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BIPM

BUREAU INTERNATIONAL DES POIDS ET MESURES

Circular T 28 (1990 June 1)

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

(Since 1990 January 1, 0h UTC, TAI-UTC = 25s)

Date 1990 (0h UTC)	MAR 29	APR 8	APR 18	APR 28
MJD	47979	47989	47999	48009
Laboratory k	UTC-UTC(k)	(Unit = 1 microsecond)		
AOS (Borowiec)	-0.94	-1.55	-2.14	-2.67
APL (Laurel)	0.95	1.10	1.24	1.30
ASMW (Berlin)	-0.10	0.02	0.20	0.28
AUS (Canberra)	-1.22	-1.16	-1.06	-1.01
BEV (Wien)	8.60	8.19	7.58	7.10
CAO (Cagliari)	9.63	8.90	-	8.54
CH (Berne)	-0.70	-0.62	-0.52	-0.45
CRL (Tokyo)	-0.46	-0.42	-0.36	-0.32
CSAO (Shaanxi)	-5.64	-5.97	-6.13	-6.39
DPT (Pretoria)	-20.18	-20.45	-20.67	-
FTZ (Darmstadt)	16.41	16.45	16.43	16.46
IEN (Torino)	-0.91	-0.90	-0.91	-0.90
IFAG (Wettzell)	-1.54	-1.43	-1.32	-1.20
INPL (Jerusalem)	163.09	165.19	167.35	169.56
JATC (Xian)	-13.79	-14.38	-14.99	-15.47
KSRI (Taejon)	-56.51	-57.33	-58.20	-59.04
NAOM (Mizusawa)	-3.02	-3.28	-3.53	-3.76
NIM (Beijing)	8.98	9.00	9.02	8.99
NIST (Boulder)	0.46	0.47	0.50	0.51
NPL (Teddington)	-2.29	-2.34	-2.36	-2.34
NPLI (New-Delhi)	-24.47	-24.98	-25.46	-26.04
NRC (Ottawa)	-0.34	-0.22	-0.04	0.15
NRLM (Tsukuba)	-30.49	-30.05	-29.47	-28.79
OMH (Budapest)	1.19	1.32	1.39	1.62
ONRJ (Rio de Janeiro)	11.85	11.63	-	11.70
OP (Paris)	-0.65	-0.68	-0.67	-0.65
ORB (Bruxelles)	5.74	5.95	6.17	6.37
PEL (Lower Hutt)	-	-	-	-
PKNM (Warsaw)	-5.30	-5.79	-6.38	-6.84
PTB (Braunschweig)	3.71	3.70	3.71	3.70
RC (Havana)	-2.62	-2.82	-3.00	-3.11
ROA (San Fernando)	9.28	9.24	9.10	9.05
SO (Shanghai)	3.83	3.83	3.75	3.77
STA (Stockholm)	0.20	0.13	0.04	-0.02
SU (Moscow) (1)	-	-	-	-
TAO (Tokyo)	-4.55	-4.34	-4.19	-4.01
TL (Taiwan)	2.10	2.31	2.18	2.36
TP (Praha)	0.79	0.76	0.56	0.73
TUG (Graz)	-2.39	-2.12	-1.85	-1.60
USNO (Washington) (USNO MC)	-1.22	-1.16	-1.06	-1.01
VSL (Delft)	2.67	2.69	2.73	2.72
YUZM (Beograd)	17.07	17.13	16.41	16.19
ZIPE (Potsdam)	-0.24	-0.08	0.05	0.03

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

Computed values of TAI-TA(k)

Date 1990 (0h UTC)			MAR 29	APR 8	APR 18	APR 28
MJD			47979	47989	47999	48009
Laboratory k			TAI-TA(k)	(Unit = 1 microsecond)		
AOS	(Borowiec)		-0.94	-1.55	-2.14	-2.67
APL	(Laurel)		-0.38	-0.24	-0.09	-0.04
AUS	(Canberra)		-26.93	-27.09	-27.19	-27.35
CH	(Berne)		-64.17	-64.36	-64.53	-64.72
CRL	(Tokyo)		-1.60	-1.54	-1.48	-1.43
CSAO	(Shaanxi)		31.86	31.43	31.17	30.81
DDR	(Berlin)		-26.48	-26.32	-26.13	-26.02
F	(Paris)		79.29	79.60	79.92	80.24
JATC	(Xian)		-1.50	-1.44	-1.48	-1.32
NIM	(Beijing)		-11.24	-11.16	-11.08	-11.07
NISA	(Boulder)	(2)	-45063.43	-45063.63	-45063.81	-45064.02
NIST	(Boulder)		-45139.94	-45140.48	-45141.02	-45141.57
NRC	(Ottawa)		15.73	15.85	16.03	16.22
PTB	(Braunschweig)		-359.69	-359.70	-359.69	-359.70
RC	(Havana)	(3)	-262.40	-262.67	-262.88	-263.08
SO	(Shanghai)		-43.71	-43.70	-43.75	-43.73
SU	(Moscow)	(1)	-	-	-	-
USNO	(Washington)	(4)	-34598.06	-34598.72	-34599.38	-34600.07

