BUREAU INTERNATIONAL DES POIDS ET MESURES

Annual Report of the BIPM Time Section

Rapport annuel de la Section du temps du BIPM

Volume 7

1994

Pavillon de Breteuil
F-92312 SEVRES Cedex, France

ISBN 92-822-2136-9
ISSN 1016-6114

Practical information about the BIPM Time Section

The Time Section of the BIPM issues two periodic publications. These are the monthly *Circular T* and the *Annual Report of the BIPM Time Section*. The complete text of *Circular T* and most tables of the present Annual Report are available through the INTERNET network (see Annex I, just before the yellow pages of this volume, for the log-on procedure).

La Section du temps du BIPM produit deux publications périodiques: la Circulaire T, mensuelle, et le Rapport annuel de la Section du temps du BIPM. Les circulaires T et la plupart des tableaux de ce rapport annuel sont disponibles par utilisation du réseau INTERNET (voir l'annexe I, juste avant les pages jaunes de ce volume, pour la mise en oeuvre de la communication).

Address :	Time Section Bureau International des Poids et Mesures Pavillon de Breteuil F-92312 Sèvres Cedex France	
Telephone :	BIPM Time Section:	+ 33 1 45 07 70 72
	BIPM Switchboard:	+ 33 1 45 07 70 70
Telefax :	BIPM Time Section:	+ 33 1 45 07 70 59
	BIPM General:	+ 33 1 45 34 20 21
Telex :	BIPM 631351 F	
Electronic Mail :	bipm@mesiob.obspm.fr tai@bipm.fr anonymous ftp on 145.238.2.2 (subdirectory TAI)	

Staff :

Dr Claudine THOMAS, Head, Principal physicist	+ 33 1 45 07 70 73	cthomas@bipm.fr
Mr Jacques AZOUBIB, Physicist	+ 33 1 45 07 70 62	jazoubib@bipm.fr
Dr Wlodzimierz LEWANDOWSKI, Physicist	+ 33 1 45 07 70 63	wlewandowski@bipm.fr
Dr Gérard PETIT, Physicist	+ 33 1 45 07 70 67	gpetit@bipm.fr
Mr Peter WOLF, Research Student	+ 33 1 45 07 70 75	pwolf@bipm.fr
Miss Hawaï KONATE, Technician	+ 33 1 45 07 70 72	hkonate@bipm.fr
Mr Philippe MOUSSAY, Technician	+ 33 1 45 07 70 66	pmoussay@bipm.fr
Mrs Michèle THOMAS, Technician	+ 33 1 45 07 70 74	

Leap seconds

Secondes intercalaires

Since 1 January 1988, the maintenance of International Atomic Time, TAI, and of Coordinated Universal Time, UTC (with the exception of decisions and announcements concerning leap seconds of UTC) has been the responsibility of the Bureau International des Poids et Mesures (BIPM) under the authority of the Comité International des Poids et Mesures (CIPM). The dates of leap seconds of UTC are decided and announced by the International Earth Rotation Service (IERS), which is responsible for the determination of Earth rotation parameters and for maintenance of the related celestial and terrestrial reference systems. The adjustments of UTC and the relationship between TAI and UTC are given in Tables 1 and 2 of this volume.

Depuis le 1^er^ janvier 1988, l'établissement du Temps atomique international, TAI, et du Temps universel coordonné, UTC, (à l'exception de l'annonce des secondes intercalaires de l'UTC) est placé sous la responsabilité du Bureau international des poids et mesures (BIPM) et du Comité international des poids et mesures (CIPM). Le choix des dates et l'annonce des secondes intercalaires de l'UTC constituent quelques-unes des missions du Service international de la rotation terrestre (IERS), qui est responsable de la détermination des paramètres de la rotation terrestre et de la conservation des systèmes de référence terrestre et céleste associés. Les ajustements de l'UTC et la relation entre le TAI et l'UTC sont donnés dans les tableaux 1 et 2 de ce volume.

Information on IERS can be obtained from:

Des renseignements sur l'IERS peuvent être obtenus à l'adresse suivante:

Central Bureau of IERS
Dr. Martine FEISSEL
Observatoire de Paris
61, avenue de l'Observatoire
75014 Paris, France

Telephone: + 33 1 40 51 22 26
Telefax: + 33 1 40 51 22 91
Electronic mail: services@obspm.fr
Anonymous ftp on 145.238.2.21 (subdirectory IERS)

Establishment of the International Atomic Time and of the Coordinated Universal Time

1. Data and computation

The International Atomic Time, TAI, and the Coordinated Universal Time, UTC, are obtained from a combination of data from about 230 atomic clocks kept by 60 laboratories spread worldwide and regularly reported to the BIPM by 46 timing centres maintaining a local UTC, UTC(k) (list in Table 3). This data is in the form of time differences [UTC(k) - Clock] taken at 10 day intervals for Modified Julian Dates (MJD) ending in 9, at 0h UTC, dates designated here as 'standard dates'. The equipment maintained by these 46 timing centres is detailed in Table 4.

An iterative algorithm produces a free atomic time scale, EAL (Echelle atomique libre) defined as a weighted average of clock readings. The processing is done in deferred-time and treats as a whole two month blocks of data [1] [2]. The weighting procedure and clock frequency prediction are chosen so that EAL is optimized for long-term stability. No attempt is made to ensure the conformity of the EAL scale interval with the second of the International System of Units.

2. Accuracy

The duration of the scale interval of EAL is evaluated by comparison with the data of primary caesium standards, after conversion on the rotating geoid. The TAI is then derived from EAL by adding a linear function of time with a convenient slope to ensure the accuracy of the TAI scale interval. The frequency offset between TAI and EAL is changed when necessary to maintain accuracy, the magnitude of the changes being of the same order as the frequency fluctuations resulting from the instability of EAL. This operation is referred to as the 'steering of TAI'. Table 5 gives the normalized frequency offsets between EAL and TAI: the relationship between TAI and EAL was not modified in 1994. Measurements of TAI frequency and estimates of the mean duration of its scale interval are reported in Tables 6 and 7.

3. Availability

The TAI and UTC are made available in the form of time differences with respect to the local time scales UTC(k), which approximate UTC, and TA(k), which are independent local atomic time scales. These differences, [UTC - UTC(k)] and [TAI - TA(k)], reported in Tables 8 and 9, are computed for the standard dates.

The computation of TAI is carried out every two months. A provisional computation, however, is made every odd-numbered month (January, March, etc.) with the data which is available. In the following month, TAI is recomputed for the whole span of two months. The deviations between the provisional one-month and complete two-month solutions are usually smaller than 10 ns. This arrangement allows the monthly publication of results in Circular T. When preparing the Annual Report, the results shown in Circular T are revised taking into account any improvement in the data made known after its publication. The computation is then strictly made for the six two-month intervals of the year.

4. Time links

The network of time links used by the BIPM is non-redundant and mainly relies on the observation of GPS satellites. In 1994 nearly all national centres keeping a local UTC were equipped with GPS time receivers and followed the international tracking schedules published by the BIPM:

- Schedule No 23, reported in Table 10, implemented on 30 June 1994 (MJD 49533), and
- Schedule No 24, reported in Table 11, implemented on 16 December 1994 (MJD 49702).

Laboratories regularly send their GPS observations to the BIPM where they are processed following a unified procedure. Strict common views, synchronized to within 1 s, are used to remove the clock-dither noise brought about by the voluntary degradation, Selective Availability, of GPS signals.

The BIPM organizes the international GPS network which takes the form of local stars within a continent joined by two long-distance links, OP-CRL and OP-NIST, chosen because measured ionospheric delays are routinely available for these three sites. Precise GPS satellites ephemerides, produced by the International Geodynamics Service with a delay of a few days, are also routinely used for these long-distance links. The ultimate precision of one single measurement of [UTC(k_1) - UTC(k_2)], obtained at the BIPM with these procedures, is about 2 ns for short distances and 8 ns for long distances. The BIPM also publishes an evaluation of [UTC - GPS time] which is reported in Table 12 of this volume.

No time link using GLONASS was used for the computation of TAI in 1994. However, the BIPM regularly publishes an evaluation of [UTC - GLONASS time], given here in Table 13, using current observations of both the GPS and GLONASS satellite systems provided by Prof. P. Daly, University of Leeds.

5. Time scales established in retrospect

For the most demanding applications, such as millisecond pulsar timing, the BIPM issues atomic time scales in retrospect. These are designated TT(BIPMxx) where 1900 + xx is the year of computation [3]. The successive versions of TT(BIPMxx) are both updates and revisions: they may differ for common dates. These time scales are available on request from the BIPM or via the INTERNET network.

Notes

Tables 14 and 15 of this report give the rates relative to TAI and the weights of the contributing clocks to TAI in 1994.

The yellow pages, at the end of this volume, give indications about time signal emissions.

References

[1] B. Guinot and C. Thomas, Establishment of the International Atomic Time, Annual Report of the BIPM Time Section, 1988, pp. D3-D22.

[2] P. Tavella and C. Thomas, Comparative study of time scale algorithms, *Metrologia*, 1991, **28**, 57-63.

[3] B. Guinot, Atomic time scales for pulsar studies and other demanding applications, *Astron. and Astrophys.*, 1988, **192**, 370-373.

Etablissement du Temps atomique international et du Temps universel coordonné

1. Données et mode de calcul

Le Temps atomique international (TAI) et le Temps universel coordonné (UTC) sont obtenus par une combinaison de données provenant d'environ 230 horloges atomiques conservées par 60 laboratoires répartis dans le monde entier, et fournies régulièrement au BIPM par 46 laboratoires de temps qui maintiennent un UTC local, UTC(k) (liste donnée dans le tableau 3). Ces données prennent la forme de differences de temps [UTC(k) - Horloge] enregistrées de 10 jours en 10 jours pour les dates juliennes modifiées (MJD) se terminant par 9, à 0hUTC, 'dates normales'. L'équipement maintenu par ces 46 laboratoires de temps est décrit dans le tableau 4.

Un algorithme itératif qui traite en temps différé des blocs de 2 mois de données [1] [2], produit une échelle atomique libre, EAL, définie comme étant une moyenne pondérée de lectures d'horloges. Le choix de la pondération et du mode de prédiction de fréquence optimise la stabilité de l'EAL à long terme. Il n'est pas tenté d'assurer la conformité de l'intervalle unitaire de l'EAL avec la seconde du Système international d'unités.

2. Exactitude

La durée de l'intervalle unitaire de l'EAL est évaluée par comparaison aux données d'étalons de fréquence à césium primaires, après conversion sur le géoïde en rotation. Ensuite le TAI se déduit de l'EAL par l'addition d'une fonction linéaire du temps dont la pente est convenablement choisie pour assurer l'exactitude de l'intervalle unitaire du TAI. Le décalage de fréquence entre le TAI et l'EAL est changé quand c'est nécessaire pour maintenir l'exactitude, les changements ayant le même ordre de grandeur que les fluctuations de fréquence qui résultent de l'instabilité de l'EAL. Cette opération est désignée par l'expression 'pilotage du TAI'. Le tableau 5 donne les différences de fréquences normalisées entre l'EAL et le TAI: la relation les liant n'a pas été modifiée en 1994. Des mesures de la fréquence du TAI et des estimations de la durée moyenne de son intervalle unitaire sont données dans les tableaux 6 et 7.

3. Disponibilité

Le TAI et l'UTC sont disponibles sous forme de différences de temps avec les échelles locales de temps UTC(k), approximation de l'UTC, et TA(k), temps atomique local indépendant, reportées dans les tableaux 8 et 9.

Le calcul du TAI doit être fait, en principe, tous les deux mois. Mais un calcul provisoire est fait un mois sur deux (pour janvier, mars, etc.) avec les données disponibles. Le mois suivant, le calcul du TAI est repris pour une durée de deux mois.

L'écart entre les résultats des calculs provisoire et complet est ordinairement inférieur à 10 ns. Cette organisation permet la publication mensuelle des résultats dans la Circulaire T du BIPM. Quand le Rapport annuel est préparé, les résultats de la Circulaire T sont révisés, compte-tenu des améliorations de données, connues après la publication de la Circulaire T. Les calculs sont alors strictement faits par période de deux mois.

4. Liaisons horaires

Le système des liaisons horaires utilisé par le BIPM est non-redondant. Il repose principalement sur l'observation des satellites du GPS.

En 1994, pratiquement tous les laboratoires de temps qui maintiennent un UTC local, étaient équipés de récepteurs du temps du GPS et suivaient les programmes de poursuite des satellites du GPS, produits par le BIPM:

- *le programme No 23, reproduit dans le tableau 10, mis en oeuvre le 30 juin 1994 (MJD 49533), et*
- *le programme No 24, reproduit dans le tableau 11, mis en oeuvre le 16 décembre 1994 (MJD 49702).*

Les laboratoires envoient régulièrement leurs données au BIPM où les calculs sont effectués d'une manière unifiée. On utilise des observations en vues simultanées strictes, c'est-à-dire synchronisées à la seconde près, ceci afin de supprimer la dégradation des signaux des horloges embarquées, due à l'implantation de 'l'accés sélectif'.

Le BIPM organise le réseau international de comparaisons horaires utilisant le GPS selon un schéma en étoile au niveau des continents, et en deux liaisons à longue distance, OP-CRL et OP-NIST, choisies parce que des données de retards ionosphériques mesurés sont disponibles pour ces trois sites. Des éphémérides précises des satellites du GPS, produites par l'IGS et accessibles en quelques jours, sont aussi utilisées de manière courante pour ces deux liaisons. La précision ultime d'une mesure unique [UTC(k_1) - UTC(k_2)] est alors d'environ 2 ns pour les liaisons à courte distance et d'environ 8 ns pour les liaisons à longue distance. Le BIPM publie aussi une évaluation de [UTC - temps du GPS], donnée dans le tableau 12 de ce volume.

Aucun lien horaire utilisant le GLONASS n'a été utilisé en 1994. Cependant, le BIPM publie régulièrement une évaluation de [UTC - temps du GLONASS], donnée dans le tableau 13 du présent volume et déduite des observations habituelles des deux systèmes GPS et GLONASS, réalisées par le Professeur P. Daly de l'Université de Leeds.

