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BIPM

BUREAU INTERNATIONAL DES POIDS ET MESURES

Circular T 31 (1990 August 28)

1 - COORDINATED UNIVERSAL TIME UTC. Computed values of UTC-UTC(k)

(From 1990 January 1, 0h UTC, to 1991 January 1, 0h UTC, TAI-UTC=25s)
(From 1991 January 1, 0h UTC, until further notice, TAI-UTC=26s)

Date 1990 (0h UTC)		JUN 27	JUL 7	JUL 17	JUL 27
MJD		48069	48079	48089	48099
Laboratory k		UTC-UTC(k)	(Unit = 1 microsecond)		
AOS (Borowiec)		-8.47	-10.02	-11.42	-12.72
APL (Laurel)		0.35	0.48	0.31	0.17
ASMW (Berlin)		-0.14	-0.38	-0.43	-0.28
AUS (Canberra)		-0.62	-0.57	-0.54	-0.51
BEV (Wien)		3.16	2.52	2.64	-
CAO (Cagliari)		7.69	7.36	7.06	6.77
CH (Berne)		0.02	0.04	0.05	0.07
CRL (Tokyo)		0.10	0.15	0.20	0.28
CSAO (Shaanxi)	(1)	-7.49	-6.87	-6.89	-6.96
DPT (Pretoria)		-21.27	-21.28	-21.34	-21.36
FTZ (Darmstadt)		16.56	16.57	16.58	16.56
IEN (Torino)		-0.86	-0.83	-0.83	-0.78
IFAG (Wettzell)		-0.74	-0.60	-0.32	0.03
IGMA (San Martin)	(2)	9.49	9.39	9.30	9.33
INPL (Jerusalem)		182.19	-	-	-
JATC (Xian)		-19.05	-19.26	-19.30	-19.36
KSRI (Taejon)		-64.06	-64.96	-65.81	-66.67
NAOM (Mizusawa)		-4.34	-4.43	-4.50	-4.52
NIM (Beijing)		9.44	9.44	9.45	9.47
NIST (Boulder)		0.36	0.31	0.25	0.18
NPL (Teddington)		-2.33	-2.15	-1.95	-1.76
NPLI (New-Delhi)		-29.55	-29.47	-29.36	-29.02
NRC (Ottawa)		1.15	1.27	1.33	1.41
NRLM (Tsukuba)		-25.37	-24.76	-24.19	-23.70
OMH (Budapest)		1.84	1.37	1.19	1.27
ONRJ (Rio de Janeiro)		12.31	12.32	12.39	12.27
OP (Paris)		-0.48	-0.42	-0.39	-0.40
ORB (Bruxelles)		7.68	7.90	8.10	8.35
PEL (Lower Hutt)		-	-	-	-
PKNM (Warsaw)		-5.49	-5.19	-4.74	-4.10
PTB (Braunschweig)		3.70	3.71	3.71	3.72
RC (Havana)		-3.37	-	-	-
ROA (San Fernando)		8.60	8.51	8.38	8.29
SO (Shanghai)		3.34	3.40	3.36	3.34
STA (Stockholm)		-0.41	-0.30	-0.19	0.07
SU (Moscow)	(3)(4)	9.93	10.01	10.02	9.85
TAO (Tokyo)		-2.77	-2.58	-2.38	-2.15
TL (Taiwan)		3.48	3.72	4.00	4.30
TP (Praha)		-0.30	-0.98	-0.70	-0.22
TUG (Graz)		0.00	0.28	0.48	0.74
USNO (Washington) (USNO MC)		-0.62	-0.57	-0.54	-0.51
VSL (Delft)		2.87	2.90	2.97	3.12
YUZM (Beograd)		17.85	18.54	19.34	20.06
ZIPE (Potsdam)		-0.27	-0.29	-0.18	0.02

