Data submission and format

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BIPM

6th meeting of laboratories
contributing to TAI
31 March 2004, BIPM

Data submission and format

- GPS data
  - weekly files
  - Tuesday
  - E-mail, BIPM ftp, lab ftp
  - file names, standard, provided by the BIPM Time section
  - CGGTTS format for the data (http://62.161.69.5/pub/tai/data)

- GPS P3 data
  - daily files / 5-day files
  - E-mail, BIPM ftp, lab ftp
  - file names, standard, provided by the BIPM Time section
  - format see tm110.pdf (http://62.161.69.5/pub/tai/data)

Support to laboratories

- ftp://62.161.69.5/pub/tai/data
  - TTR6schload
  - TTR6autocollect

- TWSTFT data
  - per session
  - E-mail, BIPM ftp, lab ftp
  - file names, standard, provided by the BIPM Time section
  - ITU-R format
- Ionospheric corrections and precise satellite orbits
  - IGS , CODE
- Clock and clock step data
  - same file, steps immediately after clock data
  - deadline 5th of month M+1 for data acquired in month M
  - format in data_format.pdf (http://62.161.69.5/pub/tai/data)

Clock file format (Jan. 2003)

The clock format is :

```
00000000011111111112222222222333333333344444444445
12345678901234567890123456789012345678901234567---
XXXXX 100YY 00200YY aaaaaaa.a CCCCCCC ccccccc.c---
```

Description of a line containing clock data:

- field 01 to 05 : XXXXX is MJD on 5 digits
- field 06 : blank
- field 07 to 11 : 100YY is the laboratory code
- field 12 : blank
- field 13 to 19 : 00200YY is the TA code of the lab
- field 20 : blank
- field 21 to 29 : aaaaaaa.a is [UTC(lab) - TA(lab)], the unit is the nanosecond.
- field 30 : blank
- field 31 to 37 : CCCCCCC is the code of one clock on 7 digits
- field 38 : blank
- field 39 to 47 : ccccccc.c is [UTC(lab) - clock],the unit is the nanosecond.

  follow other 18-digit fields, as required; each line may contain up to five 18-digit fields (101 characters maximum).

Clock step data format (Jan. 2003)

```
00000000011111111122222222223333333333444444444445
1234567890123456789012345678901234567890123456789---
XXXXX.XX CCCCCCC ccccccc.c bbbbb.bbb    AAAA 100YY
```

Description of a line containing clock step data:

- field 01 to 08 : XXXXX.XX is MJD on 5 digits and the fraction of day of the step
- field 09 : blank
- field 10 to 16 : CCCCCCC is the code of the clock on 7 digits
- field 17 : blank
- field 18 to 26 : cccccc.c is the amount of the time step, the unit is the nanosecond, the decimal character shows 0.1ns.
- field 27 : blank
- field 28 to 36: bbbbb.bbb is the amount of the frequency step, the unit is the ns/d.
- field 37 : blank
- field 41 to 44 : AAAA is the laboratory acronym, up to 4 characters
- field 45 : blank
- field 46 to 50 : 100YY is the laboratory code on 5 digits

Results, publications

- *Monthly Circular T*
  - April 2003
    - [*UTC-UTC(k)*], [*TAI-TA(k)*] to 0.1ns
    - Time links used for the calculation
  - January 2004
    - Time links,
    - u_A, u_B,
    - complete information on calibration of equipment/links
  - Automated procedure of calculation
    - shorter publication delay
    - reliability

- *Annual Report of the BIPM Time Section*

1 - Coordinated Universal Time UTC and its local realizations UTC(k). Computed values of [*UTC-UTC(k)*].
From 1999 January 1, 0h UTC, *TAI-UTC* = 32 s.