5. *Echelles de temps établies rétrospectivement*

Pour les applications les plus exigeantes, comme le chronométrage des pulsars milliseconde, le BIPM produit des échelles de temps rétrospectivement, désignées par TT(BIPMxx), 1900 + xx étant l'année du calcul [3]. Les versions successives de TT(BIPMxx) ne sont pas seulement des mises à jour, mais aussi des révisions, de sorte qu'elles peuvent différer pour les dates communes. Ces échelles de temps sont disponibles sur demande faite au BIPM ou par utilisation du réseau INTERNET.

Notes

Les tableaux 14 et 15 de ce rapport donnent les fréquences relatives au TAI et les poids des horloges qui ont contribué au calcul en 1994.

Les pages jaunes, à la fin de ce volume, concernent les émissions de signaux horaires.

Les références sont données dans le texte anglais, page 9.

List of the Tables included in the Annual Report of the BIPM Time Section for 1994

Tables indicated with * are available through the INTERNET network (see Annex I, just before the yellow pages of this volume) under the file names given in this list.

TABLE 1. FREQUENCY OFFSETS AND STEP ADJUSTMENTS OF UTC, UNTIL 31 DECEMBER 1995

DATE (AT 0h UTC)	OFFSETS	STEPS
1961 Jan. 1	-150×10^{-10}	
1961 Aug. 1	"	+0.050 s
1962 Jan. 1	-130×10^{-10}	
1963 Nov. 1	"	-0.100 s
1964 Jan. 1	-150×10^{-10}	
1964 Apr. 1	"	-0.100 s
1964 Sep. 1	"	-0.100 s
1965 Jan. 1	"	-0.100 s
1965 Mar. 1	"	-0.100 s
1965 Jul. 1	"	-0.100 s
1965 Sep. 1	"	-0.100 s
1966 Jan. 1	-300×10^{-10}	
1968 Feb. 1	"	+0.100 s
1972 Jan. 1	0	-0.107 7580 s
1972 Jul. 1	"	-1 s
1973 Jan. 1	"	-1 s
1974 Jan. 1	"	-1 s
1975 Jan. 1	"	-1 s
1976 Jan. 1	"	-1 s
1977 Jan. 1	"	-1 s
1978 Jan. 1	"	-1 s
1979 Jan. 1	"	-1 s
1980 Jan. 1	"	-1 s
1981 Jul. 1	"	-1 s
1982 Jul. 1	"	-1 s
1983 Jul. 1	"	-1 s
1985 Jul. 1	"	-1 s
1988 Jan. 1	"	-1 s
1990 Jan. 1	"	-1 s
1991 Jan. 1	"	-1 s
1992 Jul. 1	"	-1 s
1993 Jul. 1	"	-1 s
1994 Jul. 1	"	-1 s

TABLE 2. RELATIONSHIP BETWEEN TAI AND UTC, UNTIL 31 DECEMBER 1995

LIMITS OF VALIDITY (AT 0h UTC)	TAI - UTC (IN SECONDS)
1961 Jan. 1 - 1961 Aug. 1	1.422 8180 + (MJD - 37300) x 0.001 296
1961 Aug. 1 - 1962 Jan. 1	1.372 8180 + " "
1962 Jan. 1 - 1963 Nov. 1	1.845 8580 + (MJD - 37665) x 0.001 1232
1963 Nov. 1 - 1964 Jan. 1	1.945 8580 + " "
1964 Jan. 1 - 1964 Apr. 1	3.240 1300 + (MJD - 38761) x 0.001 296
1964 Apr. 1 - 1964 Sep. 1	3.340 1300 + " "
1964 Sep. 1 - 1965 Jan. 1	3.440 1300 + " "
1965 Jan. 1 - 1965 Mar. 1	3.540 1300 + " "
1965 Mar. 1 - 1965 Jul. 1	3.640 1300 + " "
1965 Jul. 1 - 1965 Sep. 1	3.740 1300 + " "
1965 Sep. 1 - 1966 Jan. 1	3.840 1300 + " "
1966 Jan. 1 - 1968 Feb. 1	4.313 1700 + (MJD - 39126) x 0.002 592
1968 Feb. 1 - 1972 Jan. 1	4.213 1700 + " "
1972 Jan. 1 - 1972 Jul. 1	10 (integral number of seconds)
1972 Jul. 1 - 1973 Jan. 1	11
1973 Jan. 1 - 1974 Jan. 1	12
1974 Jan. 1 - 1975 Jan. 1	13
1975 Jan. 1 - 1976 Jan. 1	14
1976 Jan. 1 - 1977 Jan. 1	15
1977 Jan. 1 - 1978 Jan. 1	16
1978 Jan. 1 - 1979 Jan. 1	17
1979 Jan. 1 - 1980 Jan. 1	18
1980 Jan. 1 - 1981 Jul. 1	19
1981 Jul. 1 - 1982 Jul. 1	20
1982 Jul. 1 - 1983 Jul. 1	21
1983 Jul. 1 - 1985 Jul. 1	22
1985 Jul. 1 - 1988 Jan. 1	23
1988 Jan. 1 - 1990 Jan. 1	24
1990 Jan. 1 - 1991 Jan. 1	25
1991 Jan. 1 - 1992 Jul. 1	26
1992 Jul. 1 - 1993 Jul. 1	27
1993 Jul. 1 - 1994 Jul. 1	28
1994 Jul. 1 -	29

TABLE 3. ACRONYMS AND LOCATIONS OF THE TIMING CENTRES WHICH MAINTAIN A LOCAL APPROXIMATION OF UTC, UTC(k), OR/AND AN INDEPENDENT LOCAL TIME SCALE, TA(k)

AOS	Astronomiczne Obserwatorium Szerokosciowe, Borowiec, Polska
APL	Applied Physics Laboratory, Laurel, MA, USA
AUS	Consortium of laboratories in Australia
BEV	Bundesamt für Eich - und Vermessungswesen, Wien, Oesterreich
CAO	Cagliari Astronomical Observatory , Cagliari, Italia
CH	Consortium of laboratories in Switzerland
CRL	Communications Research Laboratory, Tokyo, Japan
CSAO	Shaanxi Astronomical Observatory, Lintong, P.R. China
CSIR	Council for Scientific and Industrial Research, Pretoria, South Africa
F	Commission Nationale de l'Heure, Paris, France
FTZ	Forschungs - und Technologiezentrum Darmstadt, Deutschland
GUM (1)	Glówny Urzad Miar, Central Office of Measures, Warszawa, Polska
IEN	Istituto Elettrotecnico Nazionale Galileo Ferraris, Torino, Italia
IFAG	Institut für Angewandte Geodäsie, Frankfurt am Main, Deutschland
IGMA	Instituto Geografico Militar, Buenos-Aires, Argentina
INPL	National Physical Laboratory, Jerusalem, Israel
JATC	Joint Atomic Time Commission, Lintong, P.R. China
KRIS	Korea Research Institute of Standards and Science, Taejon, Rep. of Korea
LDS	The University of Leeds, Leeds, United Kingdom
MSL	Measurement Standards Laboratory, Lower Hutt, New Zealand
NAOM	National Astronomical Observatory, Misuzawa, Japan
NAOT	National Astronomical Observatory, Tokyo, Japan
NIM	National Institute of Metrology, Beijing, P.R. China
NIST	National Institute of Standards and Technology, Boulder, CO, USA
NMC	National Metrological Center, Sofiya, Bulgaria
NPL	National Physical Laboratory, Teddington, United Kingdom
NPLI	National Physical Laboratory, New-Delhi, India
NRC	National Research Council of Canada, Ottawa, Canada
NRLM	National Research Laboratory of Metrology, Tsukuba, Japan
OMH	Orszagos Mérésügyi Hivatal, Budapest, Hungary
ONBA	Observatorio Naval, Buenos-Aires, Argentina
ONRJ	Observatorio Nacional, Rio de Janeiro, Brazil
OP	Observatoire de Paris, Paris, France
ORB	Observatoire Royal de Belgique, Bruxelles, Belgique

TABLE 3. ACRONYMS AND LOCATIONS OF THE TIMING CENTRES WHICH MAINTAIN A LOCAL APPROXIMATION OF UTC, UTC(k), OR/AND AN INDEPENDENT LOCAL TIME SCALE, TA(k) (CONT.)

PTB	Physikalisch-Technische Bundesanstalt, Braunschweig, Deutschland
RC	Comité Estatal de Normalizacion, Habana, Cuba
ROA	Real Instituto y Observatorio de la Armada, San Fernando, Espana
SCL	Standards and Calibration Laboratory, Hong Kong
SNT	Swedish National Time and Frequency Laboratory, Stockholm, Sweden
SO	Shanghai Observatory, Shanghai, P.R. China
SU	Institute of Metrology for Time and Space (IMVP), NPO "VNIIFTRI" Mendeleevo, Moscow Region, Russia
TL	Telecommunication Laboratories, Chung-Li, Taiwan, China
TP	Institute of Radio Engineering and Electronics, Academy of Sciences of Czech Republic - Czech Republic
TUG	Technische Universität, Graz, Oesterreich
UME	Ulusal Metroloji Enstitüsü, Marmara Research Centre, National Metrology Institute, Gebze-Kocaeli, Turkey
USNO	U.S. Naval Observatory, Washington D.C., USA
VSL	Van Swinden Laboratorium, Delft, Nederland

(1) Formerly PKNM

TABLE 4. LABORATORIES CONTRIBUTING TO TAI IN 1994 : EQUIPMENT, INDEPENDENT LOCAL TIME SCALE

(Ind. Cs : industrial Cs Standard, Lab. Cs : laboratory Cs standard,

		Information on TA(k) - UTC(k)	
Laboratory (k)	Equipment in atomic standards	Interval of validity (in MJD at 0hUTC)	TA(k) - UTC(k) in s
AOS	2 Ind. Cs		
APL	2 Ind. Cs 4 H-Masers	49352-49534 49534-49717	27.999 998 537 28.999 998 537
AUS	Ind. Cs H-Masers (2)	year 1994	TA(AUS)-UTC(AUS) is sent to the BIPM by ORR
BEV	1 Ind. Cs		
CAO	3 Ind. Cs		
CH	14 Ind. Cs (4)	year 1994	TA(CH)-UTC(CH) is sent to the BIPM by OFM
CRL	1 Lab. Cs 14 Ind. Cs 4 H-Masers	year 1994	TA(CRL)-UTC(CRL) is published in CRL Standard Frequency and Time Bulletins
CSAO	5 Ind. Cs 2 H-Masers	year 1994	TA(CSAO)-UTC(CSAO) is published in CSAO Time and Frequency Bulletins

TA(k), SOURCE OF UTC(k) AND RECEPTION OF TIME SIGNALS

H-Maser : Hydrogen Maser,   * means 'yes')

	Information on time links					
Source of UTC(k) (1)	GPS recept.	Iono. meas. syst.	GLONASS recept.	LORAN-C recept.	Television link with	Two-way satellite time transfer
1 Cs + microstepper	*			*	GUM	
1 H-Maser	*					in an experimental stage
(3) 1 Cs + microstepper	*				other labs in Australia	in an experimental stage
1 Cs				*	OMH, TUG, other labs in Slovak Republic	
1 Cs	*			*		
all the Cs	*			*	PTT (4)	
11 Cs	*	*		*		*
all the Cs	*			*	other labs in China	

TABLE 4. LABORATORIES CONTRIBUTING TO TAI IN 1994 : EQUIPMENT, INDEPENDENT LOCAL TIME SCALE

(Ind. Cs : industrial Cs Standard, Lab. Cs : laboratory Cs standard,

		Information on TA(k) - UTC(k)	
Laboratory (k)	Equipment in atomic standards	Interval of validity (in MJD at 0hUTC)	TA(k) - UTC(k) in s
CSIR	2 Ind. Cs		
FTZ	4 Ind. Cs		
GUM (5)	4 Ind. Cs		
IEN	6 Ind. Cs		(6)
IFAG	5 Ind. Cs 3 H-Masers		
IGMA	4 Ind. Cs		
INPL	5 Ind. Cs	year 1994	TA(INPL)-UTC(INPL) is sent to the BIPM
JATC	1 Lab. Cs 7 Ind. Cs 3 H-Masers (7)	year 1994	TA(JATC)-UTC(JATC) is sent to the BIPM
KRIS	5 Ind. Cs 1 H-Maser	year 1994	TA(KRIS)-UTC(KRIS) is sent to the BIPM
LDS	3 Ind. Cs		
MSL	3 Ind. Cs		

TA(k), SOURCE OF UTC(k) AND RECEPTION OF TIME SIGNALS (CONT.)

H-Maser : Hydrogen Maser, * means 'yes')

	Information on time links					
Source of UTC(k) (1)	GPS recept.	Iono. meas. syst.	GLONASS recept.	LORAN-C recept.	Television link with	Two-way satellite time transfer
1 Cs	*				other labs in South Africa	
1 Cs	*					*
1 Cs + microstepper	*			*	AOS	
1 Cs + microstepper	*				CAO, other labs in Italy	
1 Cs + microstepper	*					
1 Cs + microstepper	*				ONBA, other labs in Argentina	
4 Cs	*	*				
1 Cs + microstepper	*			*		
1 Cs + microstepper	*	*		*		
1 Cs	*		* (8)			
1 Cs	*				other labs in New Zealand	

TABLE 4. LABORATORIES CONTRIBUTING TO TAI IN 1994 : EQUIPMENT, INDEPENDENT LOCAL TIME SCALE

(Ind. Cs : industrial Cs Standard, Lab. Cs : laboratory Cs standard,

		Information on TA(k) - UTC(k)	
Laboratory (k)	Equipment in atomic standards	Interval of validity (in MJD at 0hUTC)	TA(k) - UTC(k) in s
NAOM	3 Ind. Cs 1 H-Maser		
NAOT	4 Ind. Cs		
NIM	3 Ind. Cs	year 1994	TA(NIM)-UTC(NIM) is sent to the BIPM
NIST	3 Lab. Cs 20 Ind. Cs 3 H-Masers (9)	year 1994	[AT1-UTC(NIST)] is sent to the BIPM (10)
NMC	1 Ind. Cs		
NPL	7 Ind. Cs 1 H-Maser		
NPLI	3 Ind. Cs		
NRC	3 Lab. Cs 1 Ind. Cs	49352-49534 from 49534	27.999 983 931 TA(NRC)-UTC(NRC) is sent to the BIPM
NRLM	5 Ind. Cs 2 Lab. Cs		

TA(K), SOURCE OF UTC(K) AND RECEPTION OF TIME SIGNALS (CONT.)

