BIPM

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BUREAU INTERNATIONAL DES POIDS ET MESURES
Circular T 104 (1996 September 12)

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

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

Date 1996 0h UTC	Jul 30	Aug 4	Aug 9	Aug 14
MJD	50294	50299	50304	50309
Laboratory k	UTC-UTC(k) (Unit is one nanosecond)			
AOS (Borowiec)	316	203	77	-20
APL (Laurel)	-279	-291	-303	-317
AUS (Canberra)	39	38	33	31
BEV (Wien)	2728	-	-	-
BIRM (Beijing)	-2460	-2523	-2559	-2603
CAO (Cagliari)	-	-	-	-
CH (Bern)	171	172	179	166
CNM (Mexico)	-1817	-1816	-1753	-1773
CRL (Tokyo)	-98	-89	-84	-87
CSAO (Lintong)	-17	-44	-34	1
CSIR (Pretoria)	7083	7014	6977	6943
DLR (Oberpfaffenhofen)	-2273	-2275	-2277	-2283
DTAG (Darmstadt)	-421	-441	-447	-449
GUM (Warszawa)	-239	-233	-232	-233
IEN (Torino)	381	393	394	395
IFAG (Wettzell)	-4612	-4611	-4613	-4596
IGMA (Buenos Aires)	125	103	113	107
INPL (Jerusalem)	677	711	739	765
IPQ (Monte de Caparica) (1)	2	84	97	96
JATC (Lintong)	3274	3250	3272	3315
KRIS (Taejon)	30	11	8	4
LDS (Leeds)	120	103	98	106
MSL (Lower Hutt)	-5072	-5106	-5145	-5159
NAOM (Mizusawa)	-2836	-2792	-2772	-2771
NAOT (Tokyo)	-350	-279	-250	-181
NIM (Beijing)	8611	8635	8590	8620
NIST (Boulder)	-28	-29	-24	-23
NPL (Teddington)	-7	-8	-5	-6
NRC (Ottawa)	-31	-23	-14	-17
NRLM (Tsukuba)	-2442	-2385	-2311	-2256
OMH (Budapest)	-	-	-	-
ONBA (Buenos Aires) (2)	-6453	-7088	-7647	-8239
ONRJ (Rio de Janeiro)	19983	20478	21016	21397
OP (Paris)	5	4	4	1
ORB (Bruxelles)	77	60	71	70
PTB (Braunschweig)	2007	2006	1998	1990
ROA (San Fernando)	83	82	81	84
SCL (Hong Kong)	-326	-473	-425	-465
SO (Shanghai)	1256	1234	1207	1227
SP (Boras)	-8205	-8289	-8369	-8455
SU (Moskva)	-7760	-7773	-7780	-7793
TL (Chung-Li)	311	236	250	245
TP (Praha)	-22	-30	-26	-28
TUG (Graz)	451	472	495	523
UME (Gebze-Kocaeli)	182	195	216	214
USNO (Washington DC)(USNO MC)	-18	-18	-15	-15
VSL (Delft)	-421	-413	-419	-410

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TÉL. (CENTRAL) : + 33 1 45 07 70 70 TELEX : BIPM 631351 F TÉLÉCOPIE : + 33 1 45 34 20 21

1 - Coordinated Universal Time UTC. (Cont.)

Date 1996 0h UTC		Aug 19	Aug 24	Aug 29
MJD		50314	50319	50324
Laboratory k		UTC-UTC(k)	(Unit is one	nanosecond)
AOS (Borowiec)		-169	-223	-231
APL (Laurel)		-336	-360	-378
AUS (Canberra)	(3)	11	64	69
BEV (Wien)		-	-	-
BIRM (Beijing)		-2649	-2681	-2725
CAO (Cagliari)		-	-	-
CH (Bern)		170	165	154
CNM (Mexico)		-1772	-1940	-2118
CRL (Tokyo)		-84	-80	-77
CSAO (Lintong)		0	-14	-7
CSIR (Pretoria)		6895	6846	6846
DLR (Oberpfaffenhofen)		-2286	-2292	-2298
DTAG (Darmstadt)		-445	-457	-455
GUM (Warszawa)		-232	-227	-220
IEN (Torino)		395	390	381
IFAG (Wettzell)		-4589	-4580	-4571
IGMA (Buenos Aires)		118	105	117
INPL (Jerusalem)		792	814	817
IPQ (Monte de Caparica)		99	107	116
JATC (Lintong)		3329	3329	3345
KRIS (Taejon)		8	7	-4
LDS (Leeds)		118	118	123
MSL (Lower Hutt)		-5123	-5106	-5094
NAOM (Mizusawa)	(4)	-2741	-2722	-2712
NAOT (Tokyo)		-121	-68	-9
NIM (Beijing)		8608	8629	8653
NIST (Boulder)		-16	-16	-14
NPL (Teddington)		-7	-3	-3
NRC (Ottawa)		-7	5	14
NRLM (Tsukuba)		-2194	-2129	-2074
OMH (Budapest)		-	-	-
ONBA (Buenos Aires)		-8718	-8857	-9212
ONRJ (Rio de Janeiro)		21732	22105	22477
OP (Paris)		-1	-8	-1
ORB (Bruxelles)		79	80	64
PTB (Braunschweig)		1990	1989	1982
ROA (San Fernando)		87	91	88
SCL (Hong Kong)		-514	-515	-510
SO (Shanghai)		1214	1228	1217
SP (Boras)		-8549	-8637	-8730
SU (Moskva)		-7805	-7820	-7832
TL (Chung-Li)		243	243	241
TP (Praha)		-29	-25	-28
TUG (Graz)		546	565	578
UME (Gebze-Kocaeli)		229	233	232
USNO (Washington DC)(USNO MC)		-13	-13	-10
VSL (Delft)		-399	-400	-402

