ISSN 1143-1393

BUREAU INTERNATIONAL DES POIDS ET MESURES

Circular T 109 (1997 February 13)

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

(From 1996 January 1, 0h UTC, to 1997 July 1, 0h UTC, TAI-UTC = 30 s)
(From 1997 July 1, 0h UTC, until further notice, TAI-UTC = 31 s)

Date 1996/97 0h UTC		Dec 27	Jan 1	Jan 6	Jan 11
MJD		50444	50449	50454	50459
Laboratory k		UTC-UTC(k) (Unit is one nanosecond)			
AOS (Borowiec)		527	688	818	938
APL (Laurel)		505	543	575	612
AUS (Canberra)		-60	-47	-18	0
BEV (Wien)		-	-	-	-
BIRM (Beijing)		-4136	-4198	-4272	-4358
CAO (Cagliari)	(1)	-3049	-3140	108	45
CH (Bern)		170	191	205	205
CNM (Queretaro)		-4664	-4618	-4565	-4529
CRL (Tokyo)		-26	-27	-18	-20
CSAO (Lintong)		7	21	4	-23
CSIR (Pretoria)		7120	7215	7264	7321
DLR (Oberpfaffenhofen)		485	508	534	548
DTAG (Darmstadt)		-603	-607	-607	-619
GUM (Warszawa)		-11	-9	-14	-14
IEN (Torino)		457	462	459	456
IFAG (Wettzell)		-3849	-3827	-3745	-3651
IGMA (Buenos Aires)		195	170	161	177
INPL (Jerusalem)		-613	-664	-715	-772
IPQ (Monte de Caparica)		216	227	233	236
JATC (Lintong)		3541	3571	3559	3541
KRIS (Taejon)		-168	-176	-183	-201
LDS (Leeds)		4	24	5	-14
MSL (Lower Hutt)		-5633	-5575	-5569	-5574
NAO (Mizusawa)	(2)	-3135	-3161	-3196	-3241
NIM (Beijing)	(3)	-1990	-1263	-1287	-1293
NIST (Boulder)		47	44	43	40
NPL (Teddington)		85	83	86	83
NRC (Ottawa)		187	187	180	172
NRLM (Tsukuba)		-18	-11	-3	-6
OMH (Budapest)		-	-	-	-
ONBA (Buenos Aires)		-15260	-15221	-15464	-15847
ONRJ (Rio de Janeiro)		31426	31787	32057	32361
OP (Paris)		59	66	64	51
ORB (Bruxelles)		97	115	108	127
PTB (Braunschweig)		1880	1868	1862	1860
ROA (San Fernando)		25	19	3	-60
SCL (Hong Kong)		-245	-231	-196	-172
SO (Shanghai)		1174	1152	1132	1130
SP (Boras)		-15	-6	-4	-
SU (Moskva)		962	959	954	949
TL (Chung-Li)		-	-	-	476
TP (Praha)		79	99	111	127
TUG (Graz)		1171	1201	1233	1264
UME (Gebze-Kocaeli)		230	247	256	263
USNO (Washington DC)(USNO MC)		14	13	14	15
VSL (Delft)		-393	-384	-388	-396

1 - Coordinated Universal Time UTC. (Cont.)

Date 1997 0h UTC	Jan 16	Jan 21	Jan 26	Jan 31
MJD	50464	50469	50474	50479
Laboratory k	UTC-UTC(k)	(Unit is one nanosecond)		
AOS (Borowiec)	1034	1048	1092	1074
APL (Laurel)	646	682	715	741
AUS (Canberra)	-7	-20	0	10
BEV (Wien)	-	-	-	-
BIRM (Beijing)	-4417	-4462	-4532	-4570
CAO (Cagliari)	18	-11	-30	-70
CH (Bern)	209	225	244	257
CNM (Queretaro)	-4466	-4430	-4370	-4320
CRL (Tokyo)	-19	-14	-16	-16
CSAO (Lintong)	-9	10	4	51
CSIR (Pretoria)	7593	7818	8058	8255
DLR (Oberpfaffenhofen)	572	589	606	624
DTAG (Darmstadt)	-628	-634	-637	-641
GUM (Warszawa)	-9	-4	10	17
IEN (Torino)	462	463	469	476
IFAG (Wettzell)	-3588	-3523	-3486	-3414
IGMA (Buenos Aires)	166	163	168	169
INPL (Jerusalem)	-819	-870	-942	-1010
IPQ (Monte de Caparica)	247	254	266	269
JATC (Lintong)	3546	3556	3543	3578
KRIS (Taejon)	-216	-222	-214	-238
LDS (Leeds)	12	-10	-2	-1
MSL (Lower Hutt)	-5603	-5638	-5677	-5646
NAO (Mizusawa) (2)	-3270	-3327	-3375	-3425
NIM (Beijing)	-1285	-1311	-1345	-1352
NIST (Boulder)	38	36	34	30
NPL (Teddington)	84	81	81	80
NRC (Ottawa)	163	155	147	138
NRLM (Tsukuba)	2	3	9	7
OMH (Budapest)	-	-	-	-
ONBA (Buenos Aires)	-15811	-15766	-	-
ONRJ (Rio de Janeiro)	32774	33150	33576	34031
OP (Paris)	54	52	54	50
ORB (Bruxelles)	117	156	188	173
PTB (Braunschweig)	1855	1850	1847	1843
ROA (San Fernando) (4)	-6	-4	-9	-15
SCL (Hong Kong)	-113	-117	-134	-135
SO (Shanghai)	1142	1127	1118	1120
SP (Boras)	204	217	233	234
SU (Moskva)	939	930	921	916
TL (Chung-Li)	481	434	468	444
TP (Praha)	126	132	138	129
TUG (Graz)	1294	1331	1357	1405
UME (Gebze-Kocaeli)	277	279	291	306
USNO (Washington DC)(USNO MC)	17	15	16	16
VSL (Delft)	-392	-397	-399	-411

