BIPM

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BUREAU INTERNATIONAL DES POIDS ET MESURES

Circular T 98 (1996 March 18)

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

(From 1996 January 1, 0hUTC, TAI-UTC = 30 s)

Date 1996 0h UTC	Jan 27	Feb 1	Feb 6	Feb 11
MJD	50109	50114	50119	50124
Laboratory k	UTC-UTC(k) (Unit is one nanosecond)			
AOS (Borowiec)	4	57	97	171
APL (Laurel)	2069	2079	2117	2147
AUS (Canberra)	-509	-506	-549	-552
BEV (Wien)	8817	8655	8453	8285
BIRM (Beijing)	-489	-531	-586	-635
CAO (Cagliari)	-	-	-	-
CH (Bern)	277	304	331	348
CRL (Tokyo)	224	212	200	184
CSAO (Lintong)	-206	-190	-268	-302
CSIR (Pretoria)	5333	5346	5335	5388
FTZ (Darmstadt)	-263	-274	-275	-287
GUM (Warszawa)	-342	-343	-346	-348
IEN (Torino)	84	96	106	111
IFAG (Wettzell)	-4842	-4885	-4910	-4931
IGMA (Buenos Aires)	68	66	72	71
INPL (Jerusalem)	-2975	-2982	-2959	-2935
IPQ (Monte de Caparica)	-8427	-8486	-8530	-8582
JATC (Lintong)	1546	1609	1482	1443
KRIS (Taejon)	280	272	268	251
LDS (Leeds)	200	183	162	158
MSL (Lower Hutt)	-5253	-5304	-5273	-5273
NAOM (Mizusawa)	-3143	-3148	-3144	-3144
NAOT (Tokyo)	-2872	-2808	-2773	-2738
NIM (Beijing)	8094	8106	8121	8146
NIST (Boulder)	16	13	13	10
NPL (Teddington)	63	62	67	60
NPLI (New-Delhi)	-	-	-	-
NRC (Ottawa)	121	110	112	125
NRLM (Tsukuba)	-4933	-4865	-4794	-4726
OMH (Budapest)	14362	14574	14769	14998
ONBA (Buenos Aires)	-8649	-	-	-
ONRJ (Rio de Janeiro)	1646	1798	1975	2079
OP (Paris)	37	35	39	36
ORB (Bruxelles)	250	264	239	223
PTB (Braunschweig)	2200	2194	2188	2184
RC (Habana)	-	-	-	-
ROA (San Fernando)	135	134	123	130
SCL (Hong Kong)	242	252	243	235
SO (Shanghai)	1593	1585	1556	1545
SU (Moskva)	-7314	-7326	-7343	-7352
TL (Chung-Li)	28	44	33	32
TP (Praha)	-261	-260	-256	-258
TUG (Graz)	-144	-127	-117	-106
UME (Gebze-Kocaeli)	-3074	-3071	-3067	-3060
USNO (Washington DC)(USNO MC)	9	8	11	9
VSL (Delft)	-257	-268	-266	-278

PAVILLON DE BRETEUIL F - 92312 SÈVRES CEDEX

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1 - Coordinated Universal Time UTC. (Cont.)

Date 1996 0h UTC	Feb 16	Feb 21	Feb 26
MJD	50129	50134	50139
Laboratory k	UTC-UTC(k)	(Unit is	one nanosecond)
AOS (Borowiec)	177	156	126
APL (Laurel)	2172	2201	2205
AUS (Canberra)	-559	-577	-590
BEV (Wien)	8110	7876	7627
BIRM (Beijing)	-708	-747	-807
CAO (Cagliari)	-	-	-
CH (Bern)	342	346	354
CRL (Tokyo)	172	156	136
CSAO (Lintong)	-201	-241	-315
CSIR (Pretoria)	5417	5435	5542
FTZ (Darmstadt)	-291	-298	-293
GUM (Warszawa)	-352	-351	-348
IEN (Torino)	113	118	124
IFAG (Wettzell)	-4928	-4938	-4927
IGMA (Buenos Aires)	65	83	78
INPL (Jerusalem)	-2903	-2845	-2790
IPQ (Monte de Caparica)	-8633	-8686	-8755
JATC (Lintong)	1617	1648	1576
KRIS (Taejon)	231	219	207
LDS (Leeds)	179	162	137
MSL (Lower Hutt)	-5168	-5096	-5103
NAOM (Mizusawa)	-3150	-3136	-3129
NAOT (Tokyo)	-2734	-2707	-2694
NIM (Beijing)	8198	8209	8219
NIST (Boulder)	7	8	9
NPL (Teddington)	57	51	46
NPLI (New-Delhi)	-	-	-
NRC (Ottawa)	120	111	95
NRLM (Tsukuba)	-4659	-4586	-4511
OMH (Budapest)	15140	15266	15341
ONBA (Buenos Aires)	-	-	-
ONRJ (Rio de Janeiro)	2132	2225	2355
OP (Paris)	30	24	22
ORB (Bruxelles)	197	191	216
PTB (Braunschweig)	2174	2166	2162
RC (Habana)	-	-	-
ROA (San Fernando)	132	140	138
SCL (Hong Kong)	247	237	208
SO (Shanghai)	1549	1546	1533
SU (Moskva)	-7368	-7382	-7391
TL (Chung-Li)	64	66	55
TP (Praha)	-250	-262	-249
TUG (Graz)	-90	-76	-60
UME (Gebze-Kocaeli)	-3058	-3054	-3048
USNO (Washington DC)(USNO MC)	8	7	4
VSL (Delft)	-287	-279	-287

