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Circular T 41 (1991 July 1)

1 - Coordinated Universal Time UTC. Computed values of UTC-UTC(k).

(Since 1991 January 1, 0hUTC, TAI-UTC = 26s)

Date 1991 0hUTC		APR 23	MAY 3	MAY 13	MAY 23
MJD		48369	48379	48389	48399
Laboratory k		UTC-UTC(k) (Unit = 1 microsecond)			
AOS (Borowiec)		-2.95	-2.85	-2.95	-3.26
APL (Laurel)		-0.97	-0.99	-1.05	-1.08
AUS (Canberra)		0.15	0.20	0.26	0.30
BEV (Wien)		1.50	0.79	-0.02	-0.89
CAO (Cagliari)		-0.82	-0.87	-0.82	-0.84
CH (Bern)		1.80	1.95	2.07	2.08
CRL (Tokyo)		1.79	1.79	1.83	1.85
CSAO (Lintong)		-5.00	-4.92	-4.80	-4.64
DPT (Pretoria)		-25.42	-25.49	-25.47	-25.49
FTZ (Darmstadt)		20.11	20.26	20.39	20.55
IEN (Torino)		-0.09	-0.09	-0.07	-0.15
IFAG (Wettzell)		5.37	5.60	5.79	6.04
IGMA (Buenos Aires)		0.52	0.50	0.46	0.42
INPL (Jerusalem)	(1)	-25.73	-26.91	-28.10	-29.29
JATC (Lintong)		-26.12	-25.77	-25.32	-25.09
KSRI (Taejon)		0.29	0.53	0.77	0.93
LDS (Leeds)		1.01	0.29	-0.68	-1.52
NAOM (Mizusawa)		-7.47	-7.58	-7.69	-7.80
NIM (Beijing)		7.67	7.72	7.78	7.88
NIST (Boulder)		-0.98	-1.00	-1.01	-1.04
NPL (Teddington)		-1.28	-1.11	-0.97	-0.80
NPLI (New-Delhi)		-	-	-	-
NRC (Ottawa)		1.55	1.69	1.82	1.90
NRLM (Tsukuba)		-34.94	-36.63	-37.93	-39.26
OMH (Budapest)		4.45	4.28	3.86	3.46
ONRJ (Rio de Janeiro)		11.38	11.85	12.59	13.08
OP (Paris)		-0.76	-0.80	-0.86	-0.92
ORB (Bruxelles)		1.92	1.90	1.88	1.90
PEL (Lower Hutt)		0.55	0.57	0.61	0.59
PKNM (Warszawa)		4.49	4.04	3.49	2.85
PTB (Braunschweig)		3.45	3.45	3.45	3.44
RC (Habana)	(2)	-2.24	-2.05	-1.87	-1.99
ROA (San Fernando)		7.07	7.02	6.93	6.84
SO (Shanghai)		2.90	2.88	2.78	2.78
STA (Stockholm)		0.14	0.22	0.20	0.08
SU (Moskva)	(3)	6.99	6.92	6.78	6.70
TAO (Tokyo)		0.94	0.95	0.95	0.99
TL (Chung-Li)		1.63	1.78	1.92	1.94
TP (Praha)		0.17	0.13	0.06	0.04
TUG (Graz)		2.05	2.78	3.49	4.19
USNO (Washington DC)	(USNO MC)	0.15	0.20	0.26	0.30
VSL (Delft)		0.62	0.71	0.76	0.86
YUZM (Beograd)		35.39	33.98	33.25	33.20
ZIPE (Potsdam)		-0.18	0.05	0.16	0.21

