ISSN 1143-1393

BIPM

BUREAU INTERNATIONAL DES POIDS ET MESURES

Circular T 30 (1990 August 1)

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)	MAY 28	JUN 7	JUN 17	JUN 27
MJD	48039	48049	48059	48069
Laboratory k	UTC-UTC(k)	(Unit = 1 microsecond)		
AOS (Borowiec)	-4.59	-6.01	-7.08	-8.47
APL (Laurel)	0.49	0.50	0.40	0.35
ASMW (Berlin)	-0.15	-0.18	-0.13	-0.14
AUS (Canberra)	-0.78	-0.71	-0.65	-0.62
BEV (Wien)	5.75	4.39	3.78	3.16
CAO (Cagliari)	8.61	8.23	8.01	7.69
CH (Berne)	-0.20	-0.12	-0.01	0.02
CRL (Tokyo)	-0.10	-0.03	0.05	0.10
CSAO (Shaanxi)	-6.88	-7.09	-7.36	-7.49
DPT (Pretoria)	-21.17	-21.18	-21.22	-21.27
FTZ (Darmstadt)	16.43	16.46	16.44	16.56
IEN (Torino)	-0.92	-0.90	-0.86	-0.86
IFAG (Wettzell)	-0.98	-0.97	-0.93	-0.73
INPL (Jerusalem)	175.76	177.80	179.88	182.19
JATC (Xian)	-17.24	-17.85	-18.50	-19.04
KSRI (Taejon)	-61.38	-62.27	-63.15	-64.06
NAOM (Mizusawa)	-4.23	-4.28	-4.27	-4.34
NIM (Beijing)	9.19	9.40	9.43	9.44
NIST (Boulder)	0.46	0.44	0.41	0.36
NPL (Teddington)	-2.48	-2.50	-2.45	-2.33
NPLI (New-Delhi)	-29.25	-29.40	-29.57	-29.55
NRC (Ottawa)	0.84	0.94	1.02	1.15
NRLM (Tsukuba)	-27.18	-26.67	-25.97	-25.36
OMH (Budapest)	1.47	1.90	1.71	1.84
ONRJ (Rio de Janeiro)	12.00	12.24	12.37	12.31
OP (Paris)	-0.58	-0.54	-0.50	-0.48
ORB (Bruxelles)	6.97	7.26	7.48	7.69
PEL (Lower Hutt)	-	-	-	-
PKNM (Warsaw)	-6.59	-6.23	-5.72	-5.49
PTB (Braunschweig)	3.71	3.71	3.72	3.70
RC (Havana)	-3.62	-3.44	-3.36	-3.37
ROA (San Fernando)	8.86	8.78	8.71	8.60
SO (Shanghai)	3.69	3.64	3.46	3.34
STA (Stockholm)	-0.54	-0.57	-0.49	-0.41
SU (Moscow) (1)	-	-	-	-
TAO (Tokyo)	-3.40	-3.16	-2.96	-2.77
TL (Taiwan)	2.89	3.08	3.27	3.49
TP (Praha)	0.26	0.52	0.14	-0.30
TUG (Graz)	-0.84	-0.56	-0.27	0.00
USNO (Washington) (USNO MC)	-0.78	-0.71	-0.65	-0.62
VSL (Delft)	2.76	2.80	2.83	2.87
YUZM (Beograd)	16.42	16.63	17.18	17.85
ZIPE (Potsdam)	-0.13	-0.17	-0.28	-0.27

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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)			MAY 28	JUN 7	JUN 17	JUN 27
MJD			48039	48049	48059	48069
Laboratory k			TAI-TA(k)	(Unit = 1 microsecond)		
AOS	(Borowiec)		-4.59	-6.01	-7.08	-8.47
APL	(Laurel)		-0.01	0.00	-0.11	-0.15
AUS	(Canberra)		-28.02	-28.13	-28.17	-28.48
CH	(Berne)		-65.27	-65.45	-65.62	-65.81
CRL	(Tokyo)		-1.17	-1.09	-0.99	-0.91
CSAO	(Shaanxi)		30.02	29.71	29.34	29.11
DDR	(Berlin)		-26.02	-26.23	-26.38	-26.46
F	(Paris)		81.13	81.41	81.72	81.99
JATC	(Xian)		-1.26	-1.25	-1.35	-1.35
NIM	(Beijing)		-10.71	-10.45	-10.37	-10.31
NISA	(Boulder)	(2)	-45064.66	-45064.88	-45065.10	-45065.34
NIST	(Boulder)		-45143.26	-45143.83	-45144.40	-45145.00
NRC	(Ottawa)		16.91	17.01	17.09	17.22
PTB	(Braunschweig)		-359.69	-359.69	-359.68	-359.70
RC	(Havana)	(3)	-264.04	-264.21	-264.48	-264.83
SO	(Shanghai)		-43.79	-43.84	-44.00	-44.12
SU	(Moscow)	(1)	-	-	-	-
USNO	(Washington)	(4)	-34602.02	-34602.69	-34603.34	-34604.01

3 - NOTES ON SECTIONS 1 AND 2

(1) SU .