H-Maser : Hydrogen Maser, * means 'yes')

	Information on time links					
Source of UTC(k) (1)	GPS recept.	Iono. meas. syst.	GLONASS recept.	LORAN-C recept.	Television link with	Two-way satellite time transfer
1 Cs + microstepper	*			*		
1 Cs + microstepper	*			*		
1 Cs + microstepper	*			*	other labs in China	
11 Cs 1 H-Maser	*	*		*		*
1 Cs + microstepper	*				ROA	
1 H-Maser + microstepper	*	(11)		*	transmitting station at Rugby	*
1 Cs	*					
1 Lab. Cs (12)	*			*		*
1 Cs	*					

TABLE 4. LABORATORIES CONTRIBUTING TO TAI IN 1994 : EQUIPMENT, INDEPENDENT LOCAL TIME SCALE

(Ind. Cs : industrial Cs Standard, Lab. Cs : laboratory Cs standard,

		Information on TA(k) - UTC(k)	
Laboratory (k)	Equipment in atomic standards	Interval of validity (in MJD at 0hUTC)	TA(k) - UTC(k) in s
OMH	1 Ind. Cs		
ONBA	2 Ind. Cs		
ONRJ	5 Ind. Cs		
OP	5 Ind. Cs 1 Lab. Cs 1 H-Maser	year 1994	TA(F)-UTC(OP) is published in Bulletin H by LPTF (13)
ORB	3 Ind. Cs 1 H-Maser		
PTB	4 Lab. Cs 7 Ind. Cs 3 H-Masers	49352-49534 49534-49717	28.000 363 400 29.000 363 400
RC	5 H-Masers	year 1994	TA(RC)-UTC(RC) is sent to the BIPM
ROA	7 Ind. Cs		
SCL	2 Ind. Cs		
SNT	3 Ind. Cs		

TA(k), SOURCE OF UTC(k) AND RECEPTION OF TIME SIGNALS (CONT.)

H-Maser : Hydrogen Maser, * means 'yes')

	Information on time links					
Source of UTC(k) (1)	GPS recept.	Iono. meas. syst.	GLONASS recept.	LORAN-C recept.	Television link with	Two-way satellite time transfer
1 Cs	*					
2 Cs					IGMA other labs in Argentina	
5 Cs	*				other labs in Brasil	
1 Cs + microstepper	*	*		*	17 labs in France	
3 Cs	*					
1 Lab. Cs (14)	*	*		*	TP and other labs	*
3 H-Masers				*		
all the Cs	*			*	NMC	
1 Cs + microstepper	*			*		
1 Cs	*			*	other labs in Sweden	

TABLE 4. LABORATORIES CONTRIBUTING TO TAI IN 1994 : EQUIPMENT, INDEPENDENT LOCAL TIME SCALE

(Ind. Cs : industrial Cs Standard, Lab. Cs : laboratory Cs standard,

		Information on TA(k) - UTC(k)	
Laboratory (k)	Equipment in atomic standards	Interval of validity (in MJD at 0hUTC)	TA(k) - UTC(k) in s
SO	1 Lab. Cs 2 Ind. Cs 3 H-Masers	year 1994	TA(SO)-UTC(SO) is published in SO Atomic Time Bulletins
SU	2 Lab. Cs 10 H-Masers	49352-49534 49534-49717	25.172 750 000 26.172 750 000
TL	5 Ind. Cs		
TP	4 Ind. Cs		
TUG	4 Ind. Cs		
UME (16)	2 Ind. Cs		
USNO	73 Ind. Cs 12 H-Masers 2 Prototypes Mercury Ion Freq. Std.	year 1994	A.1(MEAN)-UTC(USNO,MC) is sent to the BIPM (17)
VSL	4 Ind. Cs		

TA(K), SOURCE OF UTC(K) AND RECEPTION OF TIME SIGNALS (CONT.)

H-Maser : Hydrogen Maser, * means 'yes')

	Information on time links					
Source of UTC(k) (1)	GPS recept.	Iono. meas. syst.	GLONASS recept.	LORAN-C recept.	Television link with	Two-way satellite time transfer
1 Cs + microstepper	*			*	other labs in China	
6 H-Masers (15)	*		*	*		
1 cs + microstepper	*	*				in an experi- mental stage
1 Cs + output frequency steering	*			*		
1 Cs	*			*	BEV	*
1 Cs	*					
UTC(USNO,MC) is an H-Maser + Freq. synthe- sizer steered to UTC(USNO) (17)	* (18)	*	*	* (18)	*	*
1 Cs + microstepper	*			*	18 Labs in Netherlands	*

NOTES

(1) When several clocks are indicated as source of UTC(k), laboratory k computes a software clock, steered to UTC. Often a physical realization of UTC(k) is obtained using a Cs clock and a microphase stepper.

(2) Some of the standards are located as follows (at the end of 1994) :

* Australian Telecommunications Commission (ATC, Melbourne) 7 Cs
* National Measurements Laboratory, (NML, Sydney) 3 Cs, 2 H-Masers
* Orroral Observatory (ORR, Belconnen) 5 Cs.

Australian laboratories are intercompared by GPS and by the TV method.

(3) From 1st January 1994, UTC(AUS) has been the output of a steered HP5071 caesium beam frequency standard.

(4) The standards are located as follows (at the end of 1994) :

* Office Fédéral de Métrologie (OFM, Bern) 8 Cs
* Observatoire de Neuchâtel (ON, Neuchâtel) 3 Cs
* Direction Générale des PTT (PTT, Bern) 3 Cs.

They are intercompared by LORAN-C (OFM-ON) and the TV method (OFM-PTT) and linked to the foreign laboratories through OFM.

(5) Glówny Urzad Miar, (Central Office of Measures), Warszawa, Polska. Formerly PKNM.

(6) The implementation of an algorithm for computation of TA(IEN) is under test. Values of [TA(IEN) - UTC(IEN)] are not yet reported to the BIPM.

(7) The standards are located as follows :

* Shaanxi Astronomical Observatory (CSAO, Lintong)
* Shanghai Astronomical Observatory (SO, Shanghai)
* Wuhan Time Observatory
* Beijing Institute of Radio Metrology and Measurement.

The link [UTC(JATC) - UTC(CSAO)] is obtained by direct connection.

(8) Reception of GPS and GLONASS signals on a common custom-built receiver allowing observation of the difference between GPS time and GLONASS time.

(9) A new primary frequency standard, NIST-7, using optical pumping has been developed at the NIST. Results have been regularly reported to the BIPM since August 1994.

(10) The independent local time scale AT1 appears in the BIPM publications as TA(NISA).

(11) A dual-frequency P-Code GPS receiver is under test at the NPL.

(12) In 1994, UTC(NRC) was derived from NRC Cs VI C.

NOTES (CONT.)

(13) TA(F) is the French atomic time scale computed by the LPTF with data from 21 industrial caesium clocks located as follows (at the end of 1994) :

* Centre Electronique de l'Armement (CELAR, Rennes)	2 Cs
* Centre National d'Etudes Spatiales (CNES, Toulouse)	2 Cs
* Centre National d'Etudes des Télécommunications (CNET, Bagneux)	2 Cs
* Observatoire de la Côte d'Azur (OCA, Grasse)	1 Cs
* Electronique Serge Dassault (ESD, Trappes)	1 Cs
* Hewlett-Packard (HP, Orsay)	3 Cs
* Observatoire de Paris : Laboratoire Primaire du Temps et des Fréquences (LPTF)	5 Cs
* Observatoire de Besançon (OB, Besançon)	2 Cs
* Laboratoire de Physique et de Métrologie des Oscillateurs (LPMO, Besançon)	1 Cs
* Ecole Nationale Supérieure de Mécanique et des Microtechniques (ENSMM, Besançon)	1 Cs
* Société d'Etudes, Recherches et Constructions Electroniques (SERCEL, Carquefou)	1 Cs.

Links by GPS : OP-OB, OP-SERCEL, OP-OCA, OP-CNES, OP-CELAR, OP-HP.
Cable links : OB-LPMO, OB-ENSMM.
Other national links by the TV method.

(14) Two laboratory Cs, PTB CS1 and PTB CS2, are operated continuously as clocks. TA(PTB) and UTC(PTB) were derived directly from PTB CS2 in 1994. The accuracy of PTB CS3 and PTB CS4 is being evaluated.

(15) UTC(SU) is a free running time scale obtained as the simple average of a selected number of H-masers.

(16) Ulusai Metroloji Enstitüsü, Marmara Research Centre, National Metrology Institute, Gebze-Kocaeli, Turkey.

(17) The time scale A.1 (MEAN), designated as TA(USNO) in the BIPM publications, and UTC(USNO) are computed by the USNO. They rely on a number of Cs clocks and H-masers. A.1 (MEAN) is a free atomic time scale while UTC(USNO) is closely steered on UTC.

(18) Daily time differences of [UTC(USNO,MC) - transmitting station] are published weekly (Series 4 of USNO) for the LORAN-C chains and the GPS satellite system. This data is also available via the Automated Data Service (ADS) of USNO.

TABLE 5. DIFFERENCES BETWEEN THE NORMALIZED FREQUENCIES OF EAL AND TAI, UNTIL JANUARY 1995

(File available via INTERNET under the name EALTAI94.AR)

Date	MJD	f(EAL) - f(TAI) in 10^{-13}
until 1977 Jan 1	until 43144	0
1977 Jan 1 - 1977 Apr 26	43144 - 43259	10,0
1977 Apr 26 - 1977 Jun 25	43259 - 43319	9,8
1977 Jun 25 - 1977 Aug 24	43319 - 43379	9,6
1977 Aug 24 - 1977 Oct 23	43379 - 43439	9,4
1977 Oct 23 - 1978 Oct 28	43439 - 43809	9,2
1978 Oct 28 - 1979 Jun 25	43809 - 44049	9,0
1979 Jun 25 - 1979 Aug 24	44049 - 44109	8,8
1979 Aug 24 - 1979 Oct 23	44109 - 44169	8,6
1979 Oct 23 - 1982 Apr 30	44169 - 45089	8,4
1982 Apr 30 - 1982 Jun 29	45089 - 45149	8,2
1982 Jun 29 - 1982 Aug 28	45149 - 45209	8,0
1982 Aug 28 - 1984 Feb 29	45209 - 45759	7,8
1984 Feb 29 - 1987 Apr 24	45759 - 46909	8,0
1987 Apr 24 - 1987 Dec 30	46909 - 47159	8,0125
1987 Dec 30 - 1989 Jun 22	47159 - 47699	8,0
1989 Jun 22 - 1989 Dec 29	47699 - 47889	7,95
1989 Dec 29 - 1990 Feb 27	47889 - 47949	7,90
1990 Feb 27 - 1990 Apr 28	47949 - 48009	7,85
1990 Apr 28 - 1990 Jun 27	48009 - 48069	7,80
1990 Jun 27 - 1990 Aug 26	48069 - 48129	7,75
1990 Aug 26 - 1991 Feb 22	48129 - 48309	7,70
1991 Feb 22 - 1991 Apr 23	48309 - 48369	7,625
1991 Apr 23 - 1991 Aug 31	48369 - 48499	7,55
1991 Aug 31 - 1991 Oct 30	48499 - 48559	7,50
1991 Oct 30 - 1992 Apr 27	48559 - 48739	7,45
1992 Apr 27 - 1992 Jun 26	48739 - 48799	7,40
1992 Jun 26 - 1993 Apr 22	48799 - 49099	7,35
1993 Apr 22 -	49099	7,40

As the time scales UTC and TAI differ by an integral number of seconds (see Tables 1 and 2), UTC is necessarily subjected to the same intentional frequency adjustment as TAI.

TABLE 6. MEASUREMENTS OF TAI FREQUENCY

(File available via INTERNET under the name FTAI94.AR)

The following table gives the differences of frequency measured during the period 1990-1994 between TAI and the laboratory caesium standards CRL Cs1, LPTF JPO, NIST-7, NRC CsV, NRC CsVI A and C, PTB CS1 and PTB CS2. Previous calibrations are available in the successive annual reports of the BIPM Time Section volumes 1 to 6.

The frequencies of all of these primary frequency standards are corrected for the gravitational shift (of about 1 part in 10^{-13} for an altitude of 1000 m), but only the frequencies of Cs1 from the CRL, JPO from the LPTF and NIST-7 from the NIST are corrected for the black body radiation shift (of about 2 parts in 10^{-14} for a temperature of 40 °C). This introduces some inconsistency in the published data, a problem which should be solved during the next CCDS meeting of 1996.

