9
DTAG (Darmstadt)	244.9	225.2	215.5	218.2	222.9	211.6	222.0
IEN (Torino)	35.7	24.9	29.7	25.6	16.4	16.4	1.9
IFAG (Wettzell)	-2396.0	-2406.0	-2418.9	-2430.7	-2444.1	-2453.6	-2470.4
IGMA (Buenos Aires)	-94.3	-91.2	-82.6	-86.2	-88.0	-86.6	-85.2
INPL (Jerusalem)	-8868.1	-8897.4	-8922.9	-8938.8	-8976.2	-9006.0	-9028.8
IPQ (Monte de Caparica)	-	-	-	-	-	-	-
JATC (Lintong)	-11210.0	-11197.9	-11179.7	-11172.3	-11167.3	-11163.5	-11152.4
JV (Kjeller)	-10566.5	-10546.3	-10500.1	-10455.2	-10408.9	-10378.4	-10333.0
KRIS (Daejon)	-68.6	-40.8	-9.4	13.7	43.5	31.3	7.1
LDS (Leeds)	4248.3	4273.7	4312.4	4336.7	4373.8	4391.6	4425.2
LT (Vilnius)	59.9	79.1	93.7	81.6	85.2	83.1	94.6
MSL (Lower Hutt)	-46.5	-58.0	-82.3	-68.7	-64.4	-79.4	-97.1
NAO (Mizusawa)	-0.2	0.7	-8.4	-6.1	-0.6	-6.5	-8.1
NIM (Beijing)	-2657.9	-2654.3	-2633.9	-2639.7	-2635.9	-2642.9	-2641.4
NIMB (Bucharest)	-221.7	-252.5	-286.7	-308.4	-329.7	-349.0	-346.9
NIMT (Bangkok)	-455.1	-493.2	-521.9	-553.9	-586.2	-629.9	-647.2
NIST (Boulder)	1.8	3.3	2.1	2.3	2.0	-0.8	-1.1
NMC (Sofiya)	-3166.0	-3168.0	-3207.6	-3237.9	-3275.9	-3279.3	-3277.8
NMIJ (Tsukuba)	44.7	49.1	51.8	51.6	56.6	61.3	65.2

Date 2003 0h UTC	OCT 27	NOV 1	NOV 6	NOV 11	NOV 16	NOV 21	NOV 26	
MJD	52939	52944	52949	52954	52959	52964	52969	
Laboratory *k*				[*UTC-UTC*(*k*)]/ns				
NMLS (Shah Alam)	352.3	351.1	356.3	358.1	362.5	350.5	362.1	
NPL (Teddington)	50.9	53.8	56.6	58.0	57.5	54.9	54.6	
NPLI (New-Delhi)	-	5807.9	5843.2	5901.2	-	-	-	
NRC (Ottawa)	26.2	29.9	24.6	30.7	32.2	30.5	36.3	
NTSC (Lintong)	-19.7	-13.0	-6.9	-7.3	-4.5	3.2	11.4	
OMH (Budapest)	8597.8	8613.0	8622.9	8632.8	8640.6	8643.3	8650.4	
ONBA (Buenos Aires)	-1326.1	-1380.2	-1556.9	-1612.7	-1509.2	-1501.3	-1571.5	
ONRJ (Rio de Janeiro)	5798.4	5808.4	5816.9	5842.5	5845.5	5852.7	5864.1	
OP (Paris)	54.0	57.3	51.5	41.4	43.8	44.9	45.8	
ORB (Bruxelles)	-7.2	-7.6	-5.8	-6.8	-7.5	-12.2	-13.4	
PL (Warszawa)	-238.8	-239.2	57.3	59.1	50.6	42.3	33.1	(1)
PTB (Braunschweig)	-1.0	-1.8	-0.4	1.2	2.5	2.5	0.0	
ROA (San Fernando)	78.0	77.6	69.9	71.1	74.1	74.0	79.6	
SCL (Hong Kong)	-38.1	-48.6	-61.3	-59.7	-57.2	-67.0	-62.6	
SG (Singapore)	15.1	19.6	11.7	19.6	35.5	43.5	57.9	
SMU (Bratislava)	-8991.1	-9004.7	-9041.8	-9053.4	-9084.6	-9107.6	-9130.6	
SP (Boras)	45.5	45.5	49.5	62.6	65.8	70.0	76.8	
SU (Moskva)	-0.7	-4.6	-3.7	-6.4	-6.2	-11.6	-14.2	
TCC (Concepcion)	-4890.5	-4961.6	-4987.3	-5072.5	-5113.7	-5169.8	-5233.0	
TL (Chung-Li)	-17.9	-18.5	-9.4	-6.8	-11.4	-8.1	0.7	
TP (Praha)	67.8	61.3	66.4	63.7	59.0	48.9	47.8	
UME (Gebze-Kocaeli)	25.9	34.4	31.1	33.3	38.6	32.0	52.7	
USNO (Washington DC)	3.9	2.4	3.4	5.1	5.0	4.1	4.8	
VSL (Delft)	5.3	-4.5	-7.3	-3.9	-7.8	-13.8	-21.7	

- Note on section 1:

