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BUREAU INTERNATIONAL DES POIDS ET MESURES

Circular T 120 (1998 January 15)
Circulaire T 120

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

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

Date 1997 0h UTC	Nov 27	Dec 2	Dec 7	Dec 12
MJD	50779	50784	50789	50794
Laboratory k	*UTC-UTC(k)* (Unit is one nanosecond)			
AOS (Borowiec)	-966	-773	-668	-572
APL (Laurel)	3650	3695	3737	3778
AUS (Canberra)	165	183	181	197
BEV (Wien)	-	-	-	-
BIRM (Beijing)	-7869	-7919	-7962	-8024
CAO (Cagliari)	-1912	-1931	-1963	-1997
CH (Bern)	129	125	99	93
CNM (Queretaro)	-1030	-966	-913	-848
CRL (Tokyo)	-64	-68	-64	-78
CSAO (Lintong)	-43	-19	-51	-51
CSIR (Pretoria)	-1599	-1674	-1748	-1835
DLR (Oberpfaffenhofen)	-1472	-1516	-1562	-1609
DTAG (Darmstadt)	-446	-417	-392	-366
GUM (Warszawa)	1024	1018	1013	1001
IEN (Torino)	47	55	60	62
IFAG (Wettzell)	-1316	-1369	-1427	-1462
IGMA (Buenos Aires)	91	88	81	97
INPL (Jerusalem)	33	29	20	13
IPQ (Monte de Caparica)	967	971	979	989
JATC (Lintong)	3389	3409	3371	3358
KRIS (Taejon)	-6	3	10	2
LDS (Leeds)	42	54	54	62
MSL (Lower Hutt)	-6199	-6235	-6287	-6267
NAO (Mizusawa)	-403	-329	-251	-163
NIM (Beijing)	-2488	-2497	-2521	-2524
NIST (Boulder)	1	-2	2	1
NML (Sydney)	891	889	891	875
NPL (Teddington)	87	91	91	88
NRC (Ottawa)	-9	-17	-19	-18
NRLM (Tsukuba)	296	296	303	303
OMH (Budapest)	1344	1346	1367	1383
ONBA (Buenos Aires)	-	-	-	-1351
ONRJ (Rio de Janeiro)	178	196	207	220
OP (Paris)	11	8	9	14
ORB (Bruxelles)	269	249	237	204
PSB (Singapore)	764	794	829	856
PTB (Braunschweig)	1840	1849	1847	1847
ROA (San Fernando)	46	45	54	55
SCL (Hong Kong)	-	-	-3	-23
SO (Shanghai)	858	838	829	838
SP (Boras)	628	632	627	634
SU (Moskva)	417	409	407	386
TL (Chung-Li)	509	503	506	494
TP (Praha)	227	211	220	213
TUG (Graz)	3747	3787	3819	3862
UME (Gebze-Kocaeli)	902	917	922	937
USNO (Washington DC)(USNO MC)	1	0	1	-1
VSL (Delft)	-56	-58	-45	-34

1 - Coordinated Universal Time UTC. (Cont.)

Date 1997 0h UTC	Dec 17	Dec 22	Dec 27
MJD	50799	50804	50809
Laboratory k	*UTC-UTC(k)*	(Unit is one nanosecond)	
AOS (Borowiec)	-430	-220	-204
APL (Laurel)	3812	3847	3896
AUS (Canberra)	207	208	218
BEV (Wien)	-	-	-
BIRM (Beijing)	-8080	-8133	-8181
CAO (Cagliari)	-2007	-2034	-2059
CH (Bern)	89	93	92
CNM (Queretaro)	-790	-727	-667
CRL (Tokyo)	-74	-75	-75
CSAO (Lintong)	-34	-46	-6
CSIR (Pretoria)	-1928	-2009	-2091
DLR (Oberpfaffenhofen)	-1664	-1710	-1757
DTAG (Darmstadt)	-350	-351	-348
GUM (Warszawa)	991	989	988
IEN (Torino)	62	68	81
IFAG (Wettzell)	-1513	-1553	-1605
IGMA (Buenos Aires)	100	86	83
INPL (Jerusalem)	11	8	4
IPQ (Monte de Caparica)	1004	1015	1032
JATC (Lintong)	3373	3347	3389
KRIS (Taejon)	23	27	42
LDS (Leeds)	55	54	52
MSL (Lower Hutt)	-6247	-6113	-6075
NAO (Mizusawa)	-97	-53	-1
NIM (Beijing)	-2521	-2523	-2553
NIST (Boulder)	-1	2	3
NML (Sydney)	879	881	884
NPL (Teddington)	87	81	83
NRC (Ottawa)	-13	-5	3
NRLM (Tsukuba)	308	308	308
OMH (Budapest)	1393	1393	1406
ONBA (Buenos Aires)	-1138	-1093	-782
ONRJ (Rio de Janeiro)	222	246	264
OP (Paris)	13	15	21
ORB (Bruxelles)	188	187	193
PSB (Singapore)	878	903	943
PTB (Braunschweig)	1849	1851	1861
ROA (San Fernando)	64	67	61
SCL (Hong Kong)	-69	-92	-118
SO (Shanghai)	817	814	794
SP (Boras)	635	639	-
SU (Moskva)	384	375	371
TL (Chung-Li)	495	493	486
TP (Praha)	214	209	200
TUG (Graz)	3906	3947	3990
UME (Gebze-Kocaeli)	939	940	954
USNO (Washington DC)(USNO MC)	-4	-3	-2
VSL (Delft)	-31	-31	-14