The characteristics of the calibrations of the TAI frequency provided by the different primary standards are as follows:

Standard	Unc. (1 σ)	Operation	Comparison with	Transfer to TAI
CRL Cs1	1.1×10^{-13}	discontinuous	UTC(CRL)	60 d
LPTF JPO	1.1×10^{-13}	discontinuous	UTC(OP)	10 d
NIST NIST-7	1×10^{-14}	discontinuous	H maser No 201	10 d
NRC CsV	$\simeq1\times10^{-13}$	continuous	TAI	60 d
NRC CsVI A	$\simeq1\times10^{-13}$	continuous	TAI	60 d
NRC CsVI C	$\simeq1\times10^{-13}$	continuous	TAI	60 d
PTB CS1	3×10^{-14}	continuous	TAI	60 d
PTB CS2	1.5×10^{-14}	continuous	TAI	60 d

		f(TAI) - f(Standard) in 10^{-13}		
Interval MJD	Central date	CRL Cs1	LPTF JPO	NIST NIST-7
47949-48009	1990 Apr 5	0.19		
48499-48559	1991 Sep 27	-0.13		
48949-49009	1992 Dec 23	0.26		
49119-49129	1993 May 17		-1.16	
49509-49519	1994 Jun 11			0.15
49589-49599	1994 Aug 30			0.20
49599-49609	1994 Sep 9			0.03
49629-49639	1994 Oct 9			-0.06

TABLE 6. (CONT.)

f(TAI) - f(Standard) in 10^{-13}

Interval MJD	Central date	NRC CsV	NRC CsVIA	NRC CsVIC	PTB CS1	PTB CS2
47889-47949	1990 Jan 28	-2.84	-1.01	0.16	-0.08	-0.35
47949-48009	1990 Mar 29	0.59	-0.45	0.37	-0.08	-0.36
48009-48069	1990 May 28	1.82	0.15	-9.89	0.02	-0.27
48069-48129	1990 Jul 27	0.20	-0.25	-2.01	0.08	-0.13
48129-48189	1990 Sep 25	-1.04	0.00	-0.32	-0.01	-0.49
48189-48249	1990 Nov 24	-0.05	0.79	-0.61	-0.19	-0.10
48249-48309	1991 Jan 23	0.67	-1.38	-1.17	-0.20	-0.39
48309-48369	1991 Mar 24	1.07	2.01	-1.70	-0.22	-0.53
48369-48429	1991 May 23	0.79	2.52	-0.51	-0.08	-0.17
48429-48499	1991 Jul 27	0.23	1.22	-0.21	-0.01	-0.27
48499-48559	1991 Sep 30	-0.35	0.74	-0.49	-0.07	-0.36
48559-48619	1991 Nov 29	-1.06	1.25	0.06	-0.03	-0.17
48619-48679	1992 Jan 28	-0.95	1.56	-0.04	0.20	-0.04
48679-48739	1992 Mar 28	-1.33	2.03	0.00	0.09	-0.09
48739-48799	1992 May 27	-1.22	2.22	0.60	0.03	-0.26
48799-48859	1992 Jul 26	-0.76	2.06	1.46	0.15	-0.24
48859-48919	1992 Sep 24	0.55	1.45	2.02	0.09	-0.17
48919-48979	1992 Nov 23	-	-	2.03	-0.10	-0.01
48979-49039	1993 Jan 22	-	-	1.90	-0.04	0.03
49039-49099	1993 Mar 23	-	-	1.18	-0.12	0.11
49099-49159	1993 May 22	-	-	1.31	0.08	-0.07
49159-49229	1993 Jul 26	-	-	0.90	0.03	-0.04
49229-49289	1993 Sep 29	-	-	0.94	-0.07	-0.12
49289-49349	1993 Nov 28	-	-	1.26	0.23	-0.06
49349-49409	1994 Jan 27	-	-	1.02	0.10	0.03
49409-49469	1994 Mar 28	-	-	1.16	0.02	0.04
49469-49529	1994 May 27	-	-	1.14	0.04	-0.12
49529-49589	1994 Jul 26	-	-	1.08	-0.05	-0.16
49589-49649	1994 Sep 24	-	-	1.08	0.06	-0.07
49649-49709	1994 Nov 23	-	-	1.04	0.10	-0.02

Table 7. Mean duration of the TAI scale interval in SI second on the rotating geoid

(File available via INTERNET under the name SITAI94.AR)

The estimate of the mean duration of the TAI scale interval in SI second on the rotating geoid is computed by the BIPM according to the method described in ' Azoubib J., Granveaud M., Guinot B., Metrologia 13, 1977, pp. 87-93 ', from the calibrations of Table 6 provided by PTB CS1 and PTB CS2 (data not corrected for the black body radiation shift).
In the table below, the uncertainty is conservatively estimated to 2×10^{-14}.

For the months	Mean duration	Uncertainty
1990 Jan - Feb	$1 + 2.9\times10^{-14}$	2.0×10^{-14}
1990 Mar - Apr	+ 2.8	2.0
1990 May - Jun	+ 1.9	2.0
1990 Jul - Aug	+ 1.1	2.0
1990 Sep - Oct	+ 3.3	2.0
1990 Nov - Dec	+ 1.2	2.0
1991 Jan - Feb	$1 + 3.2\times10^{-14}$	2.0×10^{-14}
1991 Mar - Apr	+ 3.7	2.0
1991 May - Jun	+ 1.8	2.0
1991 Jul - Aug	+ 2.2	2.0
1991 Sep - Oct	+ 2.5	2.0
1991 Nov - Dec	+ 1.0	2.0
1992 Jan - Feb	$1 + 0.3\times10^{-14}$	2.0×10^{-14}
1992 Mar - Apr	+ 0.8	2.0
1992 May - Jun	+ 1.6	2.0
1992 Jul - Aug	+ 1.4	2.0
1992 Sep - Oct	+ 0.9	2.0
1992 Nov - Dec	+ 0.1	2.0
1993 Jan - Feb	$1 - 0.4\times10^{-14}$	2.0×10^{-14}
1993 Mar - Apr	- 0.7	2.0
1993 May - Jun	+ 0.1	2.0
1993 Jul - Aug	+ 0.2	2.0
1993 Sep - Oct	+ 0.6	2.0
1993 Nov - Dec	+ 0.1	2.0
1994 Jan - Feb	$1 - 0.3\times10^{-14}$	2.0×10^{-14}
1994 Mar - Apr	- 0.2	2.0
1994 May - Jun	+ 0.6	2.0
1994 Jul - Aug	+ 1.0	2.0
1994 Sep - Oct	+ 0.5	2.0
1994 Nov - Dec	+ 0.2	2.0

TABLE 8 - INDEPENDENT LOCAL ATOMIC TIME SCALES

(File available via Internet under the name TAI94.AR)

The following table gives the values of [TAI - TA(k)], where TA(k) denotes the independent atomic time scale established by laboratory k. The values are given within ± 1 ns for the most accurate time links.
Corresponding stability graphs are shown on the following pages when data is available for the years 1993 and 1994.

Unit is one microsecond.

Date 1994 0h UTC	MJD	TAI - TA(k) APL	AUS	CH	CRL	CSAO
Jan 7	49359	2.608	-49.563	-76.304	33.296	15.888
Jan 17	49369	2.684	-49.791	-76.244	33.719	15.726
Jan 27	49379	2.769	-50.011	-76.126	34.125	15.663
Feb 6	49389	2.826	-50.122	-75.988	34.545	15.554
Feb 16	49399	2.833	-50.272	-75.836	34.960	15.418
Feb 26	49409	2.816	-50.442	-75.685	35.384	15.288
Mar 8	49419	2.798	-50.563	-75.531	35.812	15.207
Mar 18	49429	2.756	-50.675	-75.384	36.231	15.095
Mar 28	49439	2.712	-50.849	-75.231	36.656	14.992
Apr 7	49449	2.644	-51.020	-75.059	37.065	14.887
Apr 17	49459	2.589	-51.106	-74.894	37.496	14.803
Apr 27	49469	2.524	-51.273	-74.767	37.948	14.678
May 7	49479	2.517	-51.526	-74.597	38.361	14.509
May 17	49489	2.578	-51.715	-74.433	38.794	14.381
May 27	49499	2.666	-51.835	-74.299	39.208	14.322
Jun 6	49509	2.778	-51.975	-74.123	39.640	14.386
Jun 16	49519	2.790	-52.187	-74.009	40.063	14.254
Jun 26	49529	2.729	-52.391	-73.890	40.483	14.122
Jul 6	49539	2.665	-52.555	-73.777	40.902	13.920
Jul 16	49549	2.615	-52.719	-73.638	41.321	13.749
Jul 26	49559	2.628	-53.000	-73.522	41.750	13.579
Aug 5	49569	2.626	-53.196	-73.376	42.182	13.437
Aug 15	49579	2.613	-53.288	-73.228	42.622	13.250
Aug 25	49589	2.519	-53.532	-73.088	43.058	13.059
Sep 4	49599	2.384	-53.905	-72.989	43.495	12.821
Sep 14	49609	2.243	-54.131	-72.880	43.935	12.693
Sep 24	49619	2.249	-54.344	-72.743	44.361	12.500
Oct 4	49629	2.239	-54.597	-72.597	44.797	12.228
Oct 14	49639	2.220	-54.861	-72.446	45.238	12.143
Oct 24	49649	2.222	-55.222	-72.293	45.668	12.027
Nov 3	49659	2.222	-55.433	-72.136	46.090	11.895
Nov 13	49669	2.225	-55.740	-71.993	46.513	11.785
Nov 23	49679	2.215	-55.973	-71.845	46.938	11.633
Dec 3	49689	2.248	-56.309	-71.707	47.358	11.491
Dec 13	49699	2.260	-56.533	-71.552	47.768	11.410
Dec 23	49709	2.267	-56.786	-71.396	48.181	11.366

TABLE 8. (CONT.)

Unit is one microsecond

Date 1994 0h UTC	MJD	TAI - TA(k) F	INPL	JATC	KRIS	NIM
Jan 7	49359	124.793	-179.176	8.763	-4.870	-8.50
Jan 17	49369	125.178	-181.043	8.530	-4.721	-9.04
Jan 27	49379	125.575	-182.905	8.514	-4.551	-9.26
Feb 6	49389	125.964	-184.803	8.749	-4.402	-9.23
Feb 16	49399	126.348	-186.706	8.098	-4.238	-9.22
Feb 26	49409	126.720	-188.603	8.129	-4.093	-9.32
Mar 8	49419	127.093	-190.497	8.103	-3.907	-9.01
Mar 18	49429	127.473	-192.449	8.586	-3.721	-8.81
Mar 28	49439	127.851	-	9.415	-3.486	-8.73
Apr 7	49449	128.227	-196.410	10.044	-3.279	-8.68
Apr 17	49459	128.604	-198.459	10.708	-3.054	-8.70
Apr 27	49469	128.987	-200.492	11.488	-2.811	-8.66
May 7	49479	129.366	-202.523	11.271	-2.574	-8.59
May 17	49489	129.738	-204.582	12.068	-2.352	-8.50
May 27	49499	130.111	-206.632	12.324	-2.142	-8.44
Jun 6	49509	130.495	-208.663	12.665	-1.931	-8.26
Jun 16	49519	130.874	-210.650	12.857	-1.779	-8.17
Jun 26	49529	131.242	-212.601	12.995	-1.592	-8.00
Jul 6	49539	131.626	-214.563	13.136	-1.441	-7.94
Jul 16	49549	131.998	-216.549	13.321	-1.320	-7.85
Jul 26	49559	132.349	-218.512	13.506	-1.167	-7.58
Aug 5	49569	132.688	-220.587	13.327	-1.001	-7.84
Aug 15	49579	133.027	-222.690	13.510	-0.797	-8.03
Aug 25	49589	133.371	-224.692	13.618	-0.589	-8.04
Sep 4	49599	133.721	-226.702	13.471	-0.408	-7.95
Sep 14	49609	134.069	-228.642	13.481	-0.250	-7.91
Sep 24	49619	134.425	-230.588	13.559	-0.088	-7.92
Oct 4	49629	134.786	-232.551	13.542	0.065	-
Oct 14	49639	135.155	-234.517	13.695	0.143	-
Oct 24	49649	135.523	-236.553	13.786	0.229	-
Nov 3	49659	135.869	-238.686	13.826	0.241	-8.80
Nov 13	49669	136.225	-240.849	13.915	0.396	-8.78
Nov 23	49679	136.583	-243.010	13.969	0.566	-8.73
Dec 3	49689	136.933	-245.183	13.989	0.620	-8.69
Dec 13	49699	137.292	-247.431	13.966	0.700	-8.67
Dec 23	49709	137.647	-249.634	13.979	0.788	-8.60

TABLE 8. (CONT.)

Unit is one microsecond

Date 1994 0h UTC	MJD	TAI - TA(k) NISA *	NRC	PTB	RC
Jan 7	49359	-45108.163	20.564	-360.665	17999673.53
Jan 17	49369	-45108.538	20.614	-360.668	17999673.34
Jan 27	49379	-45108.920	20.699	-360.658	17999673.68
Feb 6	49389	-45109.297	20.805	-360.661	17999673.60
Feb 16	49399	-45109.681	20.914	-360.658	17999673.54
Feb 26	49409	-45110.064	21.025	-360.651	17999673.52
Mar 8	49419	-45110.453	21.144	-360.655	17999673.82
Mar 18	49429	-45110.846	21.238	-360.654	17999674.01
Mar 28	49439	-45111.238	21.334	-360.652	17999674.15
Apr 7	49449	-45111.631	21.436	-360.647	17999673.47
Apr 17	49459	-45112.029	21.537	-360.646	17999673.34
Apr 27	49469	-45112.417	21.636	-360.628	17999673.58
May 7	49479	-45112.818	21.731	-360.643	-
May 17	49489	-45113.216	21.838	-360.661	-
May 27	49499	-45113.624	21.942	-360.665	-
Jun 6	49509	-45114.029	22.035	-360.678	-
Jun 16	49519	-45114.446	22.131	-360.686	-
Jun 26	49529	-45114.844	22.222	-360.692	-
Jul 6	49539	-45115.241	22.298	-360.703	-
Jul 16	49549	-45115.642	22.392	-360.714	-
Jul 26	49559	-45116.041	22.495	-360.729	-
Aug 5	49569	-45116.449	22.586	-360.748	-
Aug 15	49579	-45116.864	22.687	-360.761	-
Aug 25	49589	-45117.287	22.772	-360.773	-
Sep 4	49599	-45117.710	22.887	-360.784	-
Sep 14	49609	-45118.140	22.984	-360.797	-
Sep 24	49619	-45118.565	23.082	-360.800	-
Oct 4	49629	-45118.992	23.171	-360.803	17999675.05
Oct 14	49639	-45119.422	23.248	-360.806	17999675.28
Oct 24	49649	-45119.847	23.340	-360.812	17999675.42
Nov 3	49659	-45120.277	23.416	-360.823	17999675.34
Nov 13	49669	-45120.703	23.501	-360.828	17999675.24
Nov 23	49679	-45121.131	23.607	-360.834	17999675.45
Dec 3	49689	-45121.562	23.701	-360.835	-
Dec 13	49699	-45121.999	23.795	-360.827	-
Dec 23	49709	-45122.440	23.865	-360.826	-

