BIPM

BUREAU INTERNATIONAL DES POIDS ET MESURES

Circular T 16 (1989 June 1)

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

(Since 1988 January 1, 0h UTC, TAI-UTC = 24s)

Date 1989 (0h UTC)		MAR 24	APR 3	APR 13	APR 23
MJD		47609	47619	47629	47639
Laboratory k		UTC-UTC(k) (Unit = 1 microsecond)			
AOS (Borowiec)	(1)	-6.37	-5.39	-5.17	-5.44
APL (Laurel)		-	-	-	-
ASMW (Berlin)		-0.03	0.06	0.24	0.34
AUS (Canberra)		-1.01	-0.99	-0.96	-0.95
BEV (Wien)		-9.43	-9.97	-10.44	-11.56
CAO (Cagliari)		6.75	7.03	7.29	7.52
CH (Berne)		0.69	0.67	0.62	0.55
CRL (Tokyo)		-1.43	-1.46	-1.46	-1.48
CSAO (Shaanxi)		0.56	0.41	0.35	0.24
FTZ (Darmstadt)		17.22	17.20	17.19	17.18
IEN (Torino)		-0.90	-0.85	-0.82	-0.77
IFAG (Wettzell)		-0.42	-0.68	-0.96	-0.88
INPL (Jerusalem)		106.63	108.10	109.54	110.98
JATC (Xian)		-0.20	-0.63	-1.04	-1.45
KSRI (Taejon)		-24.03	-24.58	-25.08	-25.60
NAOM (Mizusawa)	(2)	-35.69	-35.69	-35.62	-35.63
NIM (Beijing)		6.15	5.94	5.95	6.00
NIST (Boulder)		-0.34	-0.37	-0.39	-0.44
NPL (Teddington)		0.11	0.00	-0.15	-0.35
NPLI (New-Delhi)		-11.32	-11.46	-11.54	-11.60
NRC (Ottawa)		-13.48	-13.51	-13.54	-13.67
NRLM (Tsukuba)		-36.10	-36.63	-37.10	-37.54
OMH (Budapest)		-9.12	-9.13	-9.20	-9.09
OP (Paris)		-1.79	-1.74	-1.67	-1.63
ORB (Bruxelles)		-14.69	-14.97	-15.31	-15.63
PKNM (Warsaw)		5.86	5.78	5.72	5.81
PTB (Braunschweig)		4.28	4.29	4.29	4.28
ROA (San Fernando)		7.37	7.25	7.33	7.33
SO (Shanghai)		2.58	2.56	2.62	2.70
STA (Stockholm)		2.25	2.31	2.27	2.19
SU (Moscow)		-	-	-	-
TAO (Tokyo)		-2.80	-2.87	-2.90	-2.98
TL (Taiwan)		2.26	2.30	2.42	2.47
TP (Praha)		-0.19	-0.29	-0.40	-0.41
TUG (Graz)		-2.26	-2.01	-1.79	-1.53
USNO (Washington)	(USNO MC)	-1.01	-0.99	-0.96	-0.95
VSL (Delft)		1.00	1.02	0.99	0.99
YUZM (Beograd)		5.89	6.04	6.24	6.60
ZIPE (Potsdam)		0.16	0.25	0.34	0.35

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 1989 (Oh UTC)		MAR 24	APR 3	APR 13	APR 23
MJD		47609	47619	47629	47639
Laboratory k		TAI-TA(k) (Unit = 1 microsecond)			
APL (Laurel)		-	-	-	-
AUS (Canberra)		-19.13	-19.27	-19.43	-19.65
CH (Berne)		-55.67	-55.87	-56.10	-56.35
CRL (Tokyo)		-2.94	-2.96	-2.94	-2.94
CSAO (Shaanxi)		39.54	39.39	39.33	39.23
DDR (Berlin)		-28.41	-28.28	-28.11	-27.98
F (Paris)		67.58	67.91	68.26	68.58
JATC (Xian)		0.16	0.00	-0.04	-0.09
NIM (Beijing)		-10.74	-10.85	-10.89	-10.89
NISA (Boulder)	(3)	-45055.02	-45055.26	-45055.50	-45055.78
NIST (Boulder)		-45122.90	-45123.32	-45123.75	-45124.21
NRC (Ottawa)		17.59	17.56	17.53	17.40
PTB (Braunschweig)		-359.12	-359.11	-359.11	-359.12
SO (Shanghai)		-44.41	-44.46	-44.39	-44.32
SU (Moscow)		-	-	-	-
USNO (Washington)	(4)	-34576.06	-34576.65	-34577.25	-34577.80