MJD	UTC-UTC(SU)	TAI-TA(SU)
47929	11.00	2827261.00
47939	10.79	2827260.79
47949	10.81	2827260.81
47959	10.83	2827260.83
47969	10.68	2827260.68

(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..).

Date 1990	MJD	Co (ns) 0hUTC	DC(ns) PRN11 NAV 8 1h 8m	PRN14 NAV14 4h20m	PRN 6 NAV 3 8h36m	PRN 9 NAV 6 11h32m	PRN12 NAV10 12h20m	PRN13 NAV 9 13h20m	PRN 3 NAV11 14h40m
MAY 28	48039	-832	-	-	0	8	-1	-41	-3
MAY 29	48040	-818	-	-	2	12	-4	-	-
MAY 30	48041	-804	-	-	1	-2	25	-33	-
MAY 31	48042	-789	-	-	7	9	10	19	-2
JUN 1	48043	-776	-1	-	0	6	-8	-13	-3
JUN 2	48044	-764	5	-	-1	9	-25	-8	-10
JUN 3	48045	-748	-2	-	1	20	1	-24	-1
JUN 4	48046	-730	1	-	9	21	-38	-23	-8
JUN 5	48047	-714	2	-	-4	18	3	-15	-7
JUN 6	48048	-700	-7	-	-2	11	-4	5	-1
JUN 7	48049	-686	8	-	-8	15	-11	-16	-1
JUN 8	48050	-675	-2	-	0	13	14	-4	-8
JUN 9	48051	-665	0	-	-3	20	-12	-19	-3
JUN 10	48052	-654	3	-	-3	7	3	-11	-1
JUN 11	48053	-632	1	-	-5	9	-2	-5	-16

Date 1990	MJD	Co (ns) 0hUTC	DC(ns) PRN 6 NAV 3 7h36m	PRN 9 NAV 6 10h32m	PRN13 NAV 9 11h 4m	PRN12 NAV10 11h20m	PRN 3 NAV11 14h32m
JUN 12	48054	-624	0	26	-7	-8	-8
JUN 13	48055	-605	2	25	-9	24	-18
JUN 14	48056	-584	-11	20	2	24	-7
JUN 15	48057	-563	5	-11	-20	14	-10
JUN 16	48058	-543	7	21	1	-10	-20
JUN 17	48059	-525	1	28	-14	8	-10
JUN 18	48060	-509	-3	14	-2	-8	-5
JUN 19	48061	-495	5	6	5	-6	-9
JUN 20	48062	-480	-4	18	-15	9	0
JUN 21	48063	-462	-9	13	-6	11	-9
JUN 22	48064	-444	1	15	6	-10	0
JUN 23	48065	-430	-2	9	-18	-3	-1
JUN 24	48066	-418	6	22	2	-12	-14
JUN 25	48067	-407	1	8	-5	-3	-4
JUN 26	48068	-394	-4	13	4	-8	-3
JUN 27	48069	-380	2	10	-5	8	-7

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 section 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)
JUN 7	48049	47.77	0.07
JUN 17	48059	48.03	0.07
JUN 27	48069	9.90(1)	0.06

(1) On 1990 June 22 at approximately 15 h 30 UTC, GLONASS time was synchronized with UTC(SU). (communication from Prof. P. Daly)

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

Date 1990	MJD	Time comparisons (Unit : 1 microsecond)		uncert.	source	(1)
MAY 22	48033.05	UTC(TAO) - UTC(CRL) =	3.493	0.005	TAO message	CT
MAY 25	48036.05	UTC(TAO) - UTC(NRLM) =	-23.853	0.008	TAO message	CT
MAY 29	48040.01	UTC(TAO) - UTC(NAOM) =	-0.914	0.010	TAO message	CT
JUN 13	48055.42	UTC(ASMW) - UTC(PTB) =	3.858	0.010	ASMW letter	CT
JUN 13	48055.42	UTC(ASMW) - UTC(SU) =	10.318	0.010	ASMW letter	CT

(1) method : CT clock transportation

7 - INFORMATION, UTC time step on the 1st of January 1991

Bulletin C2 of the International Earth Rotation Service informs that a positive leap second will be introduced at the end of December 1990. The sequence of dates of the UTC second markers will be :

1990 December 31, 23 h 59 m 59 s
1990 December 31, 23 h 59 m 60 s
1991 January 1, 0 h 0 m 0 s

8 - 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	48009-48069	-18.2	10.0
PTB-CS1	48009-48069	-0.2	3.0
PTB-CS2	48009-48069	+2.7	1.5
BIPM estimate	48009-48069	+2	2