(1) PL : Time step of UTC(PL) of -300 ns on MJD = 52946.59

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

Date 2003 0h UTC		OCT 27	NOV 1	NOV 6	NOV 11	NOV 16	NOV 21	NOV 26	
MJD		52939	52944	52949	52954	52959	52964	52969	
Laboratory *k*					[*TAI*-*TA*(*k*)]/ns				
CH	(Bern)	37656.9	37811.0	37971.5	38123.4	38277.9	38425.5	38578.8	
CRL	(Tokyo)	179416.3	179619.8	179826.9	180030.4	180234.7	180434.7	180638.5	
F	(Paris)	169327.3	169334.8	169335.6	169334.4	169336.4	169339.9	169342.4	
IEN	(Torino)	31105.5	31229.4	31353.5	31475.7	31598.9	31731.3	31854.1	
JATC	(Lintong)	-33170.0	-33258.9	-33349.7	-33438.3	-33528.3	-33623.5	-33699.4	
KRIS	(Taejon)	6231.3	6257.2	6292.0	6318.7	6353.0	6371.6	6397.7	
NIST	(Boulder)	-45256136.3	-45256331.5	-45256529.5	-45256726.0	-45256923.1	-45257122.9	-45257320.2	
NRC	(Ottawa)	28670.1	28678.1	28677.1	28687.6	28693.5	28696.1	28706.1	
NTSC	(Lintong)	267.5	276.6	289.1	295.6	302.2	307.8	323.1	
PL	(Warszawa)	-1798.8	-1811.2	-1821.7	-1842.9	-1857.4	-1873.7	-1888.9	
PTB	(Braunschweig)	-359341.5	-359337.1	-359331.0	-359324.1	-359317.8	-359312.9	-359310.5	
SU	(Moskva)	27240999.3	27240995.4	27240996.3	27240993.6	27240993.8	27240988.4	27240985.8	(1)
USNO	(Washington DC)	-34919245.2	-34919555.7	-34919863.9	-34920171.5	-34920480.4	-34920790.7	-34921098.9	

- 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	52909 - 52969	6.950×10^{-13}	(2003 SEP 27 - 2003 NOV 26)
New correction foreseen	52969 - 53034	6.940×10^{-13}	(2003 NOV 26 - 2004 JAN 30)

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
SYRTE-JPO	52959 52969	20.8	1.0	6.5	T160	0.3	3.0	7.2	(1)
IEN CSF1	52934 52944	5.1	0.6	1.1	[1]	0.4	3.0	3.3	(2)
PTB-CSF1	52929 52944	11.5	1.1	0.9	T162	0.1	2.0	2.5	(3)
PTB-CS1	52939 52969	6.4	5.0	8.0	T148	0.0	1.0	9.5	(4)
PTB-CS2	52939 52969	4.9	3.0	12.0	T148	0.0	1.0	12.4	(4)

[1] F. Levi et al. : *Proc. IEEE* 2003, pages 199-204.

Notes:
(1) Report 3 Dec. by BNM-SYRTE.
(2) Report 14 Nov. by IEN.
(3) Report 20 Nov. by PTB.
(4) 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 52579-52969, 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	
52939-52969	10.2×10^{-15}	2.0×10^{-15}	(2003 OCT 27 - 2003 NOV 26)

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 values 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 = 2.6 ns, σ_1 = 25.6 ns

Date 2003	0h UTC	MJD	C_0/ns	N_0	C_1/ns	N_1
OCT	27	52939	-9.4	44	56.4	63
OCT	28	52940	-14.1	41	37.9	61
OCT	29	52941	-11.8	41	42.9	66
OCT	30	52942	-13.8	38	62.2	47
OCT	31	52943	-10.7	34	43.7	41
NOV	1	52944	-7.2	38	35.0	63
NOV	2	52945	-5.8	41	36.2	49
NOV	3	52946	-4.4	42	38.3	63
NOV	4	52947	-0.7	38	42.4	65
NOV	5	52948	1.5	44	38.3	80
NOV	6	52949	2.9	44	33.0	67
NOV	7	52950	1.5	44	38.1	32
NOV	8	52951	4.1	44	64.2	56
NOV	9	52952	2.6	43	64.4	53
NOV	10	52953	-1.5	45	56.2	57
NOV	11	52954	-4.8	44	51.9	32
NOV	12	52955	-7.9	46	36.9	64
NOV	13	52956	-9.9	45	30.9	70
NOV	14	52957	-9.5	44	44.0	70
NOV	15	52958	-8.5	46	57.1	48
NOV	16	52959	-3.5	44	66.9	58
NOV	17	52960	-1.6	46	64.9	57
NOV	18	52961	-4.1	45	76.5	39
NOV	19	52962	-5.0	46	80.4	64
NOV	20	52963	-2.4	45	63.6	69
NOV	21	52964	-1.0	43	51.5	63
NOV	22	52965	-5.0	44	50.7	60
NOV	23	52966	-6.6	45	68.1	65
NOV	24	52967	-4.8	44	76.0	54
NOV	25	52968	-1.9	43	81.7	51
NOV	26	52969	-1.0	39	97.9	66

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 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.

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
CNMP/USNO	GPS MC
CRL /PTB	GPS MC
CSIR/NPL	GPS MC
DLR /PTB	GPS P3
DTAG/PTB	GPS SC
IEN /PTB	TWSTFT
IFAG/PTB	GPS P3
IGMA/NIST	GPS GT
INPL/PTB	GPS SC
IPQ /PTB	-
JATC/NTSC	INT LK
JV /PTB	GPS GT
KRIS/CRL	GPS MC
LDS /PTB	GPS SC
LT /NPL	GPS MC
MSL /CRL	GPS MC
NAO /CRL	GPS SC
NIM /CRL	GPS SC
NIMB/PTB	GPS SC
NIMT/CRL	GPS MC
NIST/PTB	TWSTFT
NMC /PTB	GPS GT
NMIJ/CRL	TWSTFT
NMLS/CRL	GPS MC
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
OP /PTB	GPS SC
ORB /PTB	GPS P3
PL /NPL	GPS MC
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