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Circular T 179 (2002 December 16)
Circulaire T 179

1 - Coordinated Universal Time UTC. Computed values of [*UTC-UTC*(*k*)].
(From 1999 January 1, 0h UTC, TAI-UTC = 32 s)

Date 2002 0h UTC		Oct 27	Nov 1	Nov 6	Nov 11
MJD		52574	52579	52584	52589
Laboratory *k*			[*UTC-UTC*(*k*)]/ns		
AOS (Borowiec)		99	92	93	81
AUS (Sydney)		-72	-76	-67	-85
BEV (Wien)		32	35	39	39
BIRM (Beijing)		678	691	698	704
CAO (Cagliari)		-3779	-3775	-3768	-3771
CH (Bern)		-27	-28	-36	-35
CNM (Queretaro)		190	194	200	199
CRL (Tokyo)		-43	-35	-38	-37
CSIR (Pretoria)		-	-	-	-
DLR (Oberpfaffenhofen)		-	-	-	-
DTAG (Darmstadt)	(1)	231	264	264	267
IEN (Torino)		-1	-14	-16	-18
IFAG (Wettzell)		-1490	-1488	-1495	-1507
IGMA (Buenos Aires)		-46	-45	-46	-48
INPL (Jerusalem)		-5865	-5919	-5973	-6030
IPQ (Monte de Caparica)		-	-	-	-
JATC (Lintong)		-11204	-11241	-11293	-11344
KRIS (Daejon)		-59	-36	-39	-39
LDS (Leeds)		2386	2410	2430	2449
LT (Vilnius)		-241	-264	-253	-235
MSL (Lower Hutt)		6	-1	-39	-45
NAO (Mizusawa)		14	17	10	4
NIM (Beijing)		-2623	-2628	-2631	-2641
NIMB (Bucharest)		-19	-30	80	79
NIMT (Bangkok)		-120	-134	-162	-194
NIST (Boulder)		6	4	5	3
NMC (Sofiya)		-2275	-2318	-2332	-2351
NMIJ (Tsukuba)		71	83	93	97
NMLS (Shah Alam)		70	59	47	33
NPL (Teddington)		-4	-4	-1	0
NPLI (New-Delhi)		2383	-	-	-
NRC (Ottawa)		26	31	27	27
NTSC (Lintong)		-14	-2	-1	-3
OMH (Budapest)		7440	7453	7485	7513
ONBA (Buenos Aires)		-744	-715	-693	-681
ONRJ (Rio de Janeiro)		4984	5006	5025	5032
OP (Paris)		-9	-18	-15	-16
ORB (Bruxelles)		24	18	14	8
PL (Warszawa)		-103	-112	-123	-131
PTB (Braunschweig)		-12	-18	-20	-21
ROA (San Fernando)		27	19	23	23
SCL (Hong Kong)		15	22	24	31
SG (Singapore)		-50	-42	-47	-52
SMU (Bratislava)		-7090	-7119	-7141	-7174
SP (Boras)		94	71	41	8
SU (Moskva)		22	22	13	15
TCC (Concepcion)	(2)	-	-922	-1048	-1118
TL (Chung-Li)		-30	-18	-15	-14
TP (Praha)		-19	-19	-26	-21
UME (Gebze-Kocaeli)		-711	-718	-726	-739
USNO (Washington DC)(USNO MC)		-3	-5	-4	-4
VSL (Delft)		-15	-21	-19	-16

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1 - Coordinated Universal Time UTC. (Cont.)