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		Jul 30	Aug 4	Aug 9	Aug 14
MJD		50294	50299	50304	50309
Laboratory k		TAI-TA(k) (Unit is one nanosecond)			
APL (Laurel)		1184	1172	1160	1146
AUS (Canberra)		-71775	-71829	-71950	-72063
CH (Bern)		-57539	-57383	-57220	-57073
CRL (Tokyo)		72520	72732	72945	73150
CSAO (Lintong)		4223	4131	4076	4047
F (Paris)		157832	158014	158192	158362
IEN (Torino)		623	665	714	762
INPL (Jerusalem)		-346686	-347340	-347991	-348633
JATC (Lintong)		13681	13658	13682	13742
KRIS (Taejon)		4170	4205	4254	4296
NIM (Beijing)		-5559	-5525	-5547	-5499
NISA (Boulder)	(5)	-45147907	-45148129	-45148347	-45148568
NRC (Ottawa)		26645	26679	26713	26737
PTB (Braunschweig)		-361393	-361394	-361402	-361410
SO (Shanghai)		-46266	-46288	-46307	-46284
SU (Moskva)	(6)	27242240	27242227	27242220	27242207
USNO (Washington DC)	(7)	-34752764	-34753094	-34753422	-34753751

Date 1996 0h UTC		Aug 19	Aug 24	Aug 29
MJD		50314	50319	50324
Laboratory k		TAI-TA(k) (Unit is one nanosecond)		
APL (Laurel)		1127	1103	1085
AUS (Canberra)	(3)	-72195	-72277	-72403
CH (Bern)		-56908	-56753	-56604
CRL (Tokyo)		73362	73566	73775
CSAO (Lintong)		3981	3902	3844
F (Paris)		158541	158720	158900
IEN (Torino)		810	853	894
INPL (Jerusalem)		-349266	-349897	-350537
JATC (Lintong)		13758	13748	13765
KRIS (Taejon)		4357	4416	4470
NIM (Beijing)		-5505	-5460	-5420
NISA (Boulder)	(5)	-45148784	-45149006	-45149227
NRC (Ottawa)		26772	26811	26849
PTB (Braunschweig)		-361410	-361411	-361418
SO (Shanghai)		-46291	-46273	-46285
SU (Moskva)	(6)	27242195	27242180	27242168
USNO (Washington DC)	(7)	-34754079	-34754409	-34754736

3 - Notes on sections 1 and 2.

(1) IPQ . Apparent time step of UTC-UTC(IPQ) of + 82 ns between MJD = 50294 and MJD = 50299 due to GPS receiver calibration.

(2) ONBA. Erratum Circular T 103, note (1) :
time step of UTC(ONBA) of - 12000 ns between MJD = 50274 and MJD = 50279 .

(3) AUS . Apparent time step of UTC-UTC(AUS) and TAI-TA(AUS) of + 54 ns on MJD = 50315.33 due to change of the value of the cable delay introduced in the GPS receiver.

(4) NAOM. Change of master clock on MJD = 50321.03

(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 Jun. 30 - 1996 Aug. 29	50264-50324	7.310×10^{-13}

New steering correction foreseen for September-October 1996

1996 Aug. 29 - 1996 Oct. 28	50324-50384	7.295×10^{-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)
Jul 30	50294	19	38	8
Jul 31	50295	25	42	9
Aug 1	50296	28	49	10
Aug 2	50297	27	33	7
Aug 3	50298	22	40	8
Aug 4	50299	12	42	9
Aug 5	50300	6	38	8
Aug 6	50301	8	37	8
Aug 7	50302	9	41	8
Aug 8	50303	6	34	7
Aug 9	50304	10	38	8
Aug 10	50305	14	40	8
Aug 11	50306	11	50	10
Aug 12	50307	7	42	9
Aug 13	50308	6	56	12
Aug 14	50309	4	36	7
Aug 15	50310	8	38	8
Aug 16	50311	15	57	12
Aug 17	50312	16	41	8
Aug 18	50313	7	71	14
Aug 19	50314	3	64	13
Aug 20	50315	8	46	10
Aug 21	50316	15	40	8
Aug 22	50317	18	48	10
Aug 23	50318	12	54	11
Aug 24	50319	12	46	9
Aug 25	50320	23	43	9
Aug 26	50321	34	41	8
Aug 27	50322	36	53	11
Aug 28	50323	34	46	9
Aug 29	50324	26	43	9

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 five-day intervals, together with the standard deviation σ of his daily GLONASS data. C1 is then derived using [UTC - GPS time] of section 5.

Date 1996 0h UTC	MJD	C1 (ns)	σ (ns)
Jul 30	50294	-30591	38
Aug 4	50299	-30744	50
Aug 9	50304	-30868	44
Aug 14	50309	-31002	48
Aug 19	50314	-31135	40
Aug 24	50319	-31258	49
Aug 29	50324	-31404	42

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})
NIST-7	50264-50269	+1.1	1.0
PTB-CS2	50264-50324	+2.9	1.5
BIPM estimate	50264-50324	+2.1	1.0