Date 2004 0h UTC	JAN 30	FEB 4	FEB 9	FEB 14	FEB 19	FEB 24	FEB 29
MJD	53034	53039	53044	53049	53054	53059	53064
Laboratory *k*				[*UTC-UTC(k)*]/ns			
AOS (Borowiec)	-27.0	-35.2	-35.0	-28.8	-26.2	-25.2	-23.5
APL (Laurel)	-208.1	-194.7	-176.7	-146.6	-121.6	-103.3	-90.0
AUS (Sydney)	-461.1	-449.1	-452.4	-456.3	-447.0	-445.0	-454.5
BEV (Wien)	27.0	37.2	40.1	48.1	54.7	61.1	69.7
BIRM (Beijing)	1671.5	1687.6	1703.8	1713.8	1736.0	1755.7	1765.7
CAO (Cagliari)	-4073.7	-4066.4	-4055.1	-4043.2	-4031.8	-4019.3	-4026.6
CH (Bern)	-1.8	-0.5	-4.6	-2.1	2.4	4.9	5.5
CNM (Queretaro)	1.9	-5.0	-0.6	-3.9	4.4	1.2	1.2
CNMP (Panama)	-2217.8	-2286.6	-2345.4	-2432.6	-2473.3	-2535.6	-2603.2
CRL (Tokyo)	-12.8	-8.5	-10.4	-9.2	-7.3	-5.6	-6.1
CSIR (Pretoria)	2947.5	2886.1	2817.6	2760.6	2686.4	2614.3	2539.0
DLR (Oberpfaffenhofen)	17.0	10.2	13.3	13.3	18.3	29.9	31.4
DTAG (Darmstadt)	221.6	230.3	236.7	222.6	226.9	223.3	222.3
IEN (Torino)	-26.9	-22.0	-15.1	-12.5	-18.9	-15.1	-23.3
IFAG (Wettzell)	-2658.1	-2680.2	-2692.4	-2703.4	-2718.5	-2738.7	-2751.9
IGMA (Buenos Aires)	-83.6	-81.4	-86.7	-86.2	-77.3	-81.2	-92.3
INPL (Jerusalem)	-9348.9	-9391.6	-9433.0	-9450.8	-9484.9	-9510.4	-9533.8
JATC (Lintong)	-11080.5	-11065.6	-11061.6	-11063.2	-11057.8	-11049.7	-11039.0
JV (Kjeller)	-9864.9	-9852.0	-9808.6	-9762.2	-9745.8	-9687.1	-9616.8
KRIS (Daejon)	18.0	11.0	13.9	8.3	1.5	0.6	0.2
LDS (Leeds)	4893.2	4929.4	4962.6	5006.2	5021.4	5034.9	5051.4
LT (Vilnius)	124.7	130.6	122.3	122.2	137.9	142.9	134.3
MSL (Lower Hutt)	-80.8	-96.9	-68.2	-33.5	-14.4	-13.5	-7.7
NAO (Mizusawa)	-30.1	-35.8	-34.3	-55.2	-69.7	-72.4	-79.7
NIM (Beijing)	-2658.1	-2648.6	-2655.6	-2652.6	-2647.3	-2652.5	-2657.6
NIMB (Bucharest)	-324.1	-312.4	-305.1	-299.2	-291.8	-282.6	-294.8
NIMT (Bangkok)	-882.4	-902.2	-914.4	-936.9	-952.3	-973.6	-990.3
NIST (Boulder)	-3.1	-4.5	-1.5	-2.0	-0.5	1.2	1.1
NMC (Sofiya)	-3584.3	-3595.5	-3601.7	-3606.8	-3631.3	-3663.2	-3667.4
NMIJ (Tsukuba)	88.7	97.3	98.9	102.5	105.6	110.0	112.9

2 - International Atomic Time TAI and Local atomic time scales TA(k). Computed values of [*TAI-TA(k)*].

Date 2004 0h UTC	JAN 30	FEB 4	FEB 9	FEB 14	FEB 19	FEB 24	FEB 29	
MJD	53034	53039	53044	53049	53054	53059	53064	
Laboratory *k*				[*TAI-TA(k)*]/ns				
CH (Bern)	40499.6	40644.5	40784.0	40927.4	41068.6	41207.9	41345.2	
CRL (Tokyo)	183248.7	183451.6	183652.0	183855.3	184059.3	184261.5	184461.9	
F (Paris)	169365.1	169363.8	169365.9	169364.7	169361.0	169361.9	169360.0	
IEN (Torino)	33447.3	33563.5	33688.0	33813.5	33925.2	34045.0	34161.9	
JATC (Lintong)	-34056.5	-34044.6	-34095.6	-34136.2	-34179.8	-34217.7	-34249.0	
KRIS (Taejon)	6730.1	6746.2	6770.9	6788.4	6804.5	6825.9	6847.9	
NIST (Boulder)	-45259887.7	-45260086.8	-45260281.6	-45260479.8	-45260676.1	-45260872.1	-45261070.0	
NRC (Ottawa)	28785.0	28773.1	28773.2	28779.0	28781.7	28779.9	28782.9	
NTSC (Lintong)	414.1	425.0	424.4	421.3	426.4	431.6	435.9	
PL (Warszawa)	-2074.9	-2088.0	-2103.5	-2119.5	-2130.7	-2141.4	-2156.2	
PTB (Braunschweig)	-359245.4	-359247.0	-359242.0	-359241.8	-359233.2	-359226.5	-359224.8	
SU (Moskva)	27240971.9	27240973.0	27240972.6	27240972.0	27240972.1	27240975.4	27240972.7	(1)
USNO (Washington DC)	-34925100.1	-34925409.2	-34925715.8	-34926022.6	-34926331.9	-34926639.3	-34926948.2	

- Note on section 2:

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

3 - Difference between the normalized frequencies of EAL (free atomic time scale) and TAI.

