

BUREAU INTERNATIONAL DES POIDS ET MESURES

Circular T 44 (1991 October 1)

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

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

Date 1991	0hUTC	Jul 22	Aug 1	Aug 11	Aug 21	Aug 31
MJD		48459	48469	48479	48489	48499
Laboratory k		UTC-UTC(k) (Unit = 1 microsecond)				
AOS (Borowiec)		-0.50	1.28	2.32	0.12	-0.17
APL (Laurel)	(1)	-1.20	-1.21	-1.15	-1.10	-1.17
AUS (Canberra)		0.29	0.26	0.23	0.20	0.18
BEV (Wien)		-5.52	-6.34	-7.16	-8.29	-9.01
CAO (Cagliari)		-3.55	-4.01	-4.42	-4.74	-
CH (Bern)		1.91	1.85	1.78	1.74	1.69
CRL (Tokyo)		2.03	2.04	2.07	2.08	2.07
CSAO (Lintong)		-4.06	-3.94	-3.88	-3.80	-3.59
DPT (Pretoria)		-25.29	-25.06	-24.90	-24.79	-24.81
FTZ (Darmstadt)		21.30	21.51	21.67	21.77	21.89
IEN (Torino)		-0.87	-0.97	-1.00	-0.96	-0.97
IFAG (Wetzell)		1.34	1.56	1.40	1.53	1.61
IGMA (Buenos Aires)		0.62	0.74	0.84	0.91	1.03
INPL (Jerusalem)	(2)	-36.53	-37.79	-39.04	-0.28	-0.36
JATC (Lintong)		-24.28	-24.05	-23.88	-23.65	-23.35
KSRI (Taejon)		1.12	1.02	0.93	0.85	0.70
LDS (Leeds)		-5.95	-6.72	-7.34	-8.05	-8.84
NAOM (Mizusawa)		-8.51	-8.64	-8.77	-8.92	-9.07
NIM (Beijing)		7.65	7.71	7.74	7.78	7.82
NIST (Boulder)		-1.10	-1.12	-1.10	-1.11	-1.10
NPL (Teddington)		-0.44	-0.35	-0.30	-0.28	-0.18
NPLI (New-Delhi)		-	-	-	-	-
NRC (Ottawa)		2.09	2.09	2.12	2.09	2.08
NRLM (Tsukuba)		-48.58	-50.47	-52.56	-54.68	-56.92
OMH (Budapest)		3.61	3.15	3.09	3.38	3.20
ONRJ (Rio de Janeiro)		14.16	13.68	13.30	12.85	12.64
OP (Paris)		-0.89	-0.89	-0.90	-0.88	-0.85
ORB (Bruxelles)		1.52	1.86	2.12	2.16	1.92
PEL (Lower Hutt)		0.13	0.05	-	-	-
PKNM (Warszawa)		-0.33	-0.69	-0.87	-1.02	-0.94
PTB (Braunschweig)		3.43	3.43	3.42	3.40	3.38
RC (Habana)	(3)	-2.30	-2.34	-2.47	-2.54	-2.69
ROA (San Fernando)		6.29	6.27	6.28	6.24	6.19
SNT (Stockholm)		0.33	0.23	0.16	0.17	0.17
SO (Shanghai)		2.71	2.59	2.52	2.51	2.43
SU (Moskva)	(4)	6.04	5.92	5.76	5.63	5.47
TAO (Tokyo)		1.06	1.07	1.09	1.12	1.15
TL (Chung-Li)		2.35	2.37	2.40	2.50	2.69
TP (Praha)		-0.47	-0.61	-0.63	-0.63	-0.53
TUG (Graz)		-2.60	-2.29	-1.97	-1.62	-1.33
USNO (Washington DC)(USNO MC)		0.29	0.26	0.23	0.20	0.18
VSL (Delft)		1.36	1.44	1.58	1.68	1.77
YUZN (Beograd)		49.25	48.94	49.75	49.04	-
ZIPE (Potsdam)		-0.29	-0.31	-0.28	-0.23	-0.23

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

The following table gives the computed values of TAI-TA(k).

