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BUREAU INTERNATIONAL DES POIDS ET MESURES

Circular T 121 (1998 February 13)
Circulaire T 121

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

(From 1997 July 1, 0h UTC, *TAI-UTC* = 31 s)

Date 1997/98 0h UTC		Dec 27	Jan 1	Jan 6	Jan 11
MJD		50809	50814	50819	50824
Laboratory k		*UTC-UTC(k)* (Unit is one nanosecond)			
AOS (Borowiec)		-204	-245	-221	-176
APL (Laurel)		3896	-	-	4924
AUS (Canberra)		218	254	259	276
BIRM (Beijing)		-8181	-8229	-8273	-8330
CAO (Cagliari)		-2059	-2084	-2088	-2121
CH (Bern)		92	91	90	89
CNM (Queretaro)		-667	-608	-552	-479
CRL (Tokyo)		-75	-73	-70	-82
CSAO (Lintong)		-6	-12	-36	-31
CSIR (Pretoria)		-2091	-2180	-2260	-2345
DLR (Oberpfaffenhofen)		-1757	-1805	-1846	-
DTAG (Darmstadt)	(1)	-348	-327	-416	-417
GUM (Warszawa)		988	987	993	999
IEN (Torino)		81	95	102	102
IFAG (Wettzell)		-1605	-1656	-1729	-1788
IGMA (Buenos Aires)		83	86	94	79
INPL (Jerusalem)		4	-3	-4	8
IPQ (Monte de Caparica)		1032	1051	1069	1090
JATC (Lintong)		3389	3386	3353	3364
KRIS (Taejon)		42	44	49	50
LDS (Leeds)		52	81	109	100
MSL (Lower Hutt)		-6075	-6073	-6021	-5948
NAO (Mizusawa)		-1	56	119	185
NIM (Beijing)		-2553	-2569	-2576	-2604
NIST (Boulder)		3	0	2	4
NML (Sydney)		884	889	907	929
NPL (Teddington)		83	80	79	77
NRC (Ottawa)		3	9	54	117
NRLM (Tsukuba)		308	315	328	334
OMH (Budapest)		1406	1419	1448	1458
ONBA (Buenos Aires)		-782	-511	-450	-376
ONRJ (Rio de Janeiro)		264	270	289	293
OP (Paris)		21	27	27	20
ORB (Bruxelles)		193	188	211	222
PSB (Singapore)		943	964	994	1021
PTB (Braunschweig)	(2)	1861	-31	-27	-21
ROA (San Fernando)		61	55	46	49
SCL (Hong Kong)		-118	-152	-196	-238
SO (Shanghai)		794	797	792	791
SP (Boras)		-	650	655	652
SU (Moskva)		371	366	357	348
TL (Chung-Li)		486	476	470	469
TP (Praha)		200	195	194	182
TUG (Graz)		3990	4046	4092	4140
UME (Gebze-Kocaeli)		954	971	977	978
USNO (Washington DC)(USNO MC)		-2	-3	-5	-4
VSL (Delft)		-14	-10	-5	-20

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1 - Coordinated Universal Time UTC. (Cont.)

Date 1998 0h UTC		Jan 16	Jan 21	Jan 26	Jan 31
MJD		50829	50834	50839	50844
Laboratory k		*UTC-UTC(k)*	(Unit is one nanosecond)		
AOS (Borowiec)	(3)	-91	-353	-215	-192
APL (Laurel)		4973	5030	5080	5127
AUS (Canberra)		289	298	290	308
BIRM (Beijing)		-8384	-8413	-8451	-8508
CAO (Cagliari)		-2163	-2184	-2195	-2226
CH (Bern)		82	61	71	87
CNM (Queretaro)		-421	-361	-290	-241
CRL (Tokyo)		-78	-85	-88	-92
CSAO (Lintong)		-17	-3	-19	-42
CSIR (Pretoria)		-2424	-2481	-2559	-2638
DLR (Oberpfaffenhofen)		-	-	-2043	-2090
DTAG (Darmstadt)		-394	-364	-330	-306
GUM (Warszawa)		982	987	985	986
IEN (Torino)		99	99	94	95
IFAG (Wettzell)		-1852	-1914	-1969	-2019
IGMA (Buenos Aires)		95	84	86	85
INPL (Jerusalem)		6	-	-	-
IPQ (Monte de Caparica)		1111	1125	1137	1141
JATC (Lintong)		3382	3388	3377	3360
KRIS (Taejon)		78	76	81	82
LDS (Leeds)		119	119	126	138
MSL (Lower Hutt)		-5857	-5806	-5771	-5717
NAO (Mizusawa)		228	281	355	408
NIM (Beijing)		-2616	-2638	-2641	-2635
NIST (Boulder)		2	5	6	5
NML (Sydney)		933	939	944	952
NPL (Teddington)		74	76	77	75
NRC (Ottawa)	(4)	13	14	18	17
NRLM (Tsukuba)		337	339	348	356
OMH (Budapest)		1497	1515	1531	1553
ONBA (Buenos Aires)		-345	-224	-33	203
ONRJ (Rio de Janeiro)		311	332	350	353
OP (Paris)		16	13	14	15
ORB (Bruxelles)		230	231	212	233
PSB (Singapore)		1049	1078	1107	1130
PTB (Braunschweig)		-17	-11	-8	-7
ROA (San Fernando)		40	46	45	35
SCL (Hong Kong)		-270	-296	-311	-319
SO (Shanghai)		802	769	785	789
SP (Boras)		649	-	-	-
SU (Moskva)		343	345	340	323
TL (Chung-Li)		468	454	451	447
TP (Praha)		191	209	202	206
TUG (Graz)		4194	4245	4294	4340
UME (Gebze-Kocaeli)		983	999	1009	1018
USNO (Washington DC)(USNO MC)		-5	-3	-1	-3
VSL (Delft)		-19	-20	-8	-8