3 - NOTES ON SECTIONS 1 AND 2

(1) SU .

MJD	UTC-UTC(SU)	TAI-TA(SU)
47899	11.31	2827261.31
47909	11.19	2827261.19
47919	11.14	2827261.14

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

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

(4) 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) PRN13 NAV 9 17h20m	PRN 3 NAV11 18h40m	PRN11 NAV 8 5h56m	PRN14 NAV14 8h20m	PRN 6 NAV 3 12h36m	PRN 9 NAV 6 15h32m	PRN12 NAV10 16h20m
MAR 29	47979	-1359	-10	-1	6	-	6	-	0
MAR 30	47980	-1354	24	5	1	-	2	-	-12
MAR 31	47981	-1345	-5	10	-2	-	-8	0	20
APR 1	47982	-1330	2	-2	-5	-	1	3	-18
APR 2	47983	-1316	-4	6	5	-	-11	7	15
APR 3	47984	-1307	8	2	-3	-	-3	2	17
APR 4	47985	-1305	-13	2	-10	-	-31	-5	12
APR 5	47986	-1304	5	-2	-9	-	0	10	1
APR 6	47987	-1298	8	-4	-5	-	5	9	-27
APR 7	47988	-1292	-14	-16	10	-	-8	2	-34
APR 8	47989	-1287	-8	-29	5	-	-8	14	20
APR 9	47990	-1275	-6	-4	8	-	-3	4	-13
APR 10	47991	-1265	7	33	5	-	-13	11	-6
APR 11	47992	-1253	-11	-1	1	-	9	-2	0
APR 12	47993	-1240	-6	4	2	-	6	7	-10
APR 13	47994	-1231	16	5	7	-	0	6	-2
APR 14	47995	-1226	-11	-3	4	-	-4	-12	-2
APR 15	47996	-1218	-14	8	8	-	4	0	6
APR 16	47997	-1205	0	1	15	-	-9	-10	21
APR 17	47998	-1195	-17	8	-2	-	7	-8	7
APR 18	47999	-1186	4	-6	3	-	-10	-3	1
APR 19	48000	-1177	-10	7	-	-	1	25	-1
APR 20	48001	-1171	0	5	7	-	-11	-5	-2
APR 21	48002	-1168	-38	10	-2	-	-7	-	13
APR 22	48003	-1162	10	8	-6	-	6	16	-12
APR 23	48004	-1155	-19	10	-3	-	-8	0	-12
APR 24	48005	-1147	12	7	-	-	-9	9	8
APR 25	48006	-1142	-12	3	-	-	12	-3	-15
APR 26	48007	-1138	-8	5	-	-	-2	-2	4
APR 27	48008	-1131	-13	8	-	-	4	8	9
APR 28	48009	-1120	-18	4	-	-	2	0	-9

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.In the table below, C1 = UTC-GLONASS time is derived from these measurements after interpolation at 0 h UTC and from UTC-GPS time of table 4. The standard deviation is SD. These data are obtained with a single receiver and therefore, unconfirmed. They are averaged on about 10 satellites.

Date 1990	MJD	C1 (µs) 0 h UTC	SD (µs)
JAN 8	47899	43.23	0.09
JAN 18	47909	43.64	0.12
JAN 28	47919	44.09	0.13
FEB 7	47929	44.58	0.11
FEB 17	47939	45.01	0.10
FEB 27	47949	45.43	0.12
MAR 9	47959	45.85	0.10
MAR 19	47969	46.27	0.14
MAR 29	47979	46.45	0.09
APR 8	47989	46.59	0.09
APR 18	47999	46.76	0.07
APR 28	48009	46.94	0.11

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 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	47949-48009	-5.9	10.0
PTB-CS1	47949-48009	+0.8	3.0
PTB-CS2	47949-48009	+3.6	1.5
BIPM estimate	47949-48009	+3	2