BIPM

BUREAU INTERNATIONAL DES POIDS ET MESURES

Circular T 17 (1989 July 3)

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

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

Date 1989 (0h UTC)		APR 23	MAY 3	MAY 13	MAY 23
MJD		47639	47649	47659	47669
Laboratory k		UTC-UTC(k)	(Unit = 1 microsecond)		
AOS (Borowiec)		-5.44	-5.44	-	2.38
APL (Laurel)		-	-	-0.83	-0.85
ASMW (Berlin)		0.34	0.38	0.25	0.17
AUS (Canberra)		-0.95	-0.95	-0.94	-0.94
BEV (Wien)	(1)	-11.56	-12.26	6.98	6.22
CAO (Cagliari)		7.52	7.71	7.99	8.22
CH (Berne)		0.55	0.47	0.40	0.32
CRL (Tokyo)		-1.48	-1.49	-1.46	-1.43
CSAO (Shaanxi)		0.24	0.03	-0.27	-0.43
FTZ (Darmstadt)		17.18	17.16	17.16	17.12
IEN (Torino)		-0.77	-0.74	-0.71	-0.68
IFAG (Wettzell)	(2)	-0.88	-1.10	-1.20	-1.29
INPL (Jerusalem)		110.98	112.39	113.91	115.52
JATC (Xian)		-1.45	-2.10	-3.16	-2.77
KSRI (Taejon)	(3)	-25.60	-26.11	-26.60	-11.95
NAOM (Mizusawa)		-35.63	-35.68	-35.72	-35.67
NIM (Beijing)		6.00	5.90	5.96	5.89
NIST (Boulder)		-0.44	-0.49	-0.51	-0.52
NPL (Teddington)		-0.35	-0.58	-0.81	-1.05
NPLI (New-Delhi)		-11.60	-11.61	-11.69	-11.80
NRC (Ottawa)		-13.67	-13.63	-13.69	-13.78
NRLM (Tsukuba)		-37.54	-38.00	-38.47	-38.90
OMH (Budapest)		-9.09	-8.97	-9.24	-9.25
OP (Paris)		-1.63	-1.61	-1.59	-1.57
ORB (Bruxelles)	(4)	-15.63	-16.00	4.17	4.13
PKNM (Warsaw)		5.81	6.01	6.10	6.07
PTB (Braunschweig)		4.28	4.28	4.22	4.22
ROA (San Fernando)		7.33	7.36	7.37	7.39
SO (Shanghai)		2.70	2.66	2.51	2.43
STA (Stockholm)		2.19	2.06	1.95	1.79
SU (Moscow)	(5)	-	-	-	-
TAO (Tokyo)		-2.98	-3.03	-3.08	-3.16
TL (Taiwan)	(6)	2.47	2.20	2.31	2.40
TP (Praha)		-0.41	-0.39	-0.61	-0.87
TUG (Graz)		-1.53	-1.32	-1.09	-0.84
USNO (Washington)	(USNO MC)	-0.95	-0.95	-0.94	-0.94
VSL (Delft)		0.99	0.97	1.01	1.06
YUZM (Beograd)		6.60	6.98	7.51	8.32
ZIPE (Potsdam)		0.35	0.28	0.09	-0.09

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

Computed values of TAI-TA(k)

Date 1989 (Oh UTC)		APR 23	MAY 3	MAY 13	MAY 23
MJD		47639	47649	47659	47669
Laboratory k		TAI-TA(k)	(Unit = 1 microsecond)		
APL (Laurel)		-	-	-0.83	-0.85
AUS (Canberra)		-19.65	-19.81	-20.03	-20.22
CH (Berne)		-56.35	-56.61	-56.87	-57.13
CRL (Tokyo)		-2.94	-2.94	-2.90	-2.86
CSAO (Shaanxi)		39.23	39.01	38.71	38.55
DDR (Berlin)		-27.98	-27.89	-27.92	-27.90
F (Paris)		68.58	68.90	69.22	69.54
JATC (Xian)		-0.09	-0.31	-1.19	-0.67
NIM (Beijing)		-10.89	-11.08	-11.10	-11.25
NISA (Boulder)	(7)	-45055.78	-45056.06	-45056.31	-45056.57
NIST (Boulder)		-45124.21	-45124.65	-45125.08	-45125.52
NRC (Ottawa)		17.40	17.44	17.38	17.29
PTB (Braunschweig)		-359.12	-359.12	-359.18	-359.18
SO (Shanghai)		-44.32	-44.39	-44.58	-44.67
SU (Moscow)	(5)	-	-	-	-
USNO (Washington)	(8)	-34577.80	-34578.35	-34578.92	-34579.54