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

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

Date 1997/98 0h UTC		Dec 27	Jan 1	Jan 6	Jan 11
MJD		50809	50814	50819	50824
Laboratory k		*TAI-TA(k)* (Unit is one nanosecond)			
AMC (Col. Springs)		-365128	-365142	-365147	-365151
APL (Laurel)		5359	-	-	6387
AUS (Canberra)		-82920	-83090	-83177	-83273
CH (Bern)		-39886	-39699	-39512	-39326
CRL (Tokyo)		94100	94306	94512	94735
CSAO (Lintong)		-2309	-2315	-2289	-2234
F (Paris)		162767	162764	162759	162748
IEN (Torino)		5181	5233	5280	5325
INPL (Jerusalem)		-393489	-	-	-
JATC (Lintong)		11363	11269	11113	11013
KRIS (Taejon)		5364	5379	5397	5414
NIST (Boulder)		-45170039	-45170255	-45170465	-45170676
NML (Sydney)		922	926	945	929
NRC (Ottawa)		26997	27000	27043	27105
PTB (Braunschweig)		-361539	-361531	-361527	-361521
SO (Shanghai)		-46761	-46770	-46777	-46777
SU (Moskva)	(5)	27241371	27241366	27241357	27241348
USNO (Washington DC)		-34785975	-34786294	-34786614	-34786931

Date 1998 0h UTC		Jan 16	Jan 21	Jan 26	Jan 31
MJD		50829	50834	50839	50844
Laboratory k		*TAI-TA(k)* (Unit is one nanosecond)			
AMC (Col. Springs)		-365157	-365159	-365163	-365171
APL (Laurel)		6436	6493	6543	6590
AUS (Canberra)		-83346	-83474	-83586	-83669
CH (Bern)		-39145	-38979	-38781	-38577
CRL (Tokyo)		94953	95156	95366	95573
CSAO (Lintong)		-2170	-2106	-2072	-2045
F (Paris)		162740	162735	162729	162723
IEN (Torino)		5373	5426	5474	5527
INPL (Jerusalem)		-	-	-	-
JATC (Lintong)		10923	10826	10706	10583
KRIS (Taejon)		5448	5457	5474	5484
NIST (Boulder)		-45170890	-45171100	-45171311	-45171525
NML (Sydney)		971	977	982	991
NRC (Ottawa)		27144	27142	27146	27145
PTB (Braunschweig)		-361517	-361511	-361508	-361507
SO (Shanghai)		-46764	-46799	-46785	-46780
SU (Moskva)	(5)	27241343	27241345	27241340	27241323
USNO (Washington DC)		-34787249	-34787565	-34787881	-34788200

3 - Notes on sections 1 and 2.

(1) DTAG. Apparent time step of *UTC-UTC(DTAG)* of - 100 ns between MJD = 50814 and MJD = 50819.

(2) PTB . Time step of UTC(PTB) of + 1900 ns on MJD = 50814.0

(3) AOS . Time step of UTC(AOS) of + 400 ns on MJD = 50832.34

(4) NRC . Time step of UTC(NRC) of + 145 ns on MJD = 50827.66

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

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

Interval of validity		$f(EAL)-f(TAI)$
1997 Dec. 27 - 1998 Jan. 31	50809-50844	7.160×10^{-13}
New steering correction foreseen for February 1998		
1998 Jan. 31 - 1998 Feb. 25	50844-50869	7.150×10^{-13}
New steering correction foreseen for March 1998		
1998 Feb. 25 - 1998 Mar. 27	50869-50899	7.140×10^{-13}

5 - Duration of the TAI scale interval.