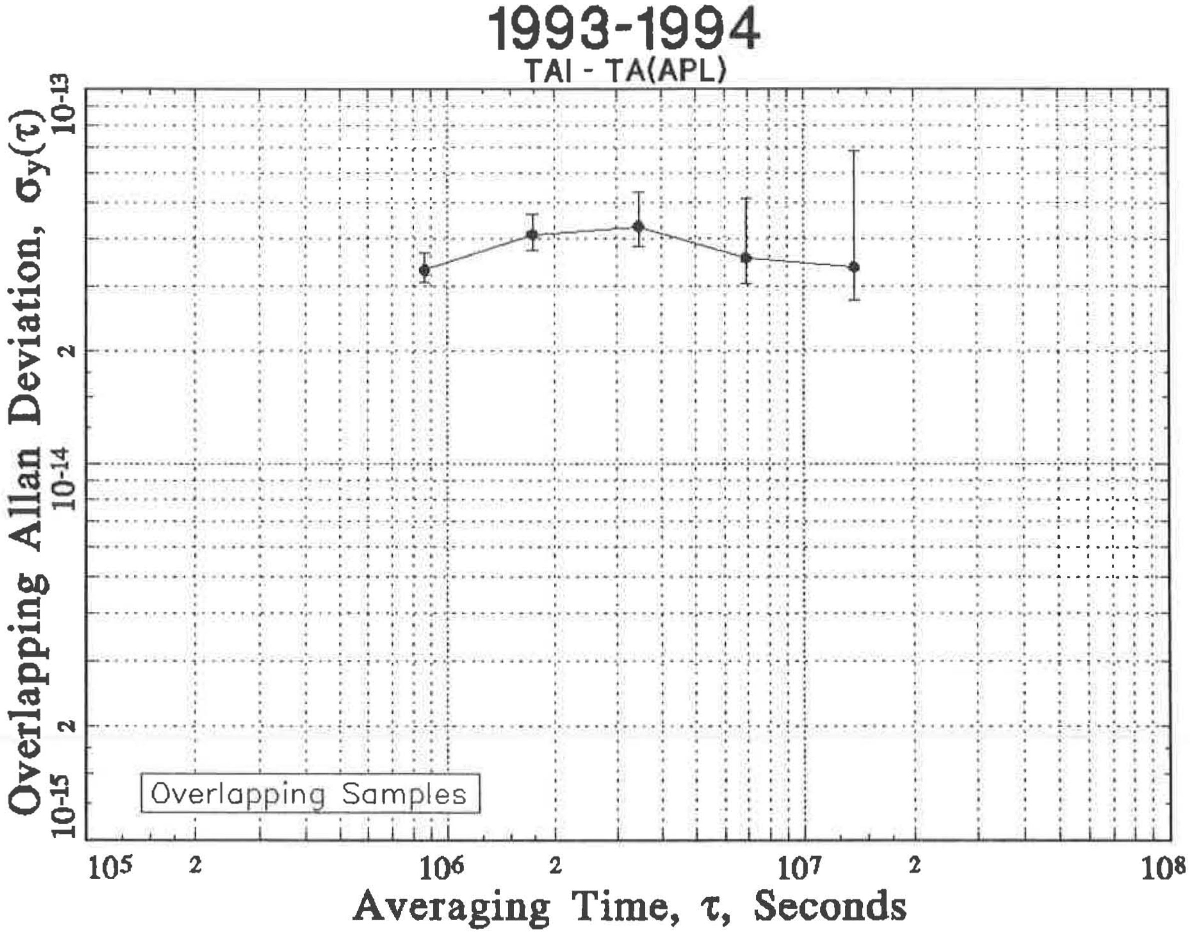
* TA(NISA) designates the scale AT1 of NIST.

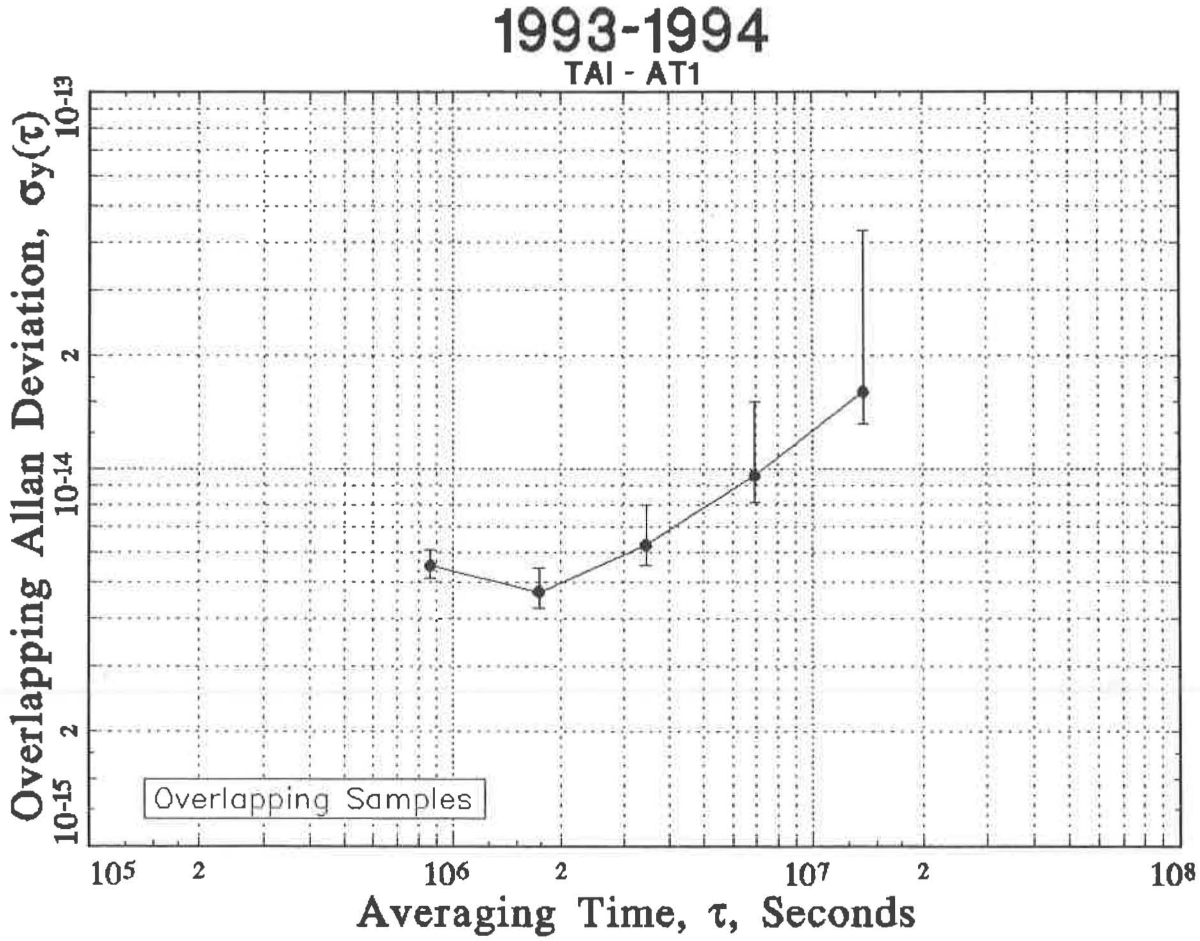
TABLE 8. (CONT.)

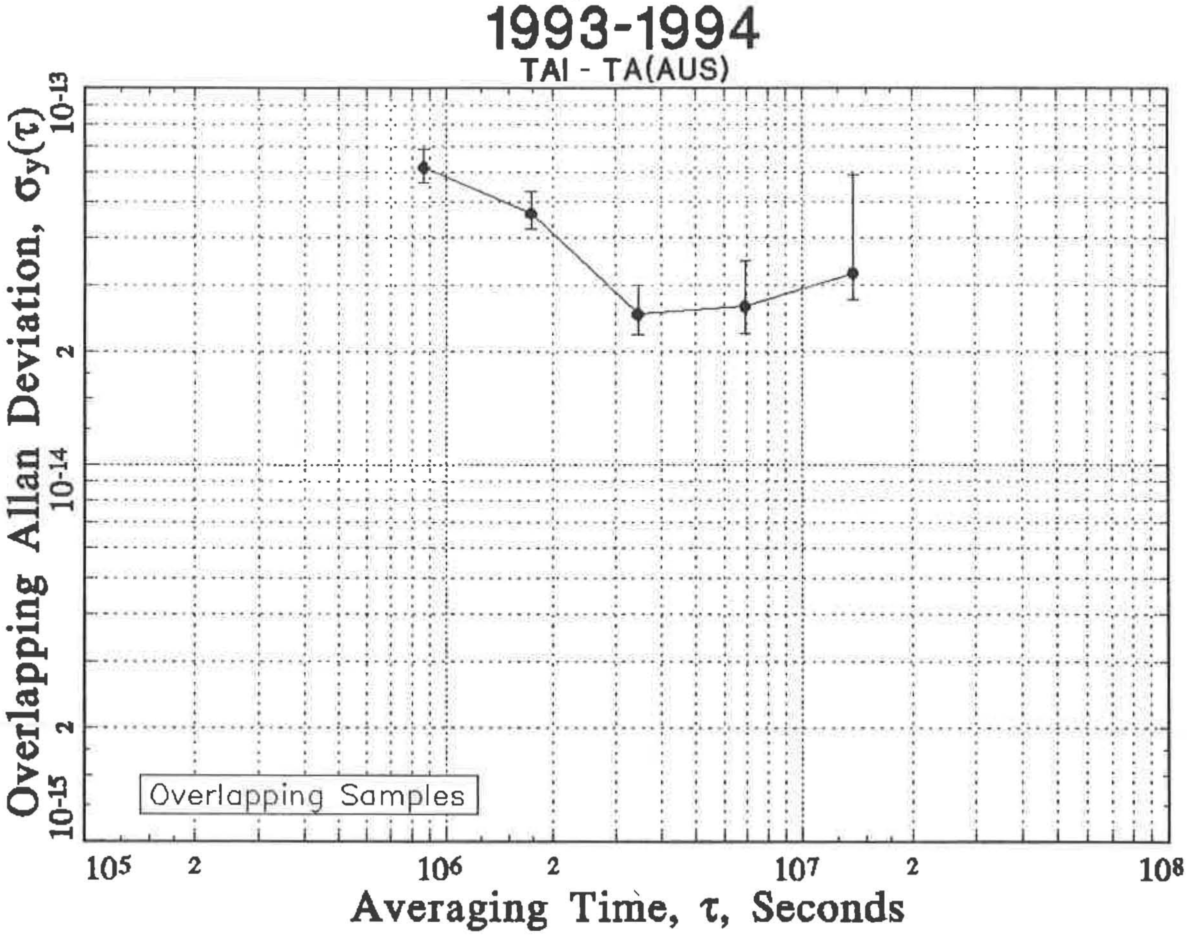
Unit is one microsecond

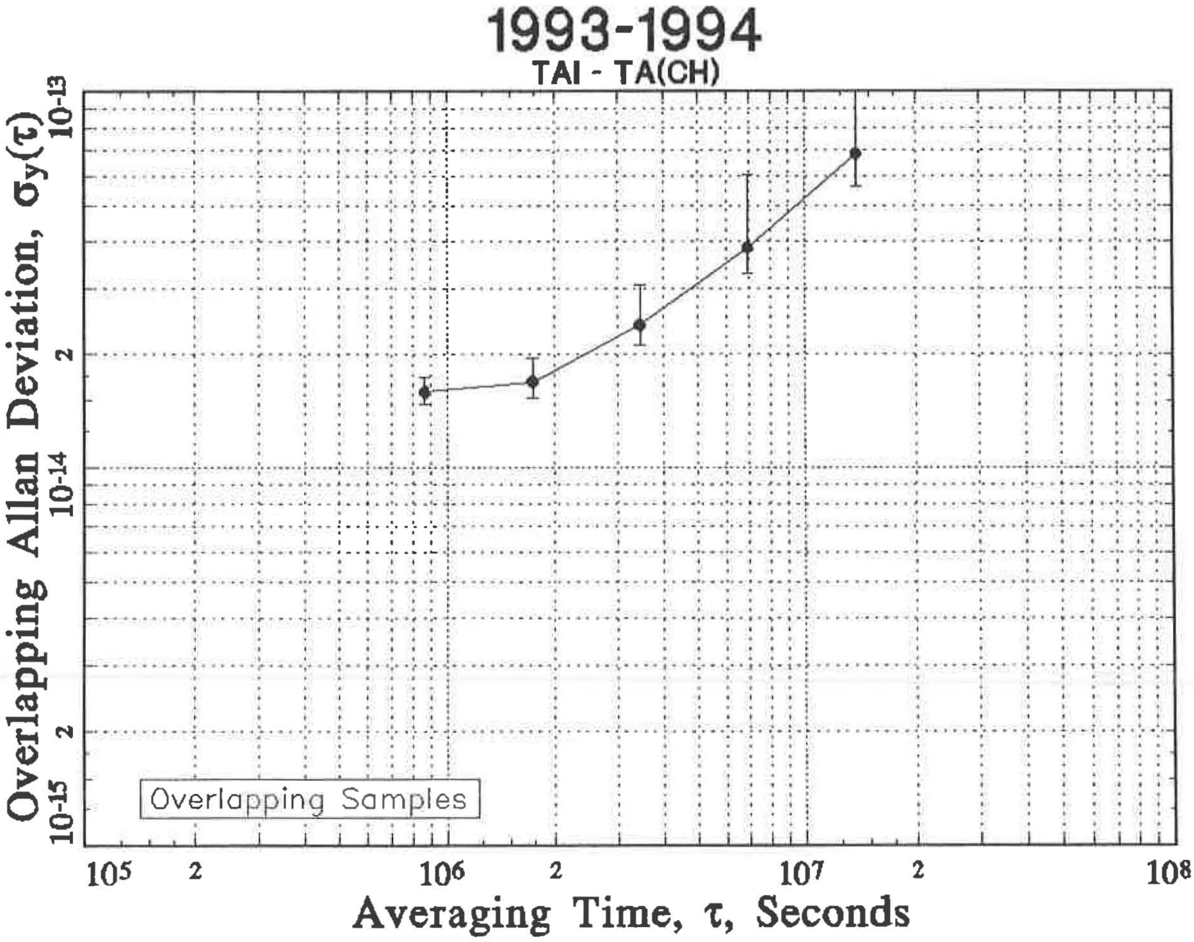
Date 1994 0h UTC	MJD	TAI - TA(k) SO	SU	USNO *
Jan 7	49359	-45.46	2827247.330	-34690.429
Jan 17	49369	-45.43	2827247.239	-34691.099
Jan 27	49379	-45.45	2827247.150	-34691.785
Feb 6	49389	-45.43	2827247.058	-34692.464
Feb 16	49399	-45.48	2827246.968	-34693.146
Feb 26	49409	-45.48	2827246.884	-34693.826
Mar 8	49419	-45.42	2827246.794	-34694.505
Mar 18	49429	-45.44	2827246.713	-34695.183
Mar 28	49439	-45.43	2827246.625	-34695.858
Apr 7	49449	-	2827246.539	-34696.529
Apr 17	49459	-45.40	2827246.452	-34697.211
Apr 27	49469	-45.45	2827246.376	-34697.880
May 7	49479	-45.49	2827246.288	-34698.552
May 17	49489	-45.47	2827246.200	-34699.223
May 27	49499	-45.46	2827246.116	-34699.894
Jun 6	49509	-45.47	2827246.029	-34700.567
Jun 16	49519	-45.46	2827245.942	-34701.245
Jun 26	49529	-45.49	2827245.859	-34701.914
Jul 6	49539	-45.52	2827245.772	-34702.587
Jul 16	49549	-45.56	2827245.681	-34703.262
Jul 26	49559	-45.53	2827245.590	-34703.934
Aug 5	49569	-45.54	2827245.499	-34704.612
Aug 15	49579	-45.58	2827245.407	-34705.287
Aug 25	49589	-45.55	2827245.315	-34705.961
Sep 4	49599	-45.54	2827245.222	-34706.629
Sep 14	49609	-45.58	2827245.133	-34707.303
Sep 24	49619	-45.57	2827245.042	-34707.974
Oct 4	49629	-45.58	2827244.946	-34708.643
Oct 14	49639	-45.58	2827244.861	-34709.317
Oct 24	49649	-45.63	2827244.770	-34709.987
Nov 3	49659	-45.59	2827244.672	-34710.660
Nov 13	49669	-45.59	2827244.579	-34711.328
Nov 23	49679	-45.58	2827244.484	-34711.999
Dec 3	49689	-45.54	2827244.387	-34712.666
Dec 13	49699	-45.51	2827244.295	-34713.337
Dec 23	49709	-45.51	2827244.201	-34714.007