3 - NOTES ON SECTIONS 1 AND 2

(1) BEV . Time step of UTC(BEV) of -20000 ns on MJD = 47654.26

(2) IFAG. Interpolated value for MJD = 47659

(3) KSRI. Change of master clock on MJD = 47665.08

(4) ORB . Time step of UTC(ORB) of -20400 ns on MJD = 47654.5

(5) SU .

MJD	UTC-UTC(SU)	TAI-TA(SU)
47559	16.12	2827266.12
47569	15.99	2827265.99
47579	15.86	2827265.86
47589	15.71	2827265.71
47599	15.82	2827265.82
47609	15.78	2827265.78

(6) TL . The time step of UTC-UTC(TL) of about 380 ns between MJD=47639 and MJD=47649 is due to the reintroduction of the GPS time link for TL.

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

(8) 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 15h42m	PRN 6 NAV 3 11h22m	PRN 9 NAV 6 12h22m	PRN11 NAV 8 6h10m	PRN12 NAV10 15h 2m	PRN13 NAV 9 14h46m
APR 23	47639	-1123	-12	-1	6	-15	-23	-12
APR 24	47640	-1123	-4	8	11	5	-6	0
APR 25	47641	-1121	-6	15	5	-9	23	-15
APR 26	47642	-1116	-8	4	8	-9	7	-8
APR 27	47643	-1112	-12	0	17	-10	5	-12
APR 28	47644	-1114	-9	11	3	-8	7	-17
APR 29	47645	-1119	-	8	4	-20	5	-12
APR 30	47646	-1127	-	-	-	-	-	-
MAY 1	47647	-1132	-6	2	-5	-	4	-7
MAY 2	47648	-1133	-5	9	-1	-6	-7	-2
MAY 3	47649	-1134	4	19	8	-2	-6	5
MAY 4	47650	-1139	-3	9	0	-11	-10	-15
MAY 5	47651	-1144	-4	5	1	-10	-11	-7
MAY 6	47652	-1144	-5	12	2	-11	0	-12
MAY 7	47653	-1141	-6	14	3	11	-7	-6
MAY 8	47654	-1139	10	12	1	15	13	-25
MAY 9	47655	-1138	-3	-7	-6	-5	-4	-9
MAY 10	47656	-1135	3	1	-5	-10	-12	4
MAY 11	47657	-1129	21	-2	9	15	-10	-18
MAY 12	47658	-1125	8	-9	4	8	16	-12
MAY 13	47659	-1121	3	7	2	-1	-7	-19
MAY 14	47660	-1116	2	1	-1	-20	-9	-3
MAY 15	47661	-1108	2	-6	2	14	3	-3
MAY 16	47662	-1096	-1	1	0	-2	3	7
MAY 17	47663	-1088	15	2	3	-7	-10	3
MAY 18	47664	-1082	7	5	0	-7	-7	3
MAY 19	47665	-1079	11	0	-8	-17	-11	8
MAY 20	47666	-1077	12	-5	-10	-	-6	7
MAY 21	47667	-1075	15	1	-12	-11	8	10
MAY 22	47668	-1076	8	4	-1	-7	-7	7
MAY 23	47669	-1078	-3	7	0	-1	-8	-3

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

Date 1989	MJD	Time comparisons (Unit : 1 microsecond)		uncert.	source	meth. (1)
MAY 22	47668.05	UTC(TAO) - UTC(CRL) =	1.798	0.005	TAO message	CT

(1) method : CT Clock Transportation.

6 - 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	47609-47669	+4.6	10.0
PTB-CS1	47609-47669	+2.5	3.0
PTB-CS2	47609-47669	+4.7	1.5
BIPM estimate	47609-47669	+3	2