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Circular T (2002 September 16)
Circulaire T

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	Jul 29	Aug 3	Aug 8	Aug 13
MJD	52484	52489	52494	52499
Laboratory *k*	[*UTC-UTC*(*k*)]/ns			
AOS (Borowiec)	-175	-148	-125	-104
AUS (Sydney)	-96	-117	-126	-114
BEV (Wien)	21	25	26	34
BIRM (Beijing)	464	-	490	505
CAO (Cagliari)	-3604	-3634	-3666	-3703
CH (Bern)	30	23	23	20
CNM (Queretaro)	124	125	136	129
CRL (Tokyo)	6	2	2	-9
CSIR (Pretoria)	-	-	-	-
DLR (Oberpfaffenhofen)	-	-	-	-
DTAG (Darmstadt)	25	32	27	43
IEN (Torino)	77	74	69	62
IFAG (Wettzell)	-1562	-1551	-1538	-1554
IGMA (Buenos Aires)	15	-15	-12	0
INPL (Jerusalem)	-4872	-4923	-4976	-5032
IPQ (Monte de Caparica)	-	-	-	-
JATC (Lintong)	-10421	-10460	-10509	-10554
KRIS (Taejon)	-41	-60	-77	-68
LDS (Leeds)	1983	2001	2022	2040
LT (Vilnius)	-254	-256	-252	-277
MSL (Lower Hutt)	445	463	476	495
NAO (Mizusawa)	80	69	79	83
NIM (Beijing)	-2619	-2620	-2631	-2619
NIMT (Bangkok)	52	35	30	19
NIST (Boulder)	-7	-11	-10	-13
NMC (Sofiya)	-1910	-1945	-1987	-2014
NMIJ (Tsukuba)	-278	-288	-285	-289
NMLS (Shah Alam)	10	-13	-30	-55
NPL (Teddington)	-11	-8	-5	-3
NPLI (New-Delhi)	1538	1583	1627	1674
NRC (Ottawa)	-17	-16	-19	-20
NTSC (Lintong)	19	28	27	31
OMH (Budapest)	7081	7090	7126	7142
ONBA (Buenos Aires)	-	-	-511	-660
ONRJ (Rio de Janeiro)	4819	4817	4827	4840
OP (Paris)	43	43	38	33
ORB (Bruxelles)	-83	-92	-94	-96
PL (Warszawa)	-23	-31	-35	-40
PTB (Braunschweig)	9	8	8	7
ROA (San Fernando) (1)	42	42	45	28
SCL (Hong Kong)	9	12	8	8
SG (Singapore)	-7	-4	-6	-9
SMU (Bratislava)	-6550	-6594	-6617	-6651
SP (Boras)	477	454	431	394
SU (Moskva)	26	23	26	30
TL (Chung-Li)	-57	-56	-56	-67
TP (Praha)	28	25	33	38
UME (Gebze-Kocaeli)	-639	-634	-633	-630
USNO (Washington DC)(USNO MC)	-5	-4	-3	-3
VSL (Delft)	-7	-8	-5	-4

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1 - Coordinated Universal Time UTC. (Cont.)

Date 2002 0h UTC	Aug 18	Aug 23	Aug 28
MJD	52504	52509	52514
Laboratory *k*		[*UTC*-*UTC*(*k*)]/ns	
AOS (Borowiec)	-91	-74	-52
AUS (Sydney)	-105	-101	-104
BEV (Wien)	38	37	41
BIRM (Beijing)	519	525	539
CAO (Cagliari)	-3733	-3767	-
CH (Bern)	16	16	14
CNM (Queretaro)	133	141	148
CRL (Tokyo)	-17	-22	-25
CSIR (Pretoria)	-	-	-
DLR (Oberpfaffenhofen)	-	-	-
DTAG (Darmstadt)	35	17	12
IEN (Torino)	56	58	61
IFAG (Wettzell)	-1545	-1544	-1528
IGMA (Buenos Aires)	1	-11	-23
INPL (Jerusalem)	-5087	-5146	-5204
IPQ (Monte de Caparica)	-	-	-
JATC (Lintong)	-10603	-10654	-10693
KRIS (Taejon)	-67	-73	-73
LDS (Leeds)	2067	2081	2106
LT (Vilnius)	-279	-269	-260
MSL (Lower Hutt)	517	519	501
NAO (Mizusawa)	79	78	71
NIM (Beijing)	-2629	-2616	-2626
NIMT (Bangkok)	11	-10	-25
NIST (Boulder)	-10	-6	-3
NMC (Sofiya)	-2028	-2061	-2076
NMIJ (Tsukuba)	-293	-368	-391
NMLS (Shah Alam)	-86	-48	26
NPL (Teddington)	-1	-1	-2
NPLI (New-Delhi)	1724	1765	1811
NRC (Ottawa)	-25	-23	-19
NTSC (Lintong)	33	27	21
OMH (Budapest)	7181	7187	7204
ONBA (Buenos Aires)	-737	-732	-666
ONRJ (Rio de Janeiro)	4845	4861	4875
OP (Paris)	32	30	28
ORB (Bruxelles)	-101	-100	-99
PL (Warszawa)	-43	-50	-52
PTB (Braunschweig)	4	2	6
ROA (San Fernando)	26	18	18
SCL (Hong Kong)	2	-9	-13
SG (Singapore)	-16	-18	-25
SMU (Bratislava)	-6671	-6688	-6705
SP (Boras)	366	335	308
SU (Moskva)	30	31	27
TL (Chung-Li)	-75	-80	-83
TP (Praha)	35	35	35
UME (Gebze-Kocaeli)	-633	-645	-652
USNO (Washington DC)(USNO MC)	-5	-4	-4
VSL (Delft)	-10	-15	-21