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

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

Date 1997 0h UTC		Nov 27	Dec 2	Dec 7	Dec 12
MJD		50779	50784	50789	50794
Laboratory k		*TAI-TA(k)* (Unit is one nanosecond)			
AMC (Col. Springs)		-365086	-365101	-365103	-365110
APL (Laurel)		5113	5158	5200	5241
AUS (Canberra)		-82276	-82446	-82528	-82662
CH (Bern)		-41031	-40827	-40645	-40447
CRL (Tokyo)		92853	93061	93272	93479
CSAO (Lintong)		-2003	-2037	-2126	-2183
F (Paris)		162805	162798	162796	162790
IEN (Torino)		4929	4973	5015	5050
INPL (Jerusalem)		-394990	-394739	-394493	-394245
JATC (Lintong)		12068	11969	11803	11667
KRIS (Taejon)		5257	5267	5288	5293
NIST (Boulder)		-45168768	-45168982	-45169190	-45169404
NML (Sydney)		927	926	929	913
NRC (Ottawa)		26998	26988	26984	26983
PTB (Braunschweig)		-361560	-361551	-361553	-361553
SO (Shanghai)		-46650	-46681	-46696	-46695
SU (Moskva)	(1)	27241417	27241409	27241407	27241386
USNO (Washington DC)		-34784067	-34784386	-34784702	-34785021

Date 1997 0h UTC		Dec 17	Dec 22	Dec 27
MJD		50799	50804	50809
Laboratory k		*TAI-TA(k)* (Unit is one nanosecond)		
AMC (Col. Springs)		-365118	-365123	-365128
APL (Laurel)		5275	5310	5359
AUS (Canberra)		-82765	-82823	-82920
CH (Bern)		-40264	-40072	-39886
CRL (Tokyo)		93692	93899	94100
CSAO (Lintong)		-2223	-2292	-2309
F (Paris)		162780	162773	162767
IEN (Torino)		5085	5129	5181
INPL (Jerusalem)		-393992	-393740	-393489
JATC (Lintong)		11565	11435	11363
KRIS (Taejon)		5327	5341	5364
NIST (Boulder)		-45169618	-45169828	-45170039
NML (Sydney)		917	919	922
NRC (Ottawa)		26985	26991	26997
PTB (Braunschweig)		-361551	-361549	-361539
SO (Shanghai)		-46722	-46735	-46761
SU (Moskva)	(1)	27241384	27241375	27241371
USNO (Washington DC)		-34785341	-34785658	-34785975

3 - Note on section 2.

(1) 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 Oct. 28 - 1997 Dec. 27	50749-50809	7.170×10^{-13}
New steering correction foreseen for January 1998		
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}

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 uncertainty of the standard frequency), and

- with a combination computed by the BIPM of all available measurements from LPTF-F01, 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	50749-50809	+0.5	1.5
PTB-CS3	50749-50809	+2.5	1.4
LPTF-F01	50754-50784	+0.99	0.22
BIPM estimate	50749-50809	+1.0	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 0h UTC	MJD	C_0 (ns)	σ (ns)	$\sigma/\sqrt{N}$ (ns)
Nov 27	50779	0	45	8
Nov 28	50780	-9	30	8
Nov 29	50781	-13	45	8
Nov 30	50782	-12	46	8
Dec 1	50783	-5	48	9
Dec 2	50784	-1	50	9
Dec 3	50785	-3	45	8
Dec 4	50786	-6	50	9
Dec 5	50787	-4	38	8
Dec 6	50788	-4	46	8
Dec 7	50789	-8	43	8
Dec 8	50790	-11	51	9
Dec 9	50791	-10	39	9
Dec 10	50792	-4	41	7
Dec 11	50793	-1	46	8
Dec 12	50794	-2	45	8
Dec 13	50795	-3	36	7
Dec 14	50796	-4	42	8
Dec 15	50797	-11	51	9
Dec 16	50798	-17	48	9
Dec 17	50799	-16	38	7
Dec 18	50800	-6	38	7
Dec 19	50801	8	49	9
Dec 20	50802	12	49	9
Dec 21	50803	7	51	9
Dec 22	50804	-2	49	9
Dec 23	50805	-6	52	14
Dec 24	50806	-	-	-
Dec 25	50807	0	35	11
Dec 26	50808	5	66	12
Dec 27	50809	0	43	8

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

[*UTC-GLONASS time*] = 0 s + C_1, [*TAI-GLONASS time*] = +30 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 0h UTC	MJD	C_1 (ns)	σ (ns)	$\sigma/\sqrt{N}$ (ns)
Nov 27	50779	394	15	2
Nov 28	50780	396	18	3
Nov 29	50781	394	21	3
Nov 30	50782	392	19	3
Dec 1	50783	398	-	-
Dec 2	50784	394	21	4
Dec 3	50785	380	26	4
Dec 4	50786	379	30	5
Dec 5	50787	382	28	4
Dec 6	50788	375	20	3
Dec 7	50789	366	20	3
Dec 8	50790	363	25	4
Dec 9	50791	358	19	3
Dec 10	50792	342	23	4
Dec 11	50793	326	26	4
Dec 12	50794	323	26	5
Dec 13	50795	333	20	3
Dec 14	50796	346	18	3
Dec 15	50797	363	23	4
Dec 16	50798	382	24	6
Dec 17	50799	398	29	7
Dec 18	50800	394	24	4
Dec 19	50801	396	23	4
Dec 20	50802	403	27	5
Dec 21	50803	395	21	3
Dec 22	50804	378	24	4
Dec 23	50805	365	12	2
Dec 24	50806	353	22	4
Dec 25	50807	341	20	3
Dec 26	50808	345	21	3
Dec 27	50809	367	20	3