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

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

Date 1991 0hUTC		APR 23	MAY 3	MAY 13	MAY 23
MJD		48369	48379	48389	48399
Laboratory k		TAI-TA(k) (Unit = 1 microsecond)			
AOS (Borowiec)		-	-	-	-
APL (Laurel)		-1.48	-1.50	-1.56	-1.59
AUS (Canberra)		-33.93	-34.09	-34.27	-34.40
CH (Bern)		-69.81	-69.82	-69.83	-69.92
CRL (Tokyo)		3.19	3.35	3.52	3.69
CSAO (Lintong)		25.64	25.52	25.44	25.40
F (Paris)		90.81	91.10	91.40	91.68
JATC (Lintong)		1.36	1.49	1.52	1.59
KSRI (Taejon)		-9.63	-10.34	-11.02	-11.75
NIM (Beijing)		-10.97	-10.89	-10.82	-10.70
NISA (Boulder)	(4)	-45073.33	-45073.60	-45073.89	-45074.19
NIST (Boulder)		-45164.09	-45164.71	-45165.35	-45166.00
NRC (Ottawa)		17.62	17.76	17.89	17.96
PTB (Braunschweig)		-359.95	-359.95	-359.95	-359.96
RC (Habana)	(2)(5)	-282.20	-282.68	-283.20	-283.95
SO (Shanghai)		-44.48	-44.51	-44.60	-44.59
SU (Moskva)		2827256.99	2827256.92	2827256.78	2827256.70
USNO (Washington DC)	(6)	-34623.58	-34624.24	-34624.91	-34625.58

3 - Notes on sections 1 and 2.

(1) INPL. Corrected values of UTC-UTC(INPL).

MJD	UTC-UTC(INPL)	MJD	UTC-UTC(INPL)
48259	-12.92	48319	-19.86
48269	-14.02	48329	-21.03
48279	-15.17	48339	-22.18
48289	-16.35	48349	-23.35
48299	-17.54	48359	-24.53
48309	-18.72	48369	-25.73

(2) RC . From MJD = 48289 to MJD = 48369 add +5 μs to the published values of UTC-UTC(RC) and TAI-TA(RC).

(3) SU . Time transfer data obtained from GLONASS satellite trackings at the University of Leeds (U.K.) and SU. See Section 5.

(4) TA(NISA) designates the scale AT1 of NIST.

(5) RC . Listed values are TAI-TA(RC) - 18 seconds.

(6) TA(USNO) designates the scale A1(MEAN) of USNO.

4 - UTC - GPS time and TAI - GPS time.

UTC - GPS time = -7s + C0, TAI - GPS time = 19s + C0.

The GPS data are taken at the Paris Observatory, from Block I satellites, and are usually corrected for the measured ionospheric delays. They are smoothed to obtain daily values of UTC(OP) - GPS time at 0hUTC. UTC - GPS time is derived from them using linear interpolation of UTC - UTC(OP).

The r values are the residuals to the smoothed data for the middle of the 13-minute tracking period. The reference times are given for the first date of the table only. The r values are reported here only to show the quality of the synchronization.

UTC may be derived at any site from observation of any listed satellite, by interpolating C0 to the tracking time. The quality of the access to UTC mainly depends upon local conditions of observation.

			r(ns)	Block I			
Date 1991 0hUTC	MJD	C0 (ns)	PRN 3 NAV11 17h20m	PRN11 NAV 8 22h 8m	PRN 6 NAV 3 9h40m	PRN12 NAV10 13h40m	PRN13 NAV 9 13h56m
Apr 23	48369	193	5	2	4	-7	-9
Apr 24	48370	193	0	20	-4	2	-18
Apr 25	48371	194	-	-10	-	-6	8
Apr 26	48372	193	13	-	6	-20	-2
Apr 27	48373	198	-	-	-	-	-
Apr 28	48374	202	-	-	-	-	-
Apr 29	48375	204	1	-6	7	5	-9
Apr 30	48376	206	14	-5	0	-11	-6
May 1	48377	213	16	6	1	4	-15
May 2	48378	219	12	2	8	-10	-20
May 3	48379	222	2	6	-6	-4	-2
May 4	48380	224	9	8	-5	-8	-13
May 5	48381	230	-1	-2	0	-4	3
May 6	48382	239	11	8	4	-1	-11
May 7	48383	246	3	-1	-6	6	0
May 8	48384	253	-3	1	-11	-16	-11
May 9	48385	264	7	11	-1	15	6
May 10	48386	273	-4	-1	-6	-	-14
May 11	48387	278	1	10	-7	9	-20
May 12	48388	285	6	1	2	18	-16
May 13	48389	295	0	5	-6	-	-7
May 14	48390	303	1	-5	-18	15	11
May 15	48391	305	7	11	-2	-	-19
May 16	48392	299	4	-3	-7	6	3
May 17	48393	292	9	-10	-1	-10	-13
May 18	48394	294	5	12	4	-	5
May 19	48395	300	9	6	-5	-11	-14
May 20	48396	305	5	17	13	-12	-10
May 21	48397	305	-5	-1	2	-6	-10
May 22	48398	305	2	4	-11	15	0
May 23	48399	311	5	-1	-14	13	-3

Section 4 (Cont.)