3 - NOTES ON SECTIONS 1 AND 2

(1) AOS . Erratum. Correct values of UTC-UTC(AOS) for the previous Circular are :

MJD	UTC - UTC(AOS)
47589	-
47599	-5.83

(2) NAOM. Improved values of UTC - UTC(NAOM) :

MJD	UTC - UTC(NAOM)
47589	-35.66
47599	-35.74

Time step of UTC-UTC(NAOM), of about -500 ns, due to introduction of GPS link on MJD=47589

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

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

4 - UTC-GPS TIME and TAI-GPS TIME

UTC-GPS TIME = -5 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 a 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 1989	MJD	Co (ns) 0hUTC	DC(ns) PRN 3 NAV11 17h42m	PRN 6 NAV 3 13h22m	PRN 9 NAV 6 14h22m	PRN11 NAV 8 8h10m	PRN12 NAV10 17h 2m	PRN13 NAV 9 16h46m
MAR 24	47609	-1206	-2	13	-8	6	-3	-6
MAR 25	47610	-1198	-9	23	12	1	-7	-12
MAR 26	47611	-1192	-2	14	16	-8	-13	-22
MAR 27	47612	-1185	-3	15	6	2	6	-14
MAR 28	47613	-1174	-10	14	2	-2	-4	-15
MAR 29	47614	-1166	1	8	11	8	10	-4
MAR 30	47615	-1160	-10	12	13	-17	-7	-19
MAR 31	47616	-1158	-12	10	7	15	14	-20
APR 1	47617	-1154	-9	23	8	-10	6	-13
APR 2	47618	-1152	-15	5	7	4	6	-15
APR 3	47619	-1153	-8	23	16	-9	-12	-1
APR 4	47620	-1148	-7	7	10	-8	-6	-12
APR 5	47621	-1141	-7	17	12	-4	-10	-1
APR 6	47622	-1131	-5	15	24	-8	11	-20
APR 7	47623	-1130	-5	7	12	-11	-4	-1
APR 8	47624	-1132	-3	15	-3	-12	-1	-9
APR 9	47625	-1130	-5	18	18	9	-2	-20
APR 10	47626	-1135	-10	10	10	-1	0	-12
APR 11	47627	-1142	-11	9	9	0	-4	-30
APR 12	47628	-1142	-3	15	17	0	-17	-18
APR 13	47629	-1129	0	14	5	9	-3	-12
APR 14	47630	-1121	-5	11	14	-1	8	-11
APR 15	47631	-1122	-2	7	0	-8	-1	-5
APR 16	47632	-1126	-12	5	9	-3	2	-7
APR 17	47633	-1125	-8	10	3	-6	-10	5
APR 18	47634	-1119	-1	18	14	2	8	-16
APR 19	47635	-1120	-11	1	12	-7	-8	-22
APR 20	47636	-1118	1	22	19	1	-17	4
APR 21	47637	-1114	12	-3	14	-14	-5	0
APR 22	47638	-1115	0	9	14	-12	8	-12
APR 23	47639	-1123						

5 - 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 that 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	47579-47639	+3.6	10.0
PTB-CS1	47579-47639	-1.4	3.0
PTB-CS2	47579-47639	+2.8	1.5
BIPM estimate	47579-47639	+2	2