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		Jul 29	Aug 3	Aug 8	Aug 13
MJD		52484	52489	52494	52499
Laboratory *k*		[*TAI*-*TA*(*k*)]/ns			
AUS (Sydney)		-116253	-116359	-116427	-116504
CH (Bern)		22122	22302	22489	22674
CRL (Tokyo)		161095	161293	161493	161693
F (Paris)		167961	167988	168014	168042
IEN (Torino)		20360	20481	20599	20713
JATC (Lintong)		-23962	-24054	-24151	-24244
KRIS (Taejon)		6081	6077	6064	6060
NIST (Boulder)		-45237900	-45238105	-45238305	-45238510
NRC (Ottawa)		28232	28237	28239	28243
NTSC (Lintong)		-138	-132	-131	-125
PL (Warszawa)		-826	-830	-832	-842
PTB (Braunschweig)		-359785	-359781	-359776	-359773
SU (Moskva)	(2)	27241026	27241023	27241026	27241030
USNO (Washington DC)		-34891023	-34891334	-34891644	-34891954

Date 2002 0h UTC		Aug 18	Aug 23	Aug 28
MJD		52504	52509	52514
Laboratory *k*		[*TAI*-*TA*(*k*)]/ns		
AUS (Sydney)		-116590	-116681	-116762
CH (Bern)		22853	23035	23216
CRL (Tokyo)		161896	162093	162290
F (Paris)		168071	168096	168124
IEN (Torino)		20826	20947	21063
JATC (Lintong)		-24347	-24447	-24543
KRIS (Taejon)		6057	6053	6050
NIST (Boulder)		-45238710	-45238911	-45239113
NRC (Ottawa)		28241	28248	28257
NTSC (Lintong)		-127	-130	-127
PL (Warszawa)		-849	-853	-853
PTB (Braunschweig)		-359771	-359767	-359759
SU (Moskva)	(2)	27241030	27241031	27241027
USNO (Washington DC)		-34892267	-34892576	-34892886

3 - Notes on sections 1 and 2.

(1) ROA . Change of master clock on MJD = 52484.41

(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*)
2002 Jul. 29 - 2002 Sep. 27	52484-52544	7.010×10^{-13}

New steering correction foreseen for October and November 2002

2002 Sep. 27 - 2002 Nov. 26	52544-52604	7.000×10^{-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	$10^{15}u$
PTB CS1	52484-52514	-0.4	8.	T148	5.	0.	1.	(1)	9.
PTB CS2	52484-52514	6.9	12.	T148	3.	0.	1.	(1)	12.

Notes:
(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 52124-52514, 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*
52484-52514	$+8.7 \times 10^{-15}$	2.5×10^{-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.

Note: The value for MJD = 52483 has been corrected from *Circular T* 175.

Date 2002 0h UTC	MJD	C_0/ns	σ/ns	$(\sigma/\sqrt{N})$/ns
Jul 28	52483	-13	3	1
Jul 29	52484	-9	3	0
Jul 30	52485	-10	3	0
Jul 31	52486	-10	3	0
Aug 1	52487	-7	3	0
Aug 2	52488	-9	3	0
Aug 3	52489	-12	3	0
Aug 4	52490	-13	3	0
Aug 5	52491	-12	3	0
Aug 6	52492	-14	3	0
Aug 7	52493	-16	3	0
Aug 8	52494	-17	3	0
Aug 9	52495	-14	3	0
Aug 10	52496	-12	3	0
Aug 11	52497	-12	3	0
Aug 12	52498	-9	3	0
Aug 13	52499	-7	3	0
Aug 14	52500	-7	3	0
Aug 15	52501	-4	3	0
Aug 16	52502	-3	3	0
Aug 17	52503	-3	3	1
Aug 18	52504	-6	3	0
Aug 19	52505	-10	4	1
Aug 20	52506	-12	4	1
Aug 21	52507	-11	4	1
Aug 22	52508	-12	4	1
Aug 23	52509	-9	4	1
Aug 24	52510	-7	3	0
Aug 25	52511	-5	3	1
Aug 26	52512	-2	4	1
Aug 27	52513	-5	3	0
Aug 28	52514	-8	3	1

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
Jul 29	52484	-345	2	1
Jul 30	52485	-371	-	-
Jul 31	52486	-368	-	-
Aug 1	52487	-366	24	4
Aug 2	52488	-356	25	5
Aug 3	52489	-377	19	5
Aug 4	52490	-373	19	5
Aug 5	52491	-350	35	16
Aug 6	52492	-323	12	5
Aug 7	52493	-366	-	-
Aug 8	52494	-444	-	-
Aug 9	52495	-419	6	4
Aug 10	52496	-333	-	-
Aug 11	52497	-289	-	-
Aug 12	52498	-310	-	-
Aug 13	52499	-354	-	-
Aug 14	52500	-388	-	-
Aug 15	52501	-416	3	2
Aug 16	52502	-399	-	-
Aug 17	52503	-401	8	5
Aug 18	52504	-446	-	-
Aug 19	52505	-460	-	-
Aug 20	52506	-437	33	13
Aug 21	52507	-372	-	-
Aug 22	52508	-335	57	40
Aug 23	52509	-370	-	-
Aug 24	52510	-402	-	-
Aug 25	52511	-385	23	11
Aug 26	52512	-374	-	-
Aug 27	52513	-398	17	10
Aug 28	52514	-418	32	16