Date 2002 0h UTC		Nov 16	Nov 21	Nov 26
MJD		52594	52599	52604
Laboratory *k*			[*UTC*-*UTC*(*k*)]/ns	
AOS (Borowiec)		74	64	52
AUS (Sydney)		-79	-75	-68
BEV (Wien)		42	43	43
BIRM (Beijing)		714	717	735
CAO (Cagliari)		-3775	-3802	-3789
CH (Bern)		-32	-31	-34
CNM (Queretaro)		201	189	181
CRL (Tokyo)		-37	-37	-42
CSIR (Pretoria)		-	-	-
DLR (Oberpfaffenhofen)		-	-	-
DTAG (Darmstadt)		282	295	317
IEN (Torino)		-22	-26	-20
IFAG (Wettzell)		-1536	-1563	-1577
IGMA (Buenos Aires)		-54	-65	-62
INPL (Jerusalem)		-6091	-6146	-6205
IPQ (Monte de Caparica)		-	-	-
JATC (Lintong)		-11380	-11422	-11456
KRIS (Daejon)		-38	-49	-42
LDS (Leeds)		2471	2483	2488
LT (Vilnius)		-241	-245	-267
MSL (Lower Hutt)		-54	-67	-60
NAO (Mizusawa)		4	5	1
NIM (Beijing)		-	-	-
NIMB (Bucharest)	(3)	83	-404	-404
NIMT (Bangkok)		-214	-234	-268
NIST (Boulder)		3	2	-1
NMC (Sofiya)		-2341	-2372	-2360
NMIJ (Tsukuba)		109	120	125
NMLS (Shah Alam)		49	35	22
NPL (Teddington)		2	4	5
NPLI (New-Delhi)		-	-	-
NRC (Ottawa)		11	10	9
NTSC (Lintong)		-4	-5	-10
OMH (Budapest)		7522	7553	7574
ONBA (Buenos Aires)		-691	-645	-838
ONRJ (Rio de Janeiro)		5046	5045	5064
OP (Paris)		-19	-19	-17
ORB (Bruxelles)		1	-6	-11
PL (Warszawa)		-143	-157	-160
PTB (Braunschweig)		-18	-18	-20
ROA (San Fernando)		19	22	23
SCL (Hong Kong)		37	39	45
SG (Singapore)		-33	-31	-39
SMU (Bratislava)		-7206	-7234	-7276
SP (Boras)		-6	-23	-45
SU (Moskva)		14	13	11
TCC (Concepcion)		-1170	-1206	-1243
TL (Chung-Li)		-17	-21	-28
TP (Praha)		-23	-31	-40
UME (Gebze-Kocaeli)		-745	-753	-767
USNO (Washington DC)(USNO MC)		-5	-4	-5
VSL (Delft)		-18	-17	-26

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

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

Date 2002 0h UTC		Oct 27	Nov 1	Nov 6	Nov 11
MJD		52574	52579	52584	52589
Laboratory *k*		[*TAI-TA*(*k*)]/ns			
AUS (Sydney)		-117780	-117862	-117956	-118044
CH (Bern)		25353	25527	25695	25871
CRL (Tokyo)		164681	164885	165084	165285
F (Paris)		168402	168420	168443	168464
IEN (Torino)		22467	22582	22699	22808
JATC (Lintong)		-25708	-25800	-25918	-26030
KRIS (Taejon)		6090	6101	6093	6090
NIST (Boulder)		-45241542	-45241746	-45241948	-45242152
NRC (Ottawa)		28353	28362	28363	28367
NTSC (Lintong)		-89	-76	-76	-76
PL (Warszawa)		-939	-949	-956	-967
PTB (Braunschweig)		-359717	-359718	-359715	-359711
SU (Moskva)	(4)	27241022	27241022	27241013	27241015
USNO (Washington DC)		-34896619	-34896932	-34897243	-34897553

Date 2002 0h UTC		Nov 16	Nov 21	Nov 26
MJD		52594	52599	52604
Laboratory *k*		[*TAI-TA*(*k*)]/ns		
AUS (Sydney)		-118117	-118197	-118283
CH (Bern)		26049	26226	26398
CRL (Tokyo)		165485	165682	165881
F (Paris)		168485	168507	168530
IEN (Torino)		22917	23034	23150
JATC (Lintong)		-26142	-26251	-26349
KRIS (Taejon)		6087	6078	6079
NIST (Boulder)		-45242355	-45242558	-45242763
NRC (Ottawa)		28356	28359	28363
NTSC (Lintong)		-72	-75	-71
PL (Warszawa)		-982	-995	-1010
PTB (Braunschweig)		-359703	-359698	-359695
SU (Moskva)	(4)	27241014	27241013	27241011
USNO (Washington DC)		-34897865	-34898175	-34898487

3 - Notes on sections 1 and 2.