For Block II satellites, the r values are computed with respect to C0 obtained from Block I only.

			r(ns) Block II				
Date 1991 0hUTC	MJD	C0 (ns)	PRN14 NAV14 2h12m	PRN18 NAV18 4h20m	PRN16 NAV16 8h 4m	PRN 2 NAV13 11h16m	PRN20 NAV20 14h44m
Apr 23	48369	193	22	-2	2	17	7
Apr 24	48370	193	9	4	-18	2	5
Apr 25	48371	194	2	10	8	25	9
Apr 26	48372	193	0	-6	18	6	-7
Apr 27	48373	198	-	-	-	-	-
Apr 28	48374	202	-	-	-	-	-
Apr 29	48375	204	-	-	-9	9	7
Apr 30	48376	206	4	14	20	16	-4
May 1	48377	213	6	20	-25	5	21
May 2	48378	219	-3	-4	-17	12	2
May 3	48379	222	9	-7	-15	1	-9
May 4	48380	224	6	7	-20	9	-12
May 5	48381	230	-2	2	-7	10	13
May 6	48382	239	-3	7	9	15	14
May 7	48383	246	-2	8	16	7	-2
May 8	48384	253	6	18	-15	4	2
May 9	48385	264	14	12	20	8	23
May 10	48386	273	11	23	1	19	5
May 11	48387	278	-5	-2	-23	-13	-7
May 12	48388	285	-12	6	-1	3	-3
May 13	48389	295	2	1	-3	14	10
May 14	48390	303	-3	10	-8	13	12
May 15	48391	305	-1	3	-7	17	-5
May 16	48392	299	-1	4	-18	-9	-5
May 17	48393	292	-2	-4	8	4	9
May 18	48394	294	4	-2	-10	-3	2
May 19	48395	300	-6	3	-13	6	0
May 20	48396	305	4	6	-10	3	15
May 21	48397	305	3	8	-1	22	-8
May 22	48398	305	-8	-8	-12	18	-3
May 23	48399	311	7	-1	1	30	-2

5 - UTC - GLONASS time.

UTC - GLONASS time = C1 (modulo 1s).

From his current observations of both the GPS and GLONASS satellite systems Prof. P. Daly, University of Leeds, establishes and reports GPS time - GLONASS time at ten-day intervals, together with the standard deviation SD of his daily GLONASS data. C1 is then derived using UTC - GPS time of section 4.

Date 1991 0hUTC	MJD	C1 (μs)	SD (μs)
Apr 23	48369	-2.19	0.07
May 3	48379	-2.51	0.06
May 13	48389	-2.82	0.06
May 23	48399	-3.10	0.05

6 - Measurement of UTC(j)-UTC(k).

Date 1991	MJD	Time comparison (Unit : 1 microsecond)	uncert.	source	meth.
May 5	48381.05	UTC(SU) - UTC(RC) = -9.138		SU report	(1)

(1) Clock transportation.

7 - Duration of the TAI scale interval.

The following table gives the departure D of the duration of the TAI scale interval from the SI second at sea level as realized by a given primary frequency standard occasionally evaluated or continuously operating as a clock. In the later case the chosen two-month period of observation is also indicated. The last communicated estimate of the inaccuracy of the standard provides the uncertainty s of the D value.

D and s are expressed in units of 10^{-14} second.

Standard	Obs. period	D	s
NRC-CsV	48339-48399	-13.2	10.0
PTB-CS1	48339-48399	+1.8	3.0
PTB-CS2	48339-48399	+4.1	1.5

The estimate of the duration of the TAI scale interval, computed by the BIPM, from all the available measurements of the TAI frequency, obtained by comparison with primary frequency standards continuously observed or occasionally evaluated (CRL, NIST, NRC, PTB, SU), is:

$$1 + 3\times10^{-14} \pm 2\times10^{-14}$$

in SI second at sea level, for the two-month interval 48339-48399 .