	Interval of validity	*f(EAL)-f(TAI)*	
Steering correction	53034 - 53094	6.930×10^{-13}	(2004 JAN 30 - 2004 MAR 30)
New correction foreseen	53094 - 53124	6.920×10^{-13}	(2004 MAR 30 - 2004 APR 29)

4 - Duration of the TAI scale interval.

TAI is a realization of coordinate time TT. The following tables give the fractional deviation d of the scale interval of TAI from that of TT (the SI second on the geoid), i.e. the fractional frequency deviation of TAI with the opposite sign: $d = -y_{TAI}$. In this section, a frequency over a time interval is defined as the ratio of the end-point phase difference to the duration of the interval. Whenever needed, the instability of EAL should be expressed as the quadratic sum of three components with τ in days: (1) a white frequency noise of $6.0\times10^{-15} / \sqrt{\tau}$, (2) a flicker frequency noise of 0.6×10^{-15} and (3) a random walk frequency noise of $1.6\times10^{-16} \times \sqrt{\tau}$. The relation between EAL and TAI is given in *Circular T* and the *Annual Report of the BIPM Time Section*.

In the first table, d is obtained, on the given periods of estimation by comparison of the TAI frequency with that of the given individual Primary Frequency Standards (PFS). In this table: u_A is the uncertainty originating in the instability of the PFS, u_B is the combined uncertainty from systematic effects, Ref(u_B) is a reference giving information on the stated value of u_B or is the *Circular T* where this reference was first given, $u_{l/lab}$ is the uncertainty in the link between the PFS and the clock participating to TAI, including the uncertainty due to the dead-time, $u_{l/TAI}$ is the uncertainty in the link to TAI, u is the quadratic sum of all four uncertainty values. All values are expressed in 10^{-15}.

Standard	Period of Estimation	d	u_A	u_B	Ref(u_B)	$u_{l/Lab}$	$u_{l/Tai}$	u	Note
SYRTE-FO2	53014 53044	7.5	0.2	0.8	T183	0.5	1.0	1.4	(1)
SYRTE-FOM	53019 53049	6.6	0.3	1.1	T183	0.7	1.0	1.7	(1)
SYRTE-JPO	53034 53059	17.7	0.5	6.5	T160	0.3	1.2	6.6	(2)
IEN-CSF1	53034 53044	2.6	0.4	1.2	T191	0.4	3.0	3.3	(3)
PTB-CS1	53034 53064	4.3	5.0	8.0	T148	0.0	1.0	9.5	(4)
PTB-CS2	53034 53064	8.8	3.0	12.0	T148	0.0	1.0	12.4	(4)

Notes:
(1) Report 5 March 2004 by BNM-SYRTE.
(2) Report 4 March 2004 by BNM-SYRTE.
(3) Report 2 March 2004 by IEN.
(4) Continuously operating as a clock participating to TAI.

The second table gives the BIPM estimate of d, based on all available PFS measurements over the period MJD 52674-53064, taking into account their individual uncertainties and characterizing the instability of EAL as noted above. u is the computed standard uncertainty of d

Period of estimation	d	u	
53034-53064	7.1×10^{-15}	1.6×10^{-15}	(2004 JAN 30 - 2004 FEB 29)

5 - Relations of UTC and TAI with GPS time and GLONASS time.

[*UTC-GPS time*] = -13 s + C_0, [*TAI-GPS time*] = 19 s + C_0, global uncertainty is of order 10 ns.
[*UTC-GLONASS time*] = 0 s + C_1, [*TAI-GLONASS time*] = 32 s + C_1, global uncertainty is of order hundreds ns.

