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BIPM

BUREAU INTERNATIONAL DES POIDS ET MESURES

Circular T 39 (1991 May 2)

1 - Coordinated Universal Time UTC. Computed values of UTC-UTC(k).

(Since 1991 January 1, 0hUTC, TAI-UTC = 26s)

Date 1991 0hUTC		FEB 22	MAR 4	MAR 14	MAR 24
MJD		48309	48319	48329	48339
Laboratory k		UTC-UTC(k) (Unit = 1 microsecond)			
AOS (Borowiec)		-3.14	-3.47	-4.26	-5.06
APL (Laurel)		-0.82	-0.81	-0.82	-0.90
AUS (Canberra)		0.07	0.09	0.08	0.10
BEV (Wien)	(1)	-6.82	7.39	5.78	5.16
CAO (Cagliari)	(2)	1.71	1.58	1.25	0.93
CH (Bern)		1.11	1.21	1.30	1.42
CRL (Tokyo)		1.67	1.69	1.71	1.74
CSAO (Lintong)	(3)	-6.29	-5.48	-5.40	-5.34
DPT (Pretoria)		-24.68	-24.78	-24.97	-25.14
FTZ (Darmstadt)		19.40	19.55	19.62	19.72
IEN (Torino)		-0.11	-0.09	-0.10	-0.08
IFAG (Wettzell)		3.69	3.98	4.26	4.42
IGMA (Buenos Aires)		0.38	0.34	0.34	0.37
INPL (Jerusalem)		-16.39	-17.87	-19.26	-20.73
JATC (Lintong)		-25.11	-25.74	-25.94	-26.20
KSRI (Taejon)		-0.64	-0.69	-0.52	-0.30
LDS (Leeds)		-36.45	-37.86	-39.28	-40.68
NAOM (Mizusawa)		-6.76	-6.87	-6.98	-7.08
NIM (Beijing)		7.57	7.45	7.54	7.50
NIST (Boulder)		-0.80	-0.81	-0.85	-0.88
NPL (Teddington)		-1.74	-1.78	-1.72	-1.62
NPLI (New-Delhi)		-	-	-	-
NRC (Ottawa)		0.98	1.10	1.12	1.22
NRLM (Tsukuba)		-27.33	-28.43	-29.56	-30.80
OMH (Budapest)		2.21	2.34	2.38	2.60
ONRJ (Rio de Janeiro)		10.81	11.20	11.24	11.20
OP (Paris)		-0.60	-0.62	-0.64	-0.64
ORB (Bruxelles)		14.76	14.89	15.22	15.55
PEL (Lower Hutt)		-	-	-	-
PKNM (Warszawa)		7.14	7.25	6.96	6.36
PTB (Braunschweig)		3.56	3.56	3.53	3.53
RC (Habana)	(4)	-7.51	-7.56	-7.46	-7.13
ROA (San Fernando)		7.54	7.49	7.43	7.34
SO (Shanghai)		2.57	2.57	2.59	2.60
STA (Stockholm)		-0.57	-0.37	-0.22	-0.03
SU (Moskva)	(5)	7.43	7.51	7.39	7.29
TAO (Tokyo)		0.86	0.90	0.89	0.91
TL (Chung-Li)		0.97	0.99	1.03	1.09
TP (Praha)		0.51	0.43	0.38	0.37
TUG (Graz)		-1.81	-1.21	-0.60	0.05
USNO (Washington DC)(USNO MC)		0.07	0.09	0.08	0.10
VSL (Delft)		0.29	0.40	0.42	0.44
YUZM (Beograd)		28.14	30.87	32.01	34.45
ZIPE (Potsdam)		0.04	-0.11	-0.23	-0.41

PAVILLON DE BRETEUIL F - 92312 SÈVRES CEDEX

TÉL. (CENTRAL) : + 33 1 45 07 70 70 TELEX : BIPM 631351 F TÉLÉCOPIE : + 33 1 45 34 20 21

2 - International Atomic Time TAI and local atomic time scales TA(k).