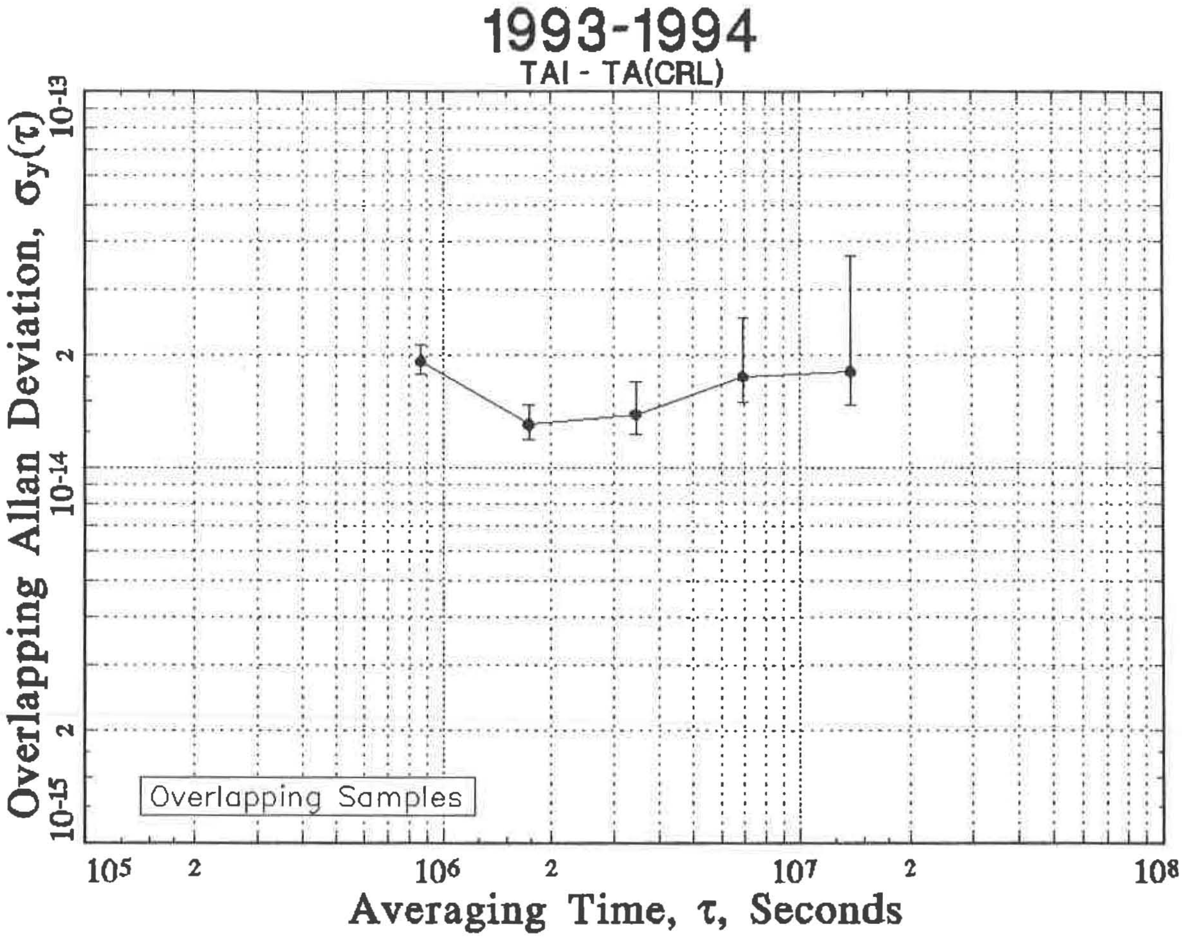
* TA(USNO) designates the scale A1(MEAN) of USNO.

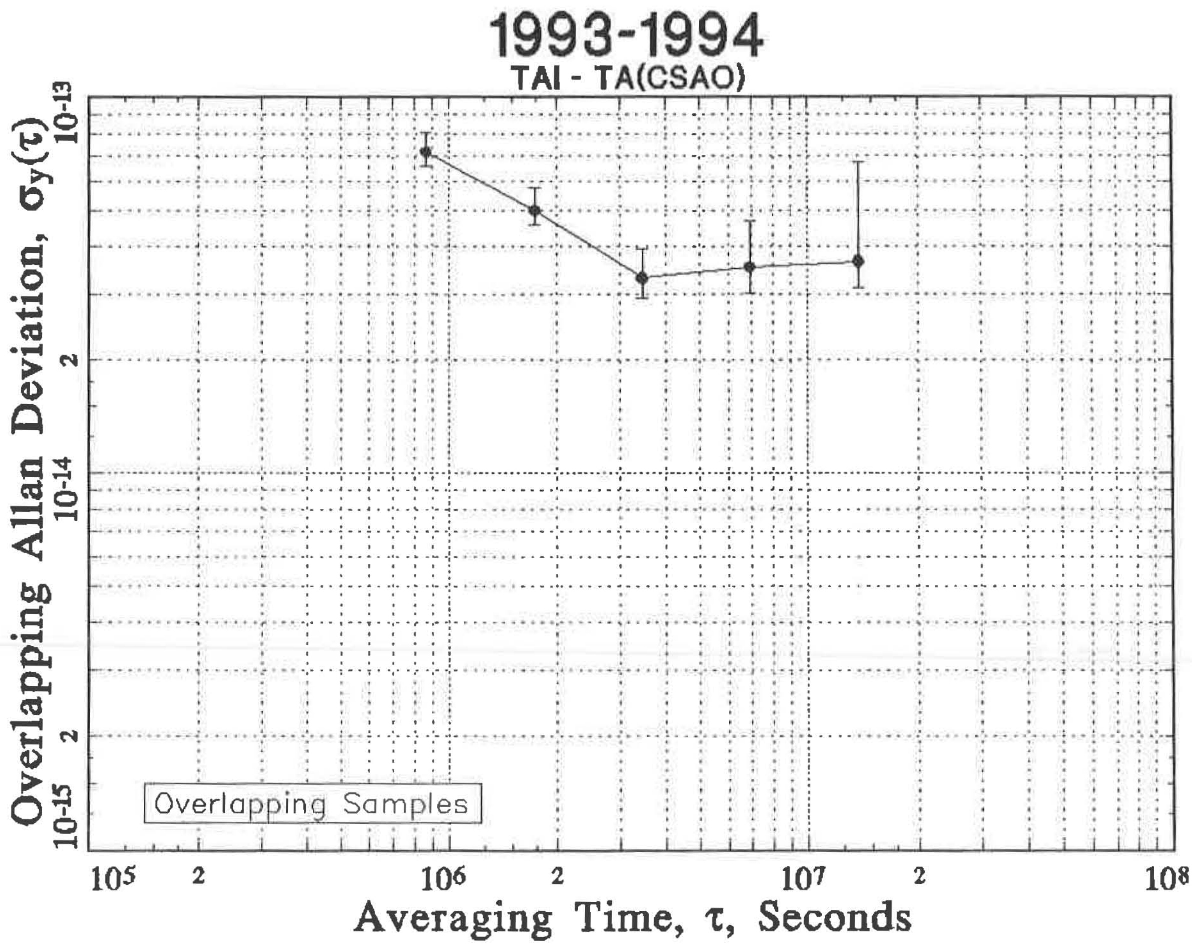

1993-1994
TAI - TA(APL)
Overlapping Allan Deviation, $\sigma_y(\tau)$
10^{-13}
2
10^{-14}
2
10^{-15}
Overlapping Samples
10^5
2
10^6
2
10^7
2
10^8
Averaging Time, τ, Seconds

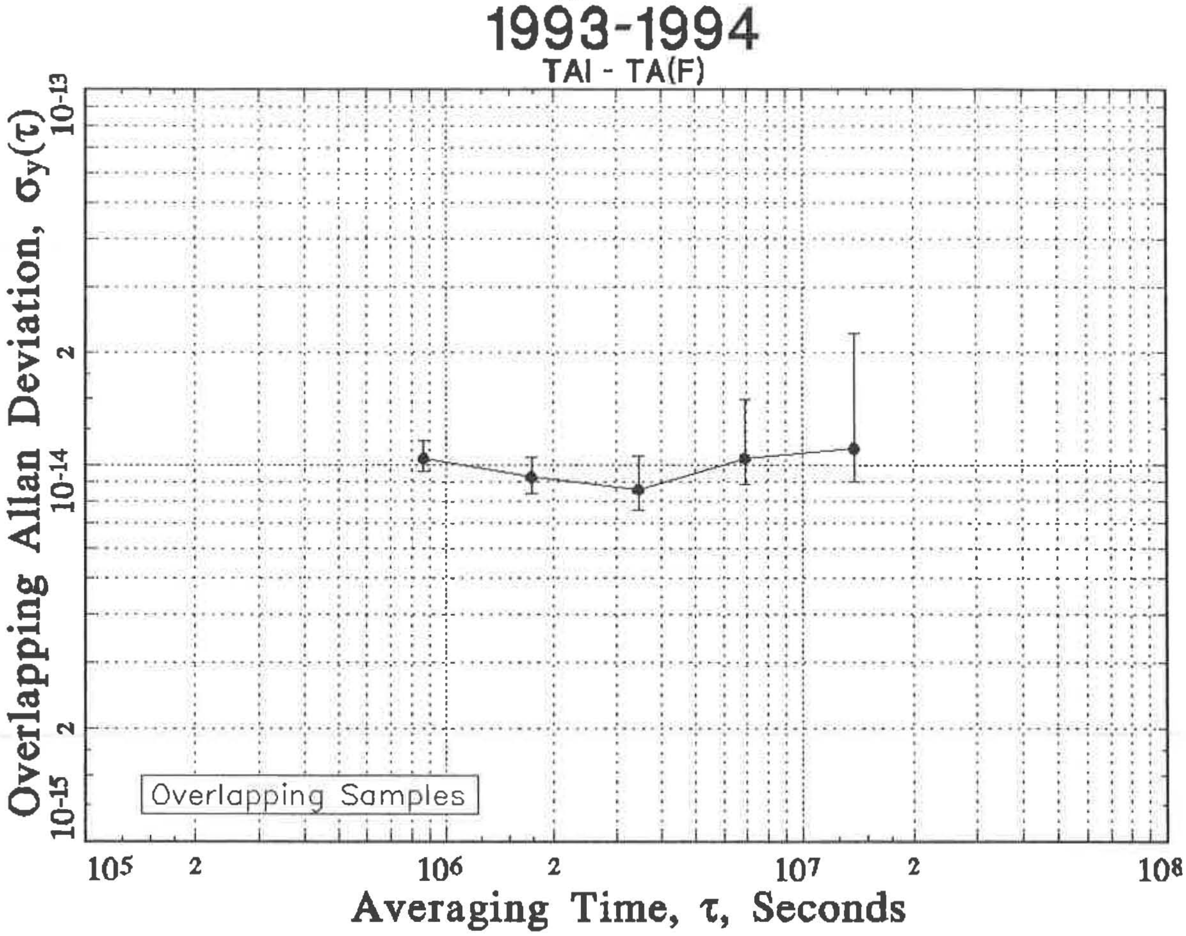

1993-1994
TAI - AT1
Overlapping Allan Deviation, $\sigma_y(\tau)$
10^{-13}
2
10^{-14}
2
10^{-15}
Overlapping Samples
10^5
2
10^6
2
10^7
2
10^8
Averaging Time, τ, Seconds