The C_0 values are obtained using the values [*UTC-UTC(OP)*] and the GPS data taken at the Paris Observatory, corrected for IGS precise orbits, clocks and ionosphere maps. The C_1 values are obtained using the values [*UTC-UTC(VSL)*] and the GLONASS data taken at the NMi Van Swinden Laboratorium (VSL). N_0 and N_1 are the numbers of measurements. The standard deviations σ_0 and σ_1 characterize the dispersion of individual measurements. The actual uncertainty of user's access to GPS and GLONASS times may differ from these values.
For this circular, σ_0 = 2.0 ns, σ_1 = 26.6 ns

Date 2004 0h UTC	MJD	C_0/ns	N_0	C_1/ns	N_1
JAN 30	53034	0.2	43	205.5	29
JAN 31	53035	-1.8	43	200.2	0
FEB 1	53036	-1.0	42	197.1	0
FEB 2	53037	1.2	40	195.0	5
FEB 3	53038	4.7	42	195.7	55
FEB 4	53039	6.3	43	204.9	49
FEB 5	53040	4.4	42	192.5	63
FEB 6	53041	1.0	42	173.2	60
FEB 7	53042	0.8	43	168.0	75
FEB 8	53043	-0.8	43	176.7	71
FEB 9	53044	-3.1	43	170.2	76
FEB 10	53045	-3.0	42	165.6	81
FEB 11	53046	-6.9	42	182.4	56
FEB 12	53047	-6.6	43	199.5	58
FEB 13	53048	-4.4	44	208.0	63
FEB 14	53049	-1.6	44	204.7	65
FEB 15	53050	-3.1	44	199.4	46
FEB 16	53051	-3.6	45	185.3	65
FEB 17	53052	-0.8	42	170.4	40
FEB 18	53053	2.4	42	168.2	35
FEB 19	53054	5.4	40	184.9	71
FEB 20	53055	4.9	42	201.9	58
FEB 21	53056	3.7	41	212.1	69
FEB 22	53057	2.2	42	205.4	59
FEB 23	53058	0.1	40	214.6	22
FEB 24	53059	0.7	40	217.3	72
FEB 25	53060	1.0	40	209.7	80
FEB 26	53061	-3.7	39	215.6	69
FEB 27	53062	-5.9	42	226.4	60
FEB 28	53063	-8.2	41	222.6	29
FEB 29	53064	-8.2	40	219.9	39

6 - Time links used for the computation of TAI and their uncertainties.

The time links used in the elaboration of this *Circular T* are listed in this section. The technique for the link is indicated as follows: GPS SC for GPS common-view single-channel C/A data; GPS MC for GPS common-view multi-channel C/A data; GPS P3 for GPS common-view multi-channel dual-frequency P code data; GPS GT for 'GPS time' observations; INT LK for internal cable link and TWSTFT for two-way satellite time and frequency transfer data.

For each link, the following uncertainties are provided: u_A is the statistical uncertainty evaluated by taking into account the level of phase noise in the raw data, the interpolation interval between data points and the effects with typical duration between 5 and 30 days. u_B is the uncertainty on the calibration, estimated by the BIPM.

The calibration type of the link is indicated as: GPS EC for GPS equipment calibration; TW EC for two-way equipment calibration; LC (technique) for a link calibrated using 'technique'; BC (technique) for a link calibrated using 'technique' to transfer a past equipment calibration through a discontinuity of link operation.

The calibration dates indicate: the most recent calibration results for the two laboratories in the case of EC and the most recent calibration of the link in the case of LC and BC, NA stands for not available, in this case estimated values are provided

Link	Type	u_A/ns	u_B/ns	Calibration Type	Calibration Dates
AOS /PTB	GPS MC	1.5	5.0	GPS EC /GPS EC	2001 Oct/2003 Aug
APL /USNO	GPS MC	1.5	20.0	NA /GPS EC	NA /2002 Apr
AUS /CRL	GPS MC	3.0	5.0	GPS EC/GPS EC	2002 Sep/2002 Aug
BEV /PTB	GPS MC	1.5	5.0	GPS EC/GPS EC	2001 Dec/2003 Aug
BIRM/CRL	GPS MC	2.5	20.0	NA /GPS EC	NA /2002 Aug
CAO /PTB	GPS SC	7.0	20.0	NA /GPS EC	NA /2003 Aug
CH /PTB	GPS SC	2.5	20.0	NA /GPS EC	NA /2003 Aug
CNM /NIST	GPS SC	5.0	20.0	NA /GPS EC	NA /2003 Jul
CNMP/USNO	GPS MC	4.0	7.0	GPS EC/GPS EC	2002 Oct/2002 Apr
CRL /PTB	GPS MC	2.0	5.0	GPS EC/GPS EC	2003 Oct/2003 Aug
CSIR/PTB	GPS MC	3.0	20.0	NA /GPS EC	NA /2003 Aug
DLR /PTB	GPS P3	0.7	5.0	GPS EC/GPS EC	2003 Apr/2003 Aug
DTAG/PTB	GPS SC	3.0	10.0	GPS EC/GPS EC	1998 May/2003 Aug
IEN /PTB	TWSTFT	1.0	5.0	LC (GPS SC)	2002 Feb
IFAG/PTB	GPS P3	0.7	5.0	GPS EC/GPS EC	2003 Jun/2003 Aug
IGMA/NIST	GPS GT	5.0	20.0	NA /GPS EC	NA /2003 Jul
INPL/PTB	GPS SC	4.0	10.0	GPS EC/GPS EC	1987 Jun/2003 Jun
JATC/NTSC	INT LK	0.2	20.0	NA	NA
JV /PTB	GPS GT	5.0	20.0	NA /GPS EC	NA /2003 Jun
KRIS/CRL	GPS MC	2.5	20.0	NA /GPS EC	NA /2002 Aug