Date 1991 0hUTC		Jul 22	Aug 1	Aug 11	Aug 21	Aug 31
MJD		48459	48469	48479	48489	48499
Laboratory k		TAI-TA(k) (Unit = 1 microsecond)				
APL (Laurel)	(1)	-1.70	-1.72	-1.66	-1.61	-1.68
AUS (Canberra)		-35.84	-35.99	-36.21	-36.46	-36.66
CH (Bern)		-70.52	-70.64	-70.76	-70.86	-70.97
CRL (Tokyo)		4.64	4.78	4.94	5.09	5.25
CSAO (Lintong)		24.78	24.70	24.56	24.44	24.45
F (Paris)		93.52	93.81	94.09	94.37	94.67
JATC (Lintong)		2.20	2.21	2.33	2.42	2.55
KSRI (Taejon)		-15.84	-16.49	-17.16	-17.79	-18.45
NIM (Beijing)		-10.83	-10.76	-10.70	-10.63	-10.57
NISA (Boulder)	(5)	-45075.99	-45076.30	-45076.60	-45076.93	-45077.24
NIST (Boulder)		-45169.88	-45170.54	-45171.19	-45171.87	-45172.52
NRC (Ottawa)		18.16	18.16	18.19	18.16	18.15
PTB (Braunschweig)		-359.97	-359.97	-359.98	-360.00	-360.02
RC (Habana)	(3)(6)	-288.58	-289.39	-290.30	-291.17	-292.11
SO (Shanghai)		-44.66	-44.77	-44.85	-44.87	-44.92
SU (Moskva)	(7)	256.04	255.92	255.76	255.63	255.47
USNO (Washington DC)	(8)	-34629.56	-34630.24	-34630.91	-34631.57	-34632.23

3 - Notes on sections 1 and 2.

(1) APL . Interpolated value for MJD = 48479 .

(2) INPL. Time step of UTC(INPL) of about -39 μ s on MJD=48480 .

(3) RC . MJD UTC-UTC(RC) TAI-TA(RC) - 18s

48439	-2.22	-286.94
48449	-2.28	-287.78

(4) SU . Time transfer data obtained from GLONASS satellite trackings at the University of Leeds (U.K.) and SU. See Section 5.

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

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

(7) SU . Listed values are TAI-TA(SU) - 2.827 seconds.

(8) 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.

			r(ns)			Block I	
Date			PRN 6	PRN12	PRN 3	PRN11	PRN13
1991	MJD	C0	NAV 3	NAV10	NAV11	NAV 8	NAV 9
0hUTC		(ns)	5h56m	7h32m	11h16m	15h48m	21h56m
Jul 22	48459	394	-	5	-7	-6	5
Jul 23	48460	388	-	-	-3	12	6
Jul 24	48461	377	-	-	-2	5	-4
Jul 25	48462	363	-	1	-2	-1	-3
Jul 26	48463	353	-	6	1	3	-5
Jul 27	48464	347	-	-11	12	11	-5
Jul 28	48465	339	-	-12	13	-	-9
Jul 29	48466	330	-	-18	-3	5	2
Jul 30	48467	322	1	13	9	3	-17
Jul 31	48468	313	-	-	5	6	-14
Aug 1	48469	304	-9	14	-8	3	-3
Aug 2	48470	295	-	-10	10	5	-4
Aug 3	48471	285	-	-5	-2	1	7
Aug 4	48472	276	8	-	-	1	-15
Aug 5	48473	266	-2	-	-9	15	11
Aug 6	48474	259	6	-	4	1	-9
Aug 7	48475	250	8	-11	1	9	5
Aug 8	48476	239	-17	8	-5	4	-4
Aug 9	48477	231	-6	-4	5	6	-21
Aug 10	48478	223	-3	4	10	11	1
Aug 11	48479	219	1	-18	1	1	-2
Aug 12	48480	222	-7	-2	3	1	-4
Aug 13	48481	231	-14	-10	4	9	-6
Aug 14	48482	243	8	16	1	-5	-9
Aug 15	48483	251	15	7	-5	1	-6
Aug 16	48484	252	-9	-	4	8	-10
Aug 17	48485	253	10	-6	7	-2	4
Aug 18	48486	253	0	-	3	6	-4
Aug 19	48487	249	-2	-15	-5	9	-3
Aug 20	48488	245	10	-12	5	2	0
Aug 21	48489	239	-3	8	-3	-4	3
Aug 22	48490	234	2	-	3	8	-15
Aug 23	48491	228	-	-	-	9	-5
Aug 24	48492	223	7	-	-2	8	-1
Aug 25	48493	216	-9	2	2	9	4
Aug 26	48494	205	-9	-6	-9	11	-7
Aug 27	48495	198	-1	-	7	9	-15
Aug 28	48496	199	-12	-1	6	11	-16
Aug 29	48497	204	12	4	9	2	-3
Aug 30	48498	205	-9	10	6	-7	-4
Aug 31	48499	201	-5	-6	-5	0	-4