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 0h UTC		Jan 27	Feb 1	Feb 6	Feb 11
MJD		50109	50114	50119	50124
Laboratory k		TAI-TA(k) (Unit is one nanosecond)			
APL (Laurel)		3532	3542	3580	3610
AUS (Canberra)		-67094	-67248	-67362	-67499
CH (Bern)		-63132	-62987	-62842	-62702
CRL (Tokyo)		64822	65032	65245	65454
CSAO (Lintong)		6433	6384	6241	6142
F (Paris)		151431	151590	151752	151919
IEN (Torino)		-427	-415	-402	-391
INPL (Jerusalem)		-321949	-322639	-323310	-323991
JATC (Lintong)		12699	12715	12526	12427
KRIS (Taejon)		2397	2458	2506	2535
NIM (Beijing)		-6751	-6723	-6681	-6625
NISA (Boulder)	(1)	-45139801	-45140021	-45140239	-45140459
NRC (Ottawa)		25539	25567	25607	25659
PTB (Braunschweig)		-361200	-361206	-361212	-361216
RC (Habana)		-	-	-	-
SO (Shanghai)		-45891	-45895	-45935	-45953
SU (Moskva)	(2)	27242686	27242674	27242657	27242648
USNO (Washington DC)	(3)	-34740570	-34740900	-34741226	-34741557

Date 1996 0h UTC		Feb 16	Feb 21	Feb 26
MJD		50129	50134	50139
Laboratory k		TAI-TA(k) (Unit is one nanosecond)		
APL (Laurel)		3635	3664	3668
AUS (Canberra)		-67593	-67726	-67848
CH (Bern)		-62568	-62423	-62275
CRL (Tokyo)		65659	65870	66079
CSAO (Lintong)		6179	6074	5935
F (Paris)		152083	152248	152413
IEN (Torino)		-382	-372	-359
INPL (Jerusalem)		-324675	-325343	-326025
JATC (Lintong)		12545	12527	12410
KRIS (Taejon)		2561	2604	2642
NIM (Beijing)		-6557	-6525	-6498
NISA (Boulder)	(1)	-45140680	-45140896	-45141113
NRC (Ottawa)		25693	25723	25746
PTB (Braunschweig)		-361226	-361234	-361238
RC (Habana)		-	-	-
SO (Shanghai)		-45937	-45932	-45933
SU (Moskva)	(2)	27242632	27242618	27242609
USNO (Washington DC)	(3)	-34741888	-34742218	-34742549

3 - Notes on sections 1 and 2.

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

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

(3) 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)
1995 Dec. 28 - 1996 Feb. 26	50079-50139	7.34×10^{-13}
New steering correction foreseen for March-April 1996		
1996 Feb. 26 - 1996 Apr. 26	50139-50199	7.33×10^{-13}

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

[UTC - GPS time] = -11 s + C0, [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 0h UTC	MJD	C0 (ns)	σ (ns)	$\sigma/\sqrt{N}$ (ns)
Jan 27	50109	55	39	8
Jan 28	50110	59	62	13
Jan 29	50111	59	36	8
Jan 30	50112	53	50	11
Jan 31	50113	45	42	9
Feb 1	50114	44	46	10
Feb 2	50115	48	56	12
Feb 3	50116	44	42	9
Feb 4	50117	40	45	9
Feb 5	50118	44	50	10
Feb 6	50119	45	51	14
Feb 7	50120	38	39	8
Feb 8	50121	35	49	10
Feb 9	50122	37	44	9
Feb 10	50123	39	45	9
Feb 11	50124	42	53	11
Feb 12	50125	43	39	8
Feb 13	50126	44	40	8
Feb 14	50127	44	41	9
Feb 15	50128	44	40	8
Feb 16	50129	49	47	10
Feb 17	50130	56	34	7
Feb 18	50131	59	40	8
Feb 19	50132	55	37	8
Feb 20	50133	51	57	12
Feb 21	50134	47	32	7
Feb 22	50135	53	54	11
Feb 23	50136	57	36	8
Feb 24	50137	49	51	11
Feb 25	50138	33	45	9
Feb 26	50139	26	56	12

6 - [UTC - GLONASS time].

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

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 its standard deviation σ. C1 is then derived using [UTC - GPS time] of section 5.

Date 1996 0h UTC	MJD	C1 (ns)	σ (ns)
Jan 27	50109	-25389	94
Feb 1	50114	-25579	90
Feb 6	50119	-25728	87
Feb 11	50124	-25887	88
Feb 16	50129	-26034	111
Feb 21	50134	-26172	97
Feb 26	50139	-26300	93

7 - 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})
* LPTF-F01	49969-49979	+1.3	0.3
LPTF-F01	49979-49989	+1.9	0.3
LPTF-F01	49989-49999	+2.0	0.3
LPTF-F01	49999-50009	+2.6	0.3
LPTF-F01	50009-50019	+1.4	0.3
LPTF-F01	50029-50039	+1.1	0.3
LPTF-F01	50039-50049	+1.1	0.3
LPTF-F01	50049-50059	+0.5	0.3
LPTF-F01	50059-50069	+0.6	0.3
LPTF-F01	50069-50079	+1.9	0.3
PTB-CS2	50079-50139	+3.1	1.5
BIPM estimate	50079-50139	+1.8	1.0

* LPTF-F01 : Caesium fountain No 1 developed at the BNM-LPTF, Paris, France.