Date 1991 0hUTC			FEB 22	MAR 4	MAR 14	MAR 24
MJD			48309	48319	48329	48339
Laboratory k			TAI-TA(k) (Unit = 1 microsecond)			
AOS	(Borowiec)		-	-	-	-
APL	(Laurel)		-1.33	-1.31	-1.33	-1.40
AUS	(Canberra)		-33.06	-33.21	-33.36	-33.52
CH	(Bern)		-69.36	-69.46	-69.58	-69.65
CRL	(Tokyo)		2.23	2.39	2.55	2.72
CSAO	(Lintong)	(3)	25.55	26.16	26.04	25.90
F	(Paris)		89.02	89.32	89.61	89.93
JATC	(Lintong)		0.41	0.36	0.50	0.65
KSRI	(Taejon)	(6)	-4.97	-5.89	-6.67	-7.36
NIM	(Beijing)		-11.19	-11.28	-11.17	-11.19
NISA	(Boulder)	(7)	-45071.62	-45071.88	-45072.17	-45072.45
NIST	(Boulder)		-45160.38	-45160.96	-45161.58	-45162.20
NRC	(Ottawa)		17.05	17.17	17.18	17.29
PTB	(Braunschweig)		-359.84	-359.84	-359.87	-359.87
RC	(Habana)	(4)(8)	-282.95	-283.86	-284.64	-285.09
SO	(Shanghai)		-44.74	-44.72	-44.70	-44.72
SU	(Moskva)		2827257.43	2827257.51	2827257.39	2827257.29
USNO	(Washington DC)	(9)	-34619.61	-34620.30	-34620.97	-34621.62

3 - Notes on sections 1 and 2.

(1) BEV . Time step of UTC(BEV) of -15 µs on MJD = 48316.35

(2) CAO . Erratum.

MJD	UTC-UTC(CAO)
48299	1.62
48309	1.71

(3) CSAO. The time step of UTC-UTC(CSAO) and TAI-TA(CSAO) of -0.791 µs between MJD=48309 and MJD=48319 is due to the introduction of GPS time link.

(4) RC .

MJD	UTC-UTC(RC)	TAI-TA(RC) - 18s
48259	-2.75	-274.92
48269	-	-
48279	-	-
48289	-7.96	-
48299	-7.65	-282.25

(5) SU . Time transfer data obtained from GLONASS satellite trackings at LDS (see Section 5) and SU.

(6) KSRI. Corrected values.

MJD	TAI-TA(KSRI)
48259	-0.22
48269	-1.22
48279	-2.18
48289	-3.12
48299	-4.07

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

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

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

4 - UTC - GPS time and TAI - GPS time.

UTC - GPS time = -7s + C0, TAI - GPS time = 19s + C0.

The GPS data are taken at the Paris Observatory, from Block I satellites, and are usually corrected for the measured ionospheric delays. They are smoothed to obtain daily values of UTC(OP) - GPS time at 0hUTC. UTC - GPS time is derived from them using linear interpolation of UTC - UTC(OP).

The r values are the residuals to the smoothed data for the middle of the 13-minute tracking period. The reference times are given for the first date of the table only. The r values are reported here only to show the quality of the synchronization.

UTC may be derived at any site from observation of any listed satellite, by interpolating C0 to the tracking time. The quality of the access to UTC mainly depends upon local conditions of observation.

			r(ns) Block I				
Date 1991 0hUTC	MJD	C0 (ns)	PRN 3 NAV11 21h20m	PRN11 NAV 8 2h12m	PRN 6 NAV 3 13h40m	PRN12 NAV10 17h40m	PRN13 NAV 9 17h56m
Feb 22	48309	146	2	0	-3	-5	0
Feb 23	48310	149	1	1	0	5	-1
Feb 24	48311	150	-2	8	-9	-9	0
Feb 25	48312	149	8	6	-3	0	-2
Feb 26	48313	148	4	12	3	-14	-3
Feb 27	48314	145	4	-1	-5	-7	-
Feb 28	48315	148	11	-4	-5	0	9
Mar 1	48316	156	13	5	-5	-9	2
Mar 2	48317	163	1	-2	-11	-3	0
Mar 3	48318	172	0	5	-7	-	2
Mar 4	48319	183	7	4	4	-6	0
Mar 5	48320	187	12	10	-9	-11	-3
Mar 6	48321	184	5	1	-7	-	-11
Mar 7	48322	180	6	3	-6	-	9
Mar 8	48323	180	2	3	-9	-	-6
Mar 9	48324	178	7	7	6	1	-6
Mar 10	48325	171	-4	3	-10	-	-2
Mar 11	48326	163	7	-5	3	-2	8
Mar 12	48327	154	-1	-5	-8	-	4
Mar 13	48328	145	9	12	-8	-3	-16
Mar 14	48329	137	-1	2	-2	-4	2
Mar 15	48330	135	4	1	-2	7	-
Mar 16	48331	133	2	1	-4	-	-
Mar 17	48332	128	-3	-10	-5	8	-3
Mar 18	48333	126	14	4	2	-	-4
Mar 19	48334	119	4	4	-6	-13	-12
Mar 20	48335	108	2	5	5	-	-15
Mar 21	48336	101	-2	12	-3	-7	0
Mar 22	48337	99	10	2	-7	-5	-4
Mar 23	48338	105	-6	4	6	6	-10
Mar 24	48339	109	5	-3	-4	11	-9

