BIPM

BUREAU INTERNATIONAL DES POIDS ET MESURES

Circular T 18 (1989 August 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)			MAY 23	JUN 2	JUN 12	JUN 22
MJD			47669	47679	47689	47699
Laboratory k			UTC-UTC(k)	(Unit = 1 microsecond)		
AOS	(Borowiec)		2.38	3.98	-	-
APL	(Laurel)		-0.84	-0.79	-0.80	-
ASMW	(Berlin)		0.17	0.09	-0.10	-0.16
AUS	(Canberra)		-0.93	-0.94	-0.94	-0.95
BEV	(Wien)		6.23	5.36	4.52	3.57
CAO	(Cagliari)		8.23	8.54	8.81	9.02
CH	(Berne)		0.33	0.24	0.17	0.13
CRL	(Tokyo)		-1.42	-1.44	-1.40	-1.39
CSAO	(Shaanxi)		-0.42	-0.40	-0.24	-0.18
FTZ	(Darmstadt)		17.13	17.11	17.09	17.11
IEN	(Torino)		-0.67	-0.61	-0.57	-0.53
IFAG	(Wettzell)		-1.29	-1.20	-1.45	-1.77
INPL	(Jerusalem)		115.53	117.16	119.20	121.27
JATC	(Xian)		-2.76	-2.73	-2.88	-3.10
KSRI	(Taejon)		-11.94	-11.09	-10.52	-10.44
NAOM	(Mizusawa)		-35.66	-35.66	-35.64	-35.64
NIM	(Beijing)		5.90	5.70	5.71	5.73
NIST	(Boulder)		-0.51	-0.53	-0.52	-0.51
NPL	(Teddington)		-1.04	-1.06	-1.05	-1.03
NPLI	(New-Delhi)		-11.80	-11.96	-12.20	-12.55
NRC	(Ottawa)		-13.77	-13.88	-13.92	-13.98
NRLM	(Tsukuba)	(1)	-38.89	-39.32	-105.16	-105.59
OMH	(Budapest)		-9.25	-9.36	-9.41	-9.24
OP	(Paris)		-1.57	-1.58	-1.55	-1.62
ORB	(Bruxelles)		4.14	4.08	4.05	4.17
PKNM	(Warsaw)		6.08	5.93	5.74	5.42
PTB	(Braunschweig)		4.22	4.22	4.19	4.17
ROA	(San Fernando)		7.40	7.46	7.56	7.64
SO	(Shanghai)		2.44	2.41	2.47	2.55
STA	(Stockholm)		1.80	1.67	1.60	1.55
SU	(Moscow)		-	-	-	-
TAO	(Tokyo)		-3.15	-3.23	-3.30	-3.38
TL	(Taiwan)		2.41	2.56	2.67	2.62
TP	(Praha)		-0.87	-1.19	-1.35	-1.14
TUG	(Graz)		-0.83	-0.54	-0.27	-0.03
USNO	(Washington)	(USNO MC)	-0.93	-0.94	-0.94	-0.95
VSL	(Delft)		1.06	1.12	1.11	1.17
YUZM	(Beograd)		8.33	8.92	9.95	10.73
ZIPE	(Potsdam)		-0.09	-0.19	-0.24	-0.29

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 (0h UTC)		MAY 23	JUN 2	JUN 12	JUN 22
MJD		47669	47679	47689	47699
Laboratory k		TAI-TA(k)	(Unit = 1 microsecond)		
APL (Laurel)		-0.84	-0.79	-0.80	-
AUS (Canberra)		-20.21	-20.44	-20.68	-20.88
CH (Berne)		-57.12	-57.39	-57.65	-57.87
CRL (Tokyo)		-2.85	-2.85	-2.80	-2.78
CSAO (Shaanxi)		38.56	38.58	38.74	38.80
DDR (Berlin)		-27.90	-27.90	-27.96	-27.99
F (Paris)		69.55	69.88	70.22	70.52
JATC (Xian)		-0.67	-0.68	-0.73	-0.77
NIM (Beijing)		-11.24	-11.46	-11.44	-11.38
NISA (Boulder)	(2)	-45056.56	-45056.81	-45057.05	-45057.30
NIST (Boulder)		-45125.51	-45125.94	-45126.36	-45126.79
NRC (Ottawa)		17.29	17.19	17.15	17.09
PTB (Braunschweig)		-359.18	-359.18	-359.21	-359.23
SO (Shanghai)		-44.67	-44.73	-44.68	-44.61
SU (Moscow)		-	-	-	-
USNO (Washington)	(3)	-34579.53	-34580.10	-34580.66	-34581.23

3 - NOTES ON SECTIONS 1 AND 2

(1) NRLM. Time step of UTC(NRLM) of +65400 ns on MJD = 47685.

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

(3) 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) PRN11 NAV 8 4h10m	PRN 6 NAV 3 9h22m	PRN 9 NAV 6 10h22m	PRN13 NAV 9 12h46m	PRN12 NAV10 13h 2m	PRN 3 NAV11 13h42m
MAY 23	47669	-1070	-1	7	0	-4	-9	-4
MAY 24	47670	-1072	-6	-3	-7	-15	-16	3
MAY 25	47671	-1069	-10	0	0	20	14	34
MAY 26	47672	-1064	-13	-5	-4	16	5	14
MAY 27	47673	-1062	-27	-13	-4	14	-4	15
MAY 28	47674	-1059	-14	-13	-4	12	6	34
MAY 29	47675	-1054	-18	-7	-11	14	-1	27
MAY 30	47676	-1049	-	-	-	13	-9	19
MAY 31	47677	-1046	-15	-8	-11	11	5	21
JUN 1	47678	-1046	-22	-6	-12	20	8	36
JUN 2	47679	-1049	-22	-6	-4	35	4	43
JUN 3	47680	-1049	-16	-4	-4	24	18	35
JUN 4	47681	-1052	2	-2	-14	3	-15	1
JUN 5	47682	-1053	-3	5	0	16	-1	15
JUN 6	47683	-1053	-12	1	0	-4	-12	10
JUN 7	47684	-1050	-19	7	-2	4	-3	2
JUN 8	47685	-1048	-21	-1	-1	12	2	18
JUN 9	47686	-1049	-3	-	-	-	-	-
JUN 10	47687	-1054	-	-	-	-	-	-
JUN 11	47688	-1062	-	-16	-4	-16	-4	19
JUN 12	47689	-1067	-43	-10	-13	4	-8	9
JUN 13	47690	-1074	7	-12	-5	17	-1	22
JUN 14	47691	-1075	-13	-1	-9	16	5	18
JUN 15	47692	-1075	-16	3	-2	16	-12	15
JUN 16	47693	-1075	-13	-10	-10	9	-10	5
JUN 17	47694	-1073	5	-8	-11	9	2	17
JUN 18	47695	-1070	-18	-5	-7	10	5	13
JUN 19	47696	-1070	11	-	-	-	14	-
JUN 20	47697	-1073	9	-9	-12	-4	-17	5
JUN 21	47698	-1077	-5	-9	-9	-21	-4	2
JUN 22	47699	-1080	1	-6	-8	5	11	17

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

Date 1989	MJD	Time comparisons (Unit : 1 microsecond)		uncert.	source	meth. (1)
MAY 15	47661.70	UTC(OMH) - UTC(TP) =	8.48	0.05	OMH letter	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	47639-47699	+10.7	10.0
PTB-CS1	47639-47699	+ 2.0	3.0
PTB-CS2	47639-47699	+ 4.1	1.5
BIPM estimate	47639-47699	+ 4	2