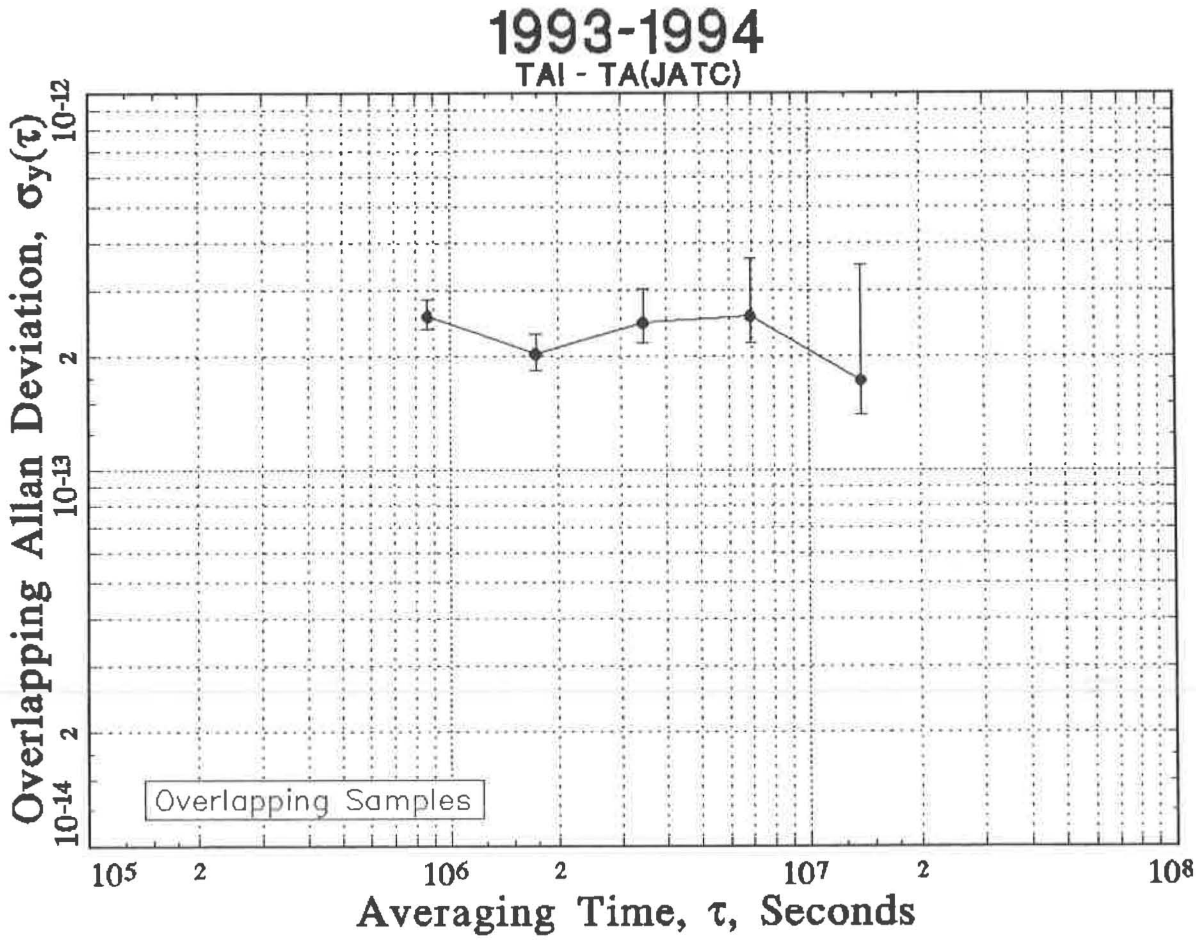

1993-1994
TAI - TA(AUS)
Overlapping Allan Deviation, $\sigma_y(\tau)$
10^{-13}
2
10^{-14}
2
10^{-15}
Overlapping Samples
10^5
2
10^6
2
10^7
2
10^8
Averaging Time, τ, Seconds

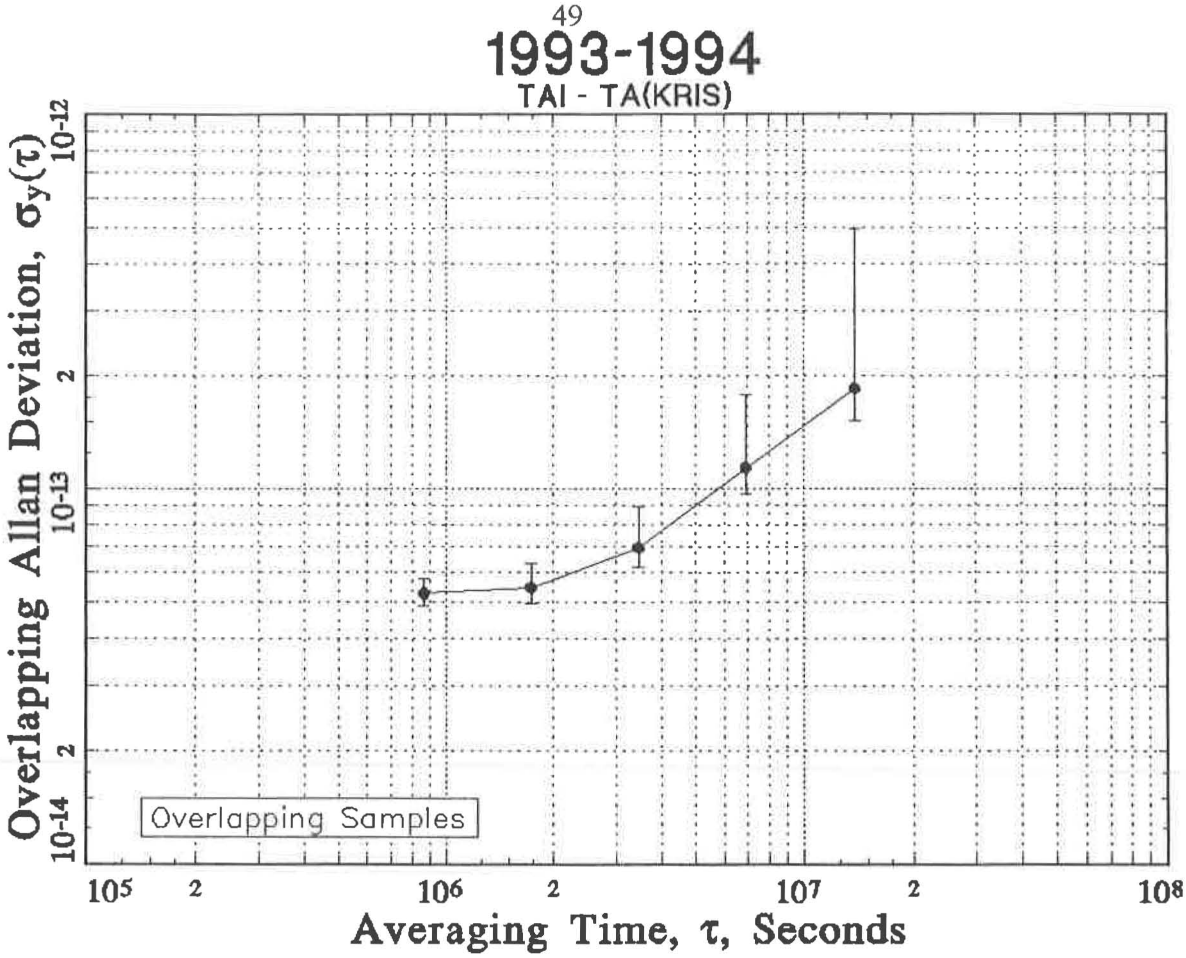

1993-1994
TAI - TA(CH)
Overlapping Allan Deviation, $\sigma_y(\tau)$
10^{-13}
2
10^{-14}
2
10^{-15}
Overlapping Samples
10^5
2
10^6
2
10^7
2
10^8
Averaging Time, τ, Seconds

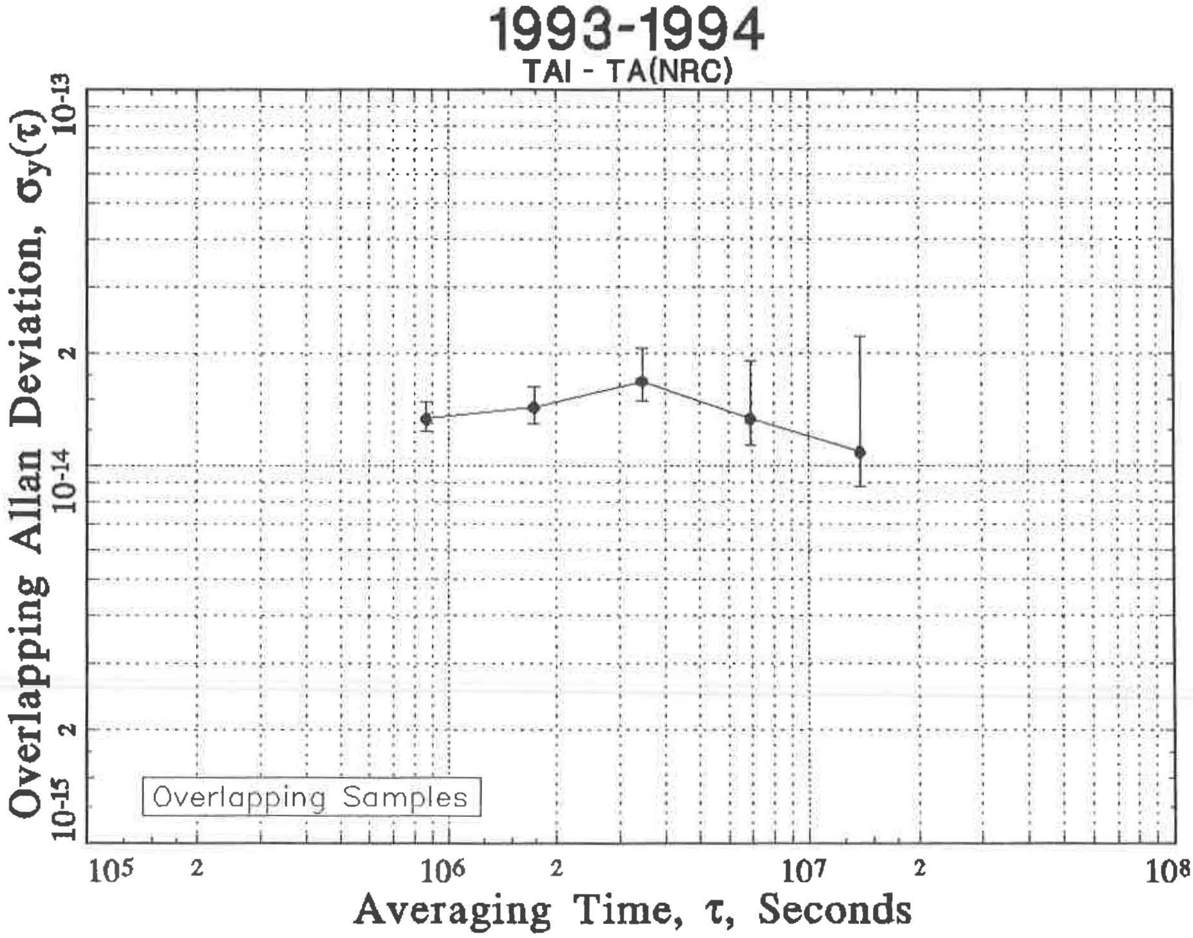

1993-1994
TAI - TA(CRL)
Overlapping Allan Deviation, σy(τ)
10-13
2
10-14
2
10-15
Overlapping Samples
105
2
106
2
107
2
108
Averaging Time, τ, Seconds

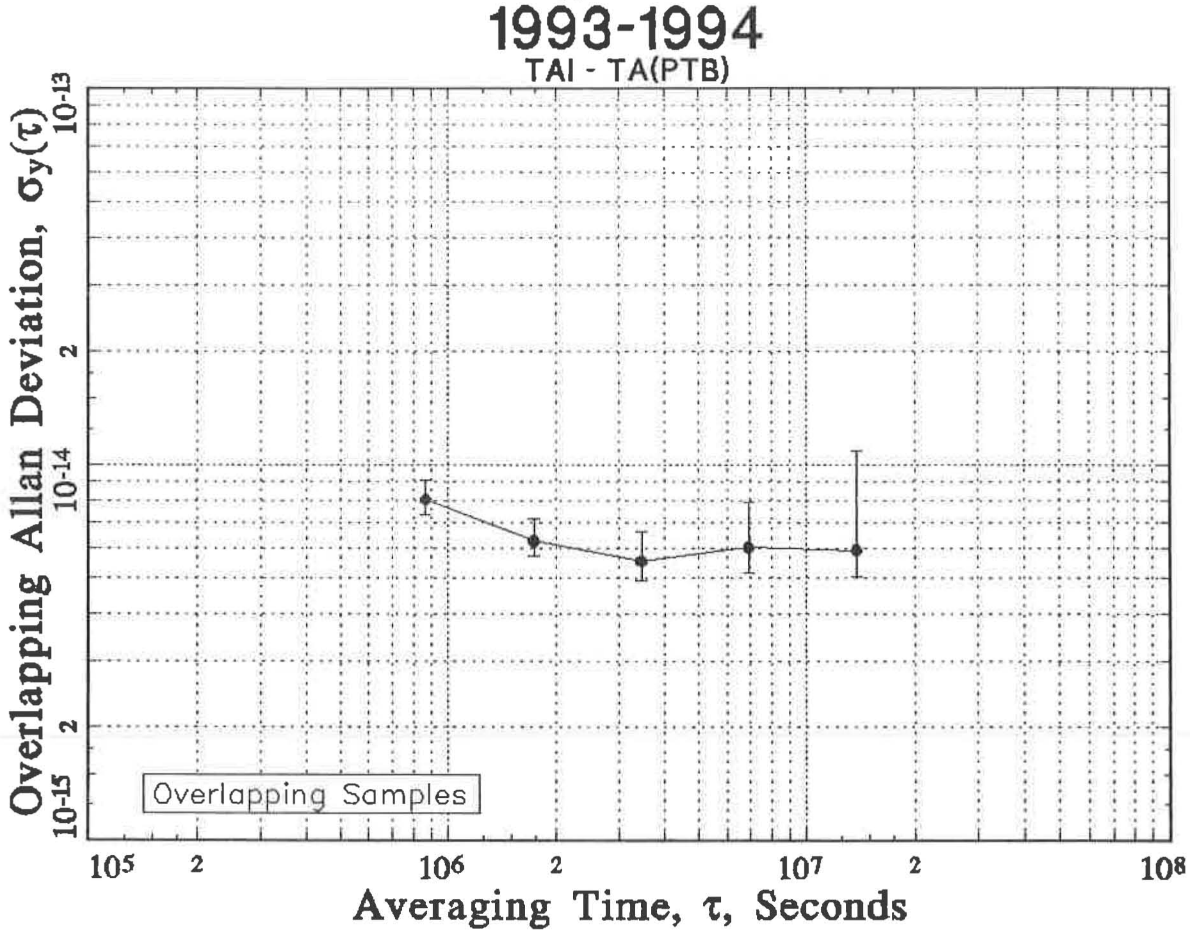

1993-1994
TAI - TA(CSAO)
Overlapping Allan Deviation, σy(τ)
10-13
2
10-14
2
10-15
Overlapping Samples
105
2
106
2
107
2
108
Averaging Time, τ, Seconds