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

The following tables give the computed values of TAI-TA(k).

Date 1996/97 0h UTC		Dec 27	Jan 1	Jan 6	Jan 11
MJD		50444	50449	50454	50459
Laboratory k		TAI-TA(k) (Unit is one nanosecond)			
APL (Laurel)		1968	2006	2038	2075
AUS (Canberra)		-75204	-75316	-75418	-75506
CH (Bern)		-52709	-52528	-52351	-52183
CRL (Tokyo)		78762	78969	79184	79383
CSAO (Lintong)		2302	2251	2169	2077
F (Paris)		163235	163414	163402	163387
IEN (Torino)		1940	1981	2020	2058
INPL (Jerusalem)		-366857	-367592	-368335	-369090
JATC (Lintong)		13548	13560	13531	13504
KRIS (Taejon)		5386	5402	5413	5412
NIM (Beijing)		-	-	-	-
NISA (Boulder)	(5)	-45154445	-45154661	-45154875	-45155090
NRC (Ottawa)		27262	27264	27258	27250
PTB (Braunschweig)		-361520	-361532	-361538	-361540
SO (Shanghai)		-46316	-46349	-46377	-46392
SU (Moskva)	(6)	27241962	27241959	27241954	27241949
USNO (Washington DC)	(7)	-34762569	-34762894	-34763213	-34763536

Date 1997 0h UTC		Jan 16	Jan 21	Jan 26	Jan 31
MJD		50464	50469	50474	50479
Laboratory k		TAI-TA(k) (Unit is one nanosecond)			
APL (Laurel)		2109	2145	2178	2204
AUS (Canberra)		-75663	-75732	-75847	-75923
CH (Bern)		-52010	-51825	-51637	-51455
CRL (Tokyo)		79595	79804	80008	80211
CSAO (Lintong)		2027	1981	1910	1892
F (Paris)		163380	163372	163364	163354
IEN (Torino)		2103	2142	2185	2228
INPL (Jerusalem)		-369841	-370604	-371394	-372186
JATC (Lintong)		13508	13510	13484	13508
KRIS (Taejon)		5415	5423	5448	5443
NIM (Beijing)		-	-	-	-
NISA (Boulder)	(5)	-45155305	-45155519	-45155734	-45155950
NRC (Ottawa)		27242	27235	27229	27221
PTB (Braunschweig)		-361545	-361550	-361553	-361557
SO (Shanghai)		-46382	-46399	-46409	-46409
SU (Moskva)	(6)	27241939	27241930	27241921	27241916
USNO (Washington DC)	(7)	-34763859	-34764185	-34764509	-34764833

3 - Notes on sections 1 and 2.

(1) CAO . Change of master clock on 50451.35

(2) NAO . Formerly NAOM.

(3) NIM . Apparent time step of UTC-UTC(NIM) between MJD = 50444 and MJD = 50449 .

(4) ROA . Time step of UTC(ROA) of -110 ns on MJD = 50463.48

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

(6) SU . Listed values are TAI-TA(SU) - 2.80 seconds.

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

4 - Difference between the normalized frequencies of EAL and TAI.

Interval of validity		f(EAL)-f(TAI)
1996 Dec. 27 - 1997 Feb. 25	50444-50504	7.265×10^{-13}
New steering correction foreseen for March-April 1997		
1997 Feb. 25 - 1997 Apr. 26	50504-50564	7.250×10^{-13}

5 - Duration of the TAI scale interval.

The following table gives the duration uTAI of the TAI scale interval expressed as its departure d from the SI second on the rotating geoid, together with its relative uncertainty σ : uTAI = 1 + d in SI second. This is obtained, on the given period of estimation, by comparison of the TAI frequency :

- with the frequency, corrected for the black-body radiation shift, of a given individual primary frequency standard (σ is then the last communicated estimate of the uncertainty of the standard frequency), and

- with a combination computed by the BIPM of all available measurements from PTB CS2, PTB CS3, NIST-7, SU MCsR 102 and LPTF-F01 consistently corrected for the black-body radiation shift (σ is then estimated by the BIPM taking into account the individual uncertainties and parameters characteristic of TAI stability).