The following table gives the duration u_{TAI} of the TAI scale interval expressed as its relative departure d from the SI second on the rotating geoid, u_0, together with its uncertainty σ : $d = (u_{TAI}-u_0)/u_0$. 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 type B uncertainty of the standard), and

- with a combination computed by the BIPM of all available measurements from LPTF-FO1, NIST-7, PTB CS2 and PTB CS3 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})	σ (10^{-14})
PTB-CS2	50809-50844	+0.6	1.5
PTB-CS3	50809-50844	+1.6	1.4
BIPM estimate	50779-50844	+0.9	1.0

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

[*UTC-GPS time*] = -12 s + C_0, [*TAI-GPS time*] = 19 s + C_0.

Daily values of C_0 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 C_0 are derived from them using linear interpolation of [*UTC-UTC(OP)*]. The global uncertainty of daily C_0 values is of order 10 ns.

In the following table, the standard deviation σ characterizes the dispersion of individual measurements, and N is the number of measurements used on a given day for estimation of the corresponding daily C_0 value.

Date 1997/98 0h UTC	MJD	C_0 (ns)	σ (ns)	$\sigma/\sqrt{N}$ (ns)
Dec 27	50809	0	43	8
Dec 28	50810	-11	52	23
Dec 29	50811	-15	47	11
Dec 30	50812	-9	47	9
Dec 31	50813	-4	41	8
Jan 1	50814	-4	44	8
Jan 2	50815	-7	43	8
Jan 3	50816	-8	46	8
Jan 4	50817	-5	39	7
Jan 5	50818	-3	44	8
Jan 6	50819	-6	56	10
Jan 7	50820	-11	38	7
Jan 8	50821	-12	45	8
Jan 9	50822	-7	52	9
Jan 10	50823	-8	48	9
Jan 11	50824	-13	40	7
Jan 12	50825	-15	41	7
Jan 13	50826	-15	47	9
Jan 14	50827	-14	40	7
Jan 15	50828	-11	33	6
Jan 16	50829	-10	40	9
Jan 17	50830	-11	40	7
Jan 18	50831	-8	45	9
Jan 19	50832	-4	33	6
Jan 20	50833	-3	34	6
Jan 21	50834	-6	44	8
Jan 22	50835	-5	44	8
Jan 23	50836	-2	50	9
Jan 24	50837	-2	49	9
Jan 25	50838	-7	52	10
Jan 26	50839	-9	53	10
Jan 27	50840	-8	37	7
Jan 28	50841	-7	44	8
Jan 29	50842	-3	45	8
Jan 30	50843	-1	39	7
Jan 31	50844	-3	46	8

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

[*UTC-GLONASS time*] = 0 s + C_1, [*TAI-GLONASS time*] = +31 s + C_1.

Daily values of C_1 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 C_1 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 C_1 estimates on 1997, January 1 (MJD = 50449). The global uncertainty of daily C_1 values is of order several hundreds of nanoseconds.

In the following table, the standard deviation σ characterizes the dispersion of individual measurements, and N is the number of measurements used on a given day for estimation of the corresponding daily C_1 value.

Date 1997/98 0h UTC	MJD	C_1 (ns)	σ (ns)	$\sigma/\sqrt{N}$ (ns)
Dec 27	50809	367	20	3
Dec 28	50810	377	21	4
Dec 29	50811	370	20	3
Dec 30	50812	363	19	3
Dec 31	50813	368	21	3
Jan 1	50814	370	28	5
Jan 2	50815	366	30	5
Jan 3	50816	362	21	3
Jan 4	50817	362	21	3
Jan 5	50818	365	26	5
Jan 6	50819	369	20	3
Jan 7	50820	367	23	4
Jan 8	50821	374	30	6
Jan 9	50822	390	31	5
Jan 10	50823	399	22	4
Jan 11	50824	390	22	4
Jan 12	50825	379	20	3
Jan 13	50826	367	22	4
Jan 14	50827	359	21	3
Jan 15	50828	358	22	4
Jan 16	50829	363	28	5
Jan 17	50830	372	26	4
Jan 18	50831	383	20	4
Jan 19	50832	385	19	3
Jan 20	50833	375	-	-
Jan 21	50834	364	15	3
Jan 22	50835	363	18	3
Jan 23	50836	365	19	3
Jan 24	50837	365	18	3
Jan 25	50838	366	24	4
Jan 26	50839	369	19	3
Jan 27	50840	374	-	-
Jan 28	50841	382	19	3
Jan 29	50842	384	20	4
Jan 30	50843	375	20	3
Jan 31	50844	370	17	3