(1) DTAG. Change of master clock on MJD = 52577.56.

(2) TCC . TIGO Concepcion Chile.

(3) NIMB. Apparent time step of UTC(NIMB) due to power failure on MJD = 52594.52.

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

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

Interval of validity		$f(EAL)-f(TAI)$
2002 Sep. 27 - 2002 Nov. 26	52544-52604	7.000×10^{-13}
New steering correction foreseen for December 2002 and January 2003		
2002 Nov. 26 - 2003 Jan. 30	52604-52669	6.990×10^{-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 $6.0\times10^{-15} / \sqrt{\tau}$,
- a flicker frequency noise 0.6×10^{-15},
- a random walk frequency noise $1.6\times10^{-16} / \sqrt{\tau}$,

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	$10^{15}u$
PTB CS1	52574-52604	-1.8	8.	T148	5.	0.	1.	(1)	9.
PTB CS2	52574-52604	8.3	12.	T148	3.	0.	1.	(1)	12.
CRL-O1	52569-52579	-2.6	3.9	T148	5.0	0.8	3.0		7.1

Note:

(1) Continuously operating as a clock participating to TAI

The second table gives the BIPM estimate of d, based on measurements of CRL-O1, LPTF-JPO, NIST-F1,PTB CS1, PTB CS2, PTBCSF1 over the period MJD 52214-52604, 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
52574-52604	$+5.6\times10^{-15}$	2.6×10^{-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 2002 0h UTC	MJD	C_0/ns	σ/ns	$(\sigma/\sqrt{N})$/ns
Oct 27	52574	-5	3	0
Oct 28	52575	-9	3	1
Oct 29	52576	-11	3	1
Oct 30	52577	-13	3	0
Oct 31	52578	-14	3	0
Nov 1	52579	-15	3	0
Nov 2	52580	-12	3	0
Nov 3	52581	-16	4	1
Nov 4	52582	-16	4	1
Nov 5	52583	-14	4	1
Nov 6	52584	-9	3	0
Nov 7	52585	-5	3	0
Nov 8	52586	-6	-	-
Nov 9	52587	-5	3	1
Nov 10	52588	-4	5	1
Nov 11	52589	-5	4	1
Nov 12	52590	-7	4	1
Nov 13	52591	-5	3	1
Nov 14	52592	-6	3	0
Nov 15	52593	-11	3	0
Nov 16	52594	-13	3	0
Nov 17	52595	-13	3	0
Nov 18	52596	-17	3	0
Nov 19	52597	-19	3	0
Nov 20	52598	-17	3	0
Nov 21	52599	-16	4	1
Nov 22	52600	-12	3	0
Nov 23	52601	-7	3	0
Nov 24	52602	-8	3	1
Nov 25	52603	-6	3	0
Nov 26	52604	-8	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 2002 0h UTC	MJD	C_1/ns	σ/ns	$(\sigma/\sqrt{N})$/ns
Oct 27	52574	-77	-	-
Oct 28	52575	-53	-	-
Oct 29	52576	-79	-	-
Oct 30	52577	-78	14	5
Oct 31	52578	-25	14	6
Nov 1	52579	-17	11	4
Nov 2	52580	-103	12	6
Nov 3	52581	3	5	3
Nov 4	52582	125	-	-
Nov 5	52583	115	-	-
Nov 6	52584	16	5	4
Nov 7	52585	-99	-	-
Nov 8	52586	-142	-	-
Nov 9	52587	-98	13	4
Nov 10	52588	2	-	-
Nov 11	52589	13	8	4
Nov 12	52590	-30	-	-
Nov 13	52591	-34	-	-
Nov 14	52592	-1	11	4
Nov 15	52593	-37	-	-
Nov 16	52594	-55	-	-
Nov 17	52595	-39	-	-
Nov 18	52596	-48	-	-
Nov 19	52597	-56	-	-
Nov 20	52598	-64	-	-
Nov 21	52599	-51	-	-
Nov 22	52600	-31	-	-
Nov 23	52601	-23	-	-
Nov 24	52602	-20	-	-
Nov 25	52603	-14	-	-
Nov 26	52604	-8	-	-