Standard	Period of estimation	d (10^{-14} s)	σ (10^{-14})
NIST-7	50439-50449	+2.7	0.7
PTB-CS2	50444-50479	+2.8	1.5
PTB-CS3	50444-50479	+5.3	1.4
BIPM estimate	50414-50479	+2.6	1.0

6 - [UTC - GPS time] and [TAI - GPS time].

[UTC - GPS time] = -11 s + C0 (until 1997 July 1, 0h UTC)
[UTC - GPS time] = -12 s + C0 (from 1997 July 1, 0h UTC)
[TAI - GPS time] = 19 s + C0.

Daily values of C0 are given in the following table. They are obtained as follows: the GPS data taken at the Paris Observatory, for highest elevation, are first corrected for precise satellite ephemerides and for measured ionospheric delays, and then smoothed to obtain daily values of [UTC(OP) - GPS time] at 0h UTC; daily values of C0 are derived from them using linear interpolation of [UTC - UTC(OP)].

For a given day, where N measurements are used for estimation of C0 :
- the dispersion of individual measurements is characterized by a standard deviation σ,
- the daily C0 value is characterized by the standard deviation of the mean $\sigma/\sqrt{N}$.

Date 1996/97 0h UTC	MJD	C0 (ns)	σ (ns)	$\sigma/\sqrt{N}$ (ns)
Dec 27	50444	58	51	11
Dec 28	50445	54	55	12
Dec 29	50446	53	43	9
Dec 30	50447	54	30	6
Dec 31	50448	57	48	11
Jan 1	50449	55	51	11
Jan 2	50450	51	37	9
Jan 3	50451	45	-	-
Jan 4	50452	40	56	11
Jan 5	50453	38	43	9
Jan 6	50454	41	49	10
Jan 7	50455	38	44	9
Jan 8	50456	37	46	9
Jan 9	50457	32	39	8
Jan 10	50458	27	44	9
Jan 11	50459	29	49	10
Jan 12	50460	39	38	8
Jan 13	50461	42	55	11
Jan 14	50462	42	56	11
Jan 15	50463	40	47	9
Jan 16	50464	39	55	11
Jan 17	50465	37	48	10
Jan 18	50466	39	32	6
Jan 19	50467	45	42	8
Jan 20	50468	41	43	9
Jan 21	50469	31	47	9
Jan 22	50470	30	40	8
Jan 23	50471	41	56	11
Jan 24	50472	46	35	7
Jan 25	50473	44	40	8
Jan 26	50474	42	49	10
Jan 27	50475	43	47	9
Jan 28	50476	41	56	11
Jan 29	50477	40	35	7
Jan 30	50478	40	49	10
Jan 31	50479	42	53	11

7 - [UTC - GLONASS time] and [TAI - GLONASS time].

[UTC - GLONASS time] = 0 s + C1
[TAI - GLONASS time] = + 30 s + C1 (until 1997 July 1, 0h UTC)
[TAI - GLONASS time] = + 31 s + C1 (from 1997 July 1, 0h UTC)

Daily values of C1 are given in the following table. They are obtained as follows: the GLONASS data taken at the NMi Van Swinden Laboratorium, Delft, The Netherlands, for highest elevation, are smoothed to obtain daily values of [UTC(VSL)-GLONASS time] at 0h UTC; daily values of C1 are then derived from them using linear interpolation of [UTC-UTC(VSL)]. A time correction of + 1285 ns is also applied in order to ensure continuity of C1 estimates on 1997, January 1 (MJD = 50449).

For a given day, where N measurements are used for estimation of C1 :
- the dispersion of individual measurements is characterized by a standard deviation σ,
- the daily C1 value is characterized by the standard deviation of the mean $\sigma/\sqrt{N}$.

Date 1997 0h UTC	MJD	C0 (ns)	σ (ns)	$\sigma/\sqrt{N}$ (ns)
Jan 1	50449	-34825	28	5
Jan 2	50450	-34851	18	3
Jan 3	50451	-34870	-	-
Jan 4	50452	-34924	-	-
Jan 5	50453	-34939	20	14
Jan 6	50454	-34945	26	5
Jan 7	50455	-34960	29	4
Jan 8	50456	-34956	32	5
Jan 9	50457	-34990	-	-
Jan 10	50458	-34999	31	4
Jan 11	50459	-34992	28	4
Jan 12	50460	-34978	28	4
Jan 13	50461	-34996	27	4
Jan 14	50462	-34984	38	6
Jan 15	50463	-34880	44	6
Jan 16	50464	-34879	27	4
Jan 17	50465	-34903	24	4
Jan 18	50466	-34919	23	3
Jan 19	50467	-34907	22	3
Jan 20	50468	-34911	14	2
Jan 21	50469	-34911	22	4
Jan 22	50470	-34916	17	3
Jan 23	50471	-34922	27	4
Jan 24	50472	-34916	24	4
Jan 25	50473	-34919	35	6
Jan 26	50474	-34913	21	3
Jan 27	50475	-34921	23	3
Jan 28	50476	-34905	-	-
Jan 29	50477	-34903	22	4
Jan 30	50478	-34913	34	5
Jan 31	50479	-34916	42	6