Section 4 (Cont.)

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

Date 1991 0hUTC	MJD	C0 (ns)	r(ns) Block II				
			PRN18 NAV18 22h40m	PRN16 NAV16 1h56m	PRN20 NAV20 8h20m	PRN15 NAV15 17h 8m	PRN14 NAV14 20h 4m
Jul 22	48459	394	-8	23	17	22	5
Jul 23	48460	388	-15	3	-	-4	-3
Jul 24	48461	377	-5	-11	-1	18	2
Jul 25	48462	363	1	15	3	-3	-4
Jul 26	48463	353	-3	-1	-231	15	8
Jul 27	48464	347	-12	4	1	13	4
Jul 28	48465	339	0	10	10	3	-24
Jul 29	48466	330	7	-6	-20	-2	-8
Jul 30	48467	322	-2	8	-10	-29	20
Jul 31	48468	313	6	3	-	3	-17
Aug 1	48469	304	-3	2	12	15	15
Aug 2	48470	295	-5	3	12	-3	-11
Aug 3	48471	285	10	3	2	20	5
Aug 4	48472	276	9	11	-10	-7	-13
Aug 5	48473	266	7	15	11	-8	9
Aug 6	48474	259	15	-7	11	26	2
Aug 7	48475	250	-11	4	0	-9	1
Aug 8	48476	239	9	-19	7	4	3
Aug 9	48477	231	-4	12	2	-10	8
Aug 10	48478	223	-7	3	6	9	8
Aug 11	48479	219	-2	2	-7	7	-9
Aug 12	48480	222	13	8	16	-4	8
Aug 13	48481	231	-2	5	7	-8	2
Aug 14	48482	243	-2	14	11	-12	19
Aug 15	48483	251	0	3	-5	3	-8
Aug 16	48484	252	9	-2	1	2	0
Aug 17	48485	253	6	9	5	-2	-3
Aug 18	48486	253	1	-12	11	-6	4
Aug 19	48487	249	-2	-	8	-4	1
Aug 20	48488	245	2	-1	-17	19	17
Aug 21	48489	239	8	18	8	5	2
Aug 22	48490	234	18	1	14	16	11
Aug 23	48491	228	15	-5	-	4	9
Aug 24	48492	223	0	2	-13	-14	8
Aug 25	48493	216	12	0	5	-7	-9
Aug 26	48494	205	6	4	5	7	15
Aug 27	48495	198	14	-8	5	-3	-10
Aug 28	48496	199	17	4	2	13	4
Aug 29	48497	204	4	18	17	15	14
Aug 30	48498	205	-3	-10	18	11	2
Aug 31	48499	201	7	8	4	-9	7

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 (μ s)	SD (μ s)
Jul 22	48459	-4.73	0.06
Aug 1	48469	-4.98	0.05
Aug 11	48479	-5.28	0.06
Aug 21	48489	-5.59	0.06
Aug 31	48499	-5.90	0.07

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 units of 10^{-14} second.

Standard	Obs. period	D	s
NRC-CsV	48429-48499	-2.2	10.0
PTB-CS1	48429-48499	+0.2	3.0
PTB-CS2	48429-48499	+2.8	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:

$$1 + 2 \times 10^{-14} \pm 2 \times 10^{-14}$$

in SI second at sea level, for the two-month interval 48429-48499 .