PAVILLON DE BRETEUIL F - 92312 SÈVRES CEDEX
TÉL. (CENTRAL) : + 33 1 45 07 70 70 TELEX : BIPM 201067 F TÉLÉCOPIE : + 33 1 45 34 20 21

2 - INTERNATIONAL ATOMIC TIME TAI AND LOCAL ATOMIC TIME SCALES TA(k)

Computed values of TAI-TA(k)

Date 1990 (0h UTC)		JUN 27	JUL 7	JUL 17	JUL 27
MJD		48069	48079	48089	48099
Laboratory k		TAI-TA(k)	(Unit = 1 microsecond)		
AOS (Borowiec)		-8.47	-10.02	-11.42	-12.72
APL (Laurel)		-0.15	-0.03	-0.20	-0.34
AUS (Canberra)		-28.48	-28.79	-28.97	-29.25
CH (Berne)		-65.81	-65.98	-66.17	-66.33
CRL (Tokyo)		-0.91	-0.84	-0.75	-0.65
CSAO (Shaanxi)	(1)	29.11	29.57	29.35	29.08
DDR (Berlin)		-26.46	-26.88	-27.18	-27.41
F (Paris)		81.99	82.28	82.59	82.90
JATC (Xian)		-1.35	-1.20	-1.17	-1.16
NIM (Beijing)		-10.31	-10.26	-10.20	-10.13
NISA (Boulder)	(5)	-45065.35	-45065.58	-45065.83	-45066.08
NIST (Boulder)		-45145.01	-45145.62	-45146.25	-45146.88
NRC (Ottawa)		17.22	17.34	17.40	17.48
PTB (Braunschweig)		-359.70	-359.69	-359.69	-359.68
RC (Havana)		-	-	-	-
SO (Shanghai)		-44.12	-44.03	-44.07	-44.05
SU (Moscow)	(3)(4)	2827259.93	2827260.01	2827260.02	2827259.85
USNO (Washington)	(6)	-34604.01	-34604.64	-34605.26	-34605.91

3 - NOTES ON SECTIONS 1 AND 2

(1) CSAO. The time step of UTC-UTC(CSAO) and TAI-TA(CSAO) of-739 ns between MJD=48069 and MJD=48079 is due to the introduction of GPS time link.

(2) IGMA. Instituto Geografico Militar, San Martin, Provincia de Buenos Aires, Argentina.

(3) SU .

MJD	UTC-UTC(SU)	TAI-TA(SU)
47979	10.70	2827260.70
47989	10.73	2827260.73
47999	10.70	2827260.70
48009	10.39	2827260.39
48019	10.16	2827260.16
48029	10.07	2827260.07
48039	10.11	2827260.11
48049	10.11	2827260.11
48059	10.11	2827260.11

(4) SU . Data obtained from GLONASS satellite tracking at the University of Leeds (U.K.) since MJD = 48069. See Section 5.

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

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

4 - UTC-GPS TIME and TAI-GPS TIME

UTC-GPS TIME = -6 seconds + Co ; TAI-GPS TIME = 19 seconds + Co.

Co is obtained from measurements made at Paris Observatory, usually corrected for the measured ionospheric delay, and from linear interpolation of UTC-UTC(OP).
DC is the synchronization offset between satellites, as measured at Paris Observatory at the instant T of the tracking. T is given for the middle of the tracking period of 13 minutes, for the first tabular date and must be decremented by 4 minutes per day (8 minutes when moving from 0h.. to 23h..).

For most of the applications it is sufficient to derive UTC from the observations of any of the listed satellites, at any time, by interpolating Co. However, in case of large values of DC, one might obtain better values of UTC by using, instead of Co, C=Co+DC.