Section 4 (Cont.)

For some Block II satellites, the r values are computed with respect to C0 obtained from Block I only.

			r(ns) Block II				
Date 1991 0hUTC	MJD	C0 (ns)	PRN14 NAV14 6h12m	PRN18 NAV18 8h20m	PRN16 NAV16 12h 4m	PRN 2 NAV13 15h16m	PRN20 NAV20 18h44m
Feb 22	48309	146	9	-1	-11	16	-5
Feb 23	48310	149	4	8	5	12	11
Feb 24	48311	150	1	-7	11	10	-4
Feb 25	48312	149	-6	4	-5	-14	-7
Feb 26	48313	148	-3	-3	-17	28	-
Feb 27	48314	145	18	12	-5	11	0
Feb 28	48315	148	0	0	7	20	5
Mar 1	48316	156	-8	-3	-19	1	-2
Mar 2	48317	163	-1	-3	8	21	9
Mar 3	48318	172	13	4	-16	3	18
Mar 4	48319	183	-5	9	-10	20	-3
Mar 5	48320	187	14	-3	2	21	-2
Mar 6	48321	184	5	4	-8	23	1
Mar 7	48322	180	-13	-5	-19	3	-6
Mar 8	48323	180	5	-13	4	23	-11
Mar 9	48324	178	-1	-5	-23	8	2
Mar 10	48325	171	24	5	13	19	-2
Mar 11	48326	163	0	7	-5	13	13
Mar 12	48327	154	1	3	-7	-2	-9
Mar 13	48328	145	12	-8	-9	18	11
Mar 14	48329	137	-5	10	12	-1	-7
Mar 15	48330	135	16	0	21	26	5
Mar 16	48331	133	0	2	13	23	4
Mar 17	48332	128	4	6	4	-5	4
Mar 18	48333	126	17	16	-6	33	10
Mar 19	48334	119	5	-12	-11	5	-16
Mar 20	48335	108	-3	3	-6	-7	2
Mar 21	48336	101	-7	-14	-3	9	-1
Mar 22	48337	99	-9	-18	-10	10	-6
Mar 23	48338	105	13	8	3	0	-7
Mar 24	48339	109	6	16	0	19	15

5 - UTC - GLONASS time.

UTC - GLONASS time = C1 (modulo 1s).

From his current observations of both the GPS and GLONASS satellite systems Prof. P. Daly, University of Leeds, establishes and reports GPS time - GLONASS time at ten-day intervals, together with the standard deviation SD of his daily GLONASS data. C1 is then derived using UTC - GPS time of section 4.

Date 1991 0hUTC	MJD	C1 (µs)	SD (µs)
Feb 22	48309	0.17	0.06
Mar 4	48319	-0.27	0.06
Mar 14	48329	-0.70	0.06
Mar 24	48339	-1.12	0.06

6 - Duration of the TAI scale interval.

The following table gives the departure D of the duration of the TAI scale interval from the SI second at sea level as realized by a given primary frequency standard occasionally evaluated or continuously operating as a clock. In the later case the chosen two-month period of observation is also indicated. The last communicated estimate of the inaccuracy of the standard provides the uncertainty s of the D value.

D and s are expressed in 1*10**-14 second.

Standard	Obs. period	D	s
NRC-CsV	48279-48339	-5.6	10.0
PTB-CS1	48279-48339	+1.6	3.0
PTB-CS2	48279-48339	+5.4	1.5

The estimate of the duration of the TAI scale interval, computed by the BIPM, from all the available measurements of the TAI frequency, obtained by comparison with primary frequency standards continuously observed or occasionally evaluated (CRL, NIST, NRC, PTB, SU), is:

1 + 4*10**-14 +or- 2*10**-14

in SI second at sea level, for the two-month interval 48279-48339 .