Link	Type	u_A/ns	u_B/ns	Calibration Type	Calibration Dates
LDS /PTB	GPS SC	3.0	20.0	NA /GPS EC	NA /2003 Jun
LT /PTB	GPS MC	1.5	5.0	GPS EC/GPS EC	2001 Nov/2003 Jun
MSL /CRL	GPS MC	3.0	20.0	NA /GPS EC	NA /2002 Aug
NAO /CRL	GPS SC	3.0	20.0	NA /GPS EC	NA /2002 Aug
NIM /CRL	GPS SC	3.0	20.0	NA /GPS EC	NA /2002 Aug
NIMB/PTB	GPS SC	15.0	20.0	NA /GPS EC	NA /2003 Jun
NIMT/CRL	GPS MC	3.0	20.0	NA /GPS EC	NA /2002 Aug
NIST/PTB	TWSTFT	0.5	5.0	LC(GPS SC)	2003 Sep
NMC /PTB	GPS GT	5.0	20.0	NA /GPS EC	NA /2003 Aug
NMIJ/CRL	TWSTFT	1.5	5.0	LC(GPS SC)	2001 Oct
NMLS/CRL	GPS MC	3.0	20.0	NA /GPS EC	NA /2002 Aug
NPL /PTB	TWSTFT	0.5	5.0	LC(GPS SC)	1999 Nov
NPLI/PTB	GPS SC	3.0	20.0	NA /GPS EC	NA /2003 Aug
NRC /USNO	GPS SC	3.0	15.0	GPS EC/GPS EC	1982 /2002 Apr
NTSC/CRL	TWSTFT	1.5	5.0	LC(GPS SC)	2001 Oct
OMH /PTB	GPS SC	2.5	20.0	NA /GPS EC	NA /2003 Aug
ONBA/USNO	GPS MC	5.0	7.0	GPS EC/GPS EC	2000 Oct/2002 Apr
ONRJ/NIST	GPS SC	5.0	20.0	NA /GPS EC	NA /2003 Jul
OP /PTB	GPS SC	2.5	5.0	GPS EC/GPS EC	2004 Jan/2003 Aug
ORB /PTB	GPS P3	0.7	5.0	GPS EC/GPS EC	2003 Jul/2003 Aug
PL /PTB	GPS MC	1.5	5.0	GPS EC/GPS EC	2001 Oct/2003 Aug
ROA /PTB	TWSTFT	1.0	5.0	LC(GPS SC)	2001 Dec
SCL /CRL	GPS SC	4.0	10.0	GPS EC/GPS EC	1993 May/2002 Aug
SG /CRL	GPS MC	3.0	20.0	NA /GPS EC	NA /2002 Aug
SMU /PTB	GPS SC	5.0	20.0	NA /GPS EC	NA /2003 Aug
SP /PTB	GPS SC	3.0	10.0	GPS EC/GPS EC	1997 Oct/2003 Aug
SU /PTB	GPS SC	3.0	5.0	GPS EC/GPS EC	2003 Apr/2003 Jun
TCC /NIST	GPS SC	5.0	20.0	NA /GPS EC	NA /2003 Jul
TL /CRL	TWSTFT	1.5	5.0	LC(GPS SC)	2001 Oct
TP /PTB	GPS SC	2.5	5.0	GPS EC/GPS EC	2001 Oct/2003 Jun
UME /PTB	GPS SC	15.0	20.0	NA /GPS EC	NA /2003 Jun
USNO/PTB	TWSTFT	0.5	3.0	BC(GPS P3)	2003 Sep
VSL /PTB	TWSTFT	1.0	5.0	LC(GPS SC)	1999 Dec