Date 1990	MJD	Co (ns) 0hUTC	DC(ns) PRN 6 NAV 3 6h36m	PRN 9 NAV 6 9h32m	PRN13 NAV 9 10h 4m	PRN12 NAV10 10h20m	PRN 3 NAV11 13h32m
JUN 27	48069	-380	2	10	-5	8	-8
JUN 28	48070	-365	4	14	-2	-11	-7
JUN 29	48071	-351	3	16	1	-14	-64
JUN 30	48072	-336	-2	29	-19	-26	-4
JUL 1	48073	-320	-5	23	-9	-7	-6
JUL 2	48074	-310	2	19	-11	4	-6
JUL 3	48075	-306	-9	19	-11	-10	-2
JUL 4	48076	-306	-1	27	6	29	-9
JUL 5	48077	-310	-2	10	-9	-11	-3
JUL 6	48078	-312	-7	14	3	34	-6
JUL 7	48079	-311	-22	18	-6	25	-10
JUL 8	48080	-317	3	21	-14	-33	2
JUL 9	48081	-329	-8	2	2	22	-6
JUL 10	48082	-342	-1	-	-	-	-1
JUL 11	48083	-353	-4	22	-	-4	-10
JUL 12	48084	-362	-	9	-5	-25	-12
JUL 13	48085	-368	-12	22	-1	15	-8
JUL 14	48086	-379	-3	13	-17	-31	-2
JUL 15	48087	-393	-1	18	1	4	-6
JUL 16	48088	-410	-2	7	-4	-13	1
JUL 17	48089	-424	-10	-1	3	3	2
JUL 18	48090	-437	3	7	1	25	-11
JUL 19	48091	-446	14	14	-7	-13	-8
JUL 20	48092	-458	4	15	1	3	-10
JUL 21	48093	-474	13	14	-11	2	-13
JUL 22	48094	-490	1	16	-15	-20	-13
JUL 23	48095	-501	3	17	0	-39	-6
JUL 24	48096	-511	-4	21	4	-8	-8
JUL 25	48097	-526	4	-29	-4	-9	-12
JUL 26	48098	-537	-2	10	-3	21	-3
JUL 27	48099	-544	11	4	-3	-22	-2

5 - UTC-GLONASS TIME

Measurements are currently in progress at the University of Leeds by Prof. P. Daly to establish system time references of both GPS and GLONASS.

C1 = UTC-GLONASS time is derived from these measurements after interpolation at 0 h UTC and from UTC-GPS time of section 4. The standard deviation is SD.

UTC(USNO)-UTC(SU) is provided by Prof. Daly.

Date 1990 (0 h UTC)	MJD (0 h UTC)	C1 (μs)	SD (μs)	UTC(USNO)-UTC(SU) (μs)
JUN 27	48069	9.90	0.06	10.55
JUL 7	48079	9.85	0.06	10.58
JUL 17	48089	9.68	0.06	10.56
JUL 27	48099	9.50	0.08	10.36

6 - MEASUREMENT OF UTC(j)-UTC(k)

Date 1990	MJD	Time comparisons (Unit : 1 microsecond)	uncert	source	meth. (1)
FEB 1	47923.02	UTC(SU) - UTC(RC) = -13.19	0.025	SU Bull. B	CT

(1) metod CT : clock transportation.

7 - DURATION OF THE TAI SCALE INTERVAL : 1 second + D

D and its standard deviation s are expressed in 1*10**-14 second.

The following data are given :
- for continuously operating primary standards (primary clocks), the average of D for the two previous months, with the last available estimate of the inaccuracy of the standard;
- for occasional measurements, the value D for the measurement interval, as computed by BIPM (the BIPM uncertainty may be larger than the reported uncertainty on account of the time comparisons);
- the BIPM evaluation from all available measurements (from CRL, NIST, NRC, PTB, SU), with the uncertainty based on those of individual measurements, as reported.

Standards,	Interval(MJD)	D	s
NRC-CsV	48039-48099	-10.4	10.0
PTB-CS1	48039-48099	-0.3	3.0
PTB-CS2	48039-48099	+2.9	1.5
BIPM estimate	48039-48099	+2	2

8 - INFORMATION.

Time signal Y3S. The emission of time signals by Y3S station on 4525 kHz frequency have ceased on 1990 July, 1.