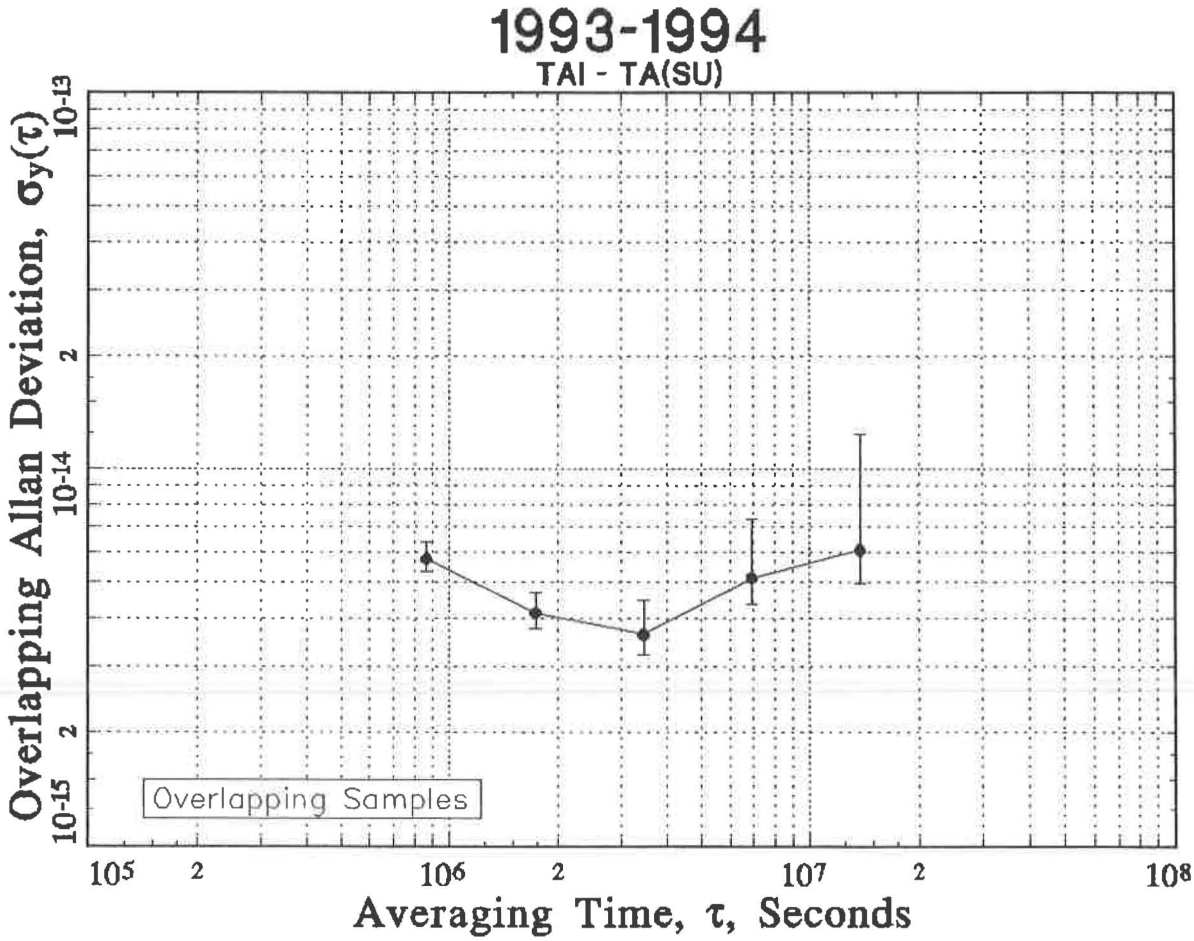

1993-1994
TAI - TA(F)
Overlapping Allan Deviation, σy(τ)
10-13
2
10-14
2
10-15
Overlapping Samples
105
2
106
2
107
2
108
Averaging Time, τ, Seconds

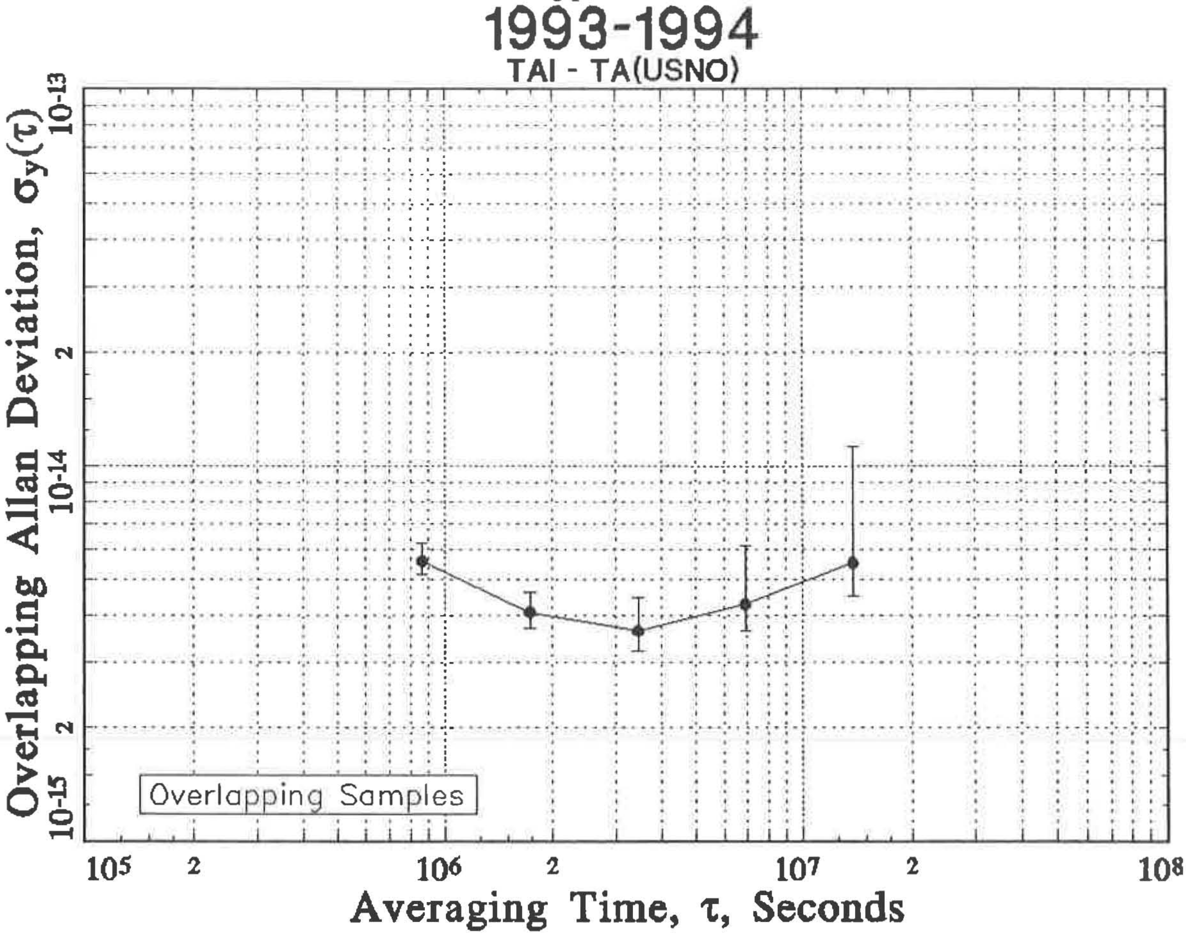

1993-1994
TAI - TA(JATC)
Overlapping Allan Deviation, σy(τ)
10-12
2
10-13
2
10-14
Overlapping Samples
105
2
106
2
107
2
108
Averaging Time, τ, Seconds


1993-1994
TAI - TA(KRIS)
Overlapping Allan Deviation, $\sigma_y(\tau)$
10-12
2
10-13
2
10-14
Overlapping Samples
105
2
106
2
107
2
108
Averaging Time, τ, Seconds


1993-1994
TAI - TA(NRC)
Overlapping Allan Deviation, $\sigma_y(\tau)$
10-13
2
10-14
2
10-15
Overlapping Samples
105
2
106
2
107
2
108
Averaging Time, τ, Seconds


1993-1994
TAI - TA(PTB)
Overlapping Allan Deviation, σy(τ)
10-13
2
10-14
2
10-15
Overlapping Samples
105
2
106
2
107
2
108
Averaging Time, τ, Seconds


1993-1994
TAI - TA(SU)
Overlapping Allan Deviation, σy(τ)
10-13
2
10-14
2
10-15
Overlapping Samples
105
2
106
2
107
2
108
Averaging Time, τ, Seconds



1993-1994
TAI - TA(USNO)
Overlapping Allan Deviation, σy(τ)
10-13
2
10-14
2
10-15
Overlapping Samples
105
2
106
2
107
2
108
Averaging Time, τ, Seconds

TABLE 9. LOCAL REPRESENTATIONS OF UTC : VALUES OF [UTC - UTC(K)]

(File available via Internet under the name UTC94.AR)

The following table gives the values of [UTC - UTC(k)], where UTC(k) denotes the approximation to UTC kept by laboratory k. The values are given within ± 1 ns for the most accurate time links.

Unit is one microsecond.

Date 1994 0h UTC	MJD	UTC - UTC(k) AOS	APL	AUS (1)	BEV	CAO (2)	CH (3)
Jan 7	49359	-1.393	1.145	0.517	9.52	-5.013	1.096
Jan 17	49369	-1.402	1.221	0.499	9.56	-5.213	1.196
Jan 27	49379	-1.582	1.306	0.529	9.37	-5.451	1.354
Feb 6	49389	-1.642	1.363	0.594	9.17	-5.655	1.472
Feb 16	49399	-1.252	1.370	0.634	9.29	-5.843	1.564
Feb 26	49409	-0.772	1.353	0.627	-	-6.090	1.655
Mar 8	49419	-0.841	1.335	0.604	-	-6.361	1.749
Mar 18	49429	-1.022	1.293	0.561	-	-6.592	1.836
Mar 28	49439	-1.153	1.249	0.498	-	-6.872	1.929
Apr 7	49449	-1.377	1.181	0.476	-	-7.066	1.921
Apr 17	49459	-1.520	1.126	0.447	-	-7.233	1.826
Apr 27	49469	-1.701	1.061	0.408	-	-7.483	1.693
May 7	49479	-1.591	1.054	0.357	-	-7.706	1.603
May 17	49489	-1.184	1.115	0.336	-	-7.992	1.507
May 27	49499	-1.095	1.203	0.296	-	-0.289	1.381
Jun 6	49509	-0.810	1.315	0.305	-	-0.501	1.297
Jun 16	49519	-0.703	1.327	0.245	-	-0.733	1.151
Jun 26	49529	-0.892	1.266	0.246	-	-0.950	1.010
Jul 6	49539	-1.484	1.202	0.222	-	-1.217	0.863
Jul 16	49549	-1.619	1.152	0.231	-	-1.044	0.742
Jul 26	49559	-1.490	1.165	0.198	-	-1.379	0.598
Aug 5	49569	-1.108	1.163	0.205	-	-1.648	0.484
Aug 15	49579	-1.155	1.150	0.165	-	-1.885	0.372
Aug 25	49589	-1.492	1.056	0.116	-	-2.106	0.252
Sep 4	49599	-1.515	0.921	0.086	-	-2.276	0.091
Sep 14	49609	-1.444	0.780	0.018	-	-2.513	-0.060
Sep 24	49619	-1.245	0.786	-0.037	-16.48	-2.753	-0.117
Oct 4	49629	-1.159	0.776	-0.080	-16.85	-3.046	-0.121
Oct 14	49639	-1.347	0.757	-0.158	-17.13	-3.274	-0.120
Oct 24	49649	-1.470	0.759	-0.226	-17.34	-3.515	-0.117
Nov 3	49659	-1.443	0.759	-0.287	-17.63	-3.773	-0.110
Nov 13	49669	-1.343	0.762	-0.374	-18.03	-4.046	-0.117
Nov 23	49679	-1.175	0.752	-0.428	-18.41	-4.313	-0.095
Dec 3	49689	-1.086	0.785	-0.496	-	-4.486	-0.067
Dec 13	49699	-1.013	0.797	-0.485	-	-4.751	-0.022
Dec 23	49709	-1.067	0.804	-0.469	-	-4.987	0.024

TABLE 9. (CONT.)

Unit is one microsecond.

Date 1994 0h UTC	MJD	UTC - UTC(k) CRL	CSAO	CSIR (4)	FTZ (5)	GUM (6)	IEN (7)
Jan 7	49359	2.274	-0.847	-3.429	-0.020	0.155	-0.065
Jan 17	49369	2.250	-0.837	-3.464	-0.032	0.021	-0.056
Jan 27	49379	2.210	-0.727	-3.418	-0.019	0.025	-0.054
Feb 6	49389	2.179	-0.663	-3.103	-0.050	0.028	-0.032
Feb 16	49399	2.143	-0.626	-3.109	-0.058	0.190	-0.036
Feb 26	49409	2.114	-0.583	-3.271	-0.061	0.374	0.015
Mar 8	49419	2.095	-0.521	-3.450	-0.037	0.581	0.042
Mar 18	49429	2.072	-0.504	-3.174	0.000	0.502	0.049
Mar 28	49439	2.053	-0.477	-3.061	0.040	0.454	0.065
Apr 7	49449	2.024	-0.452	-2.924	0.092	0.373	0.103
Apr 17	49459	2.010	-0.407	-2.865	0.161	0.241	0.131
Apr 27	49469	2.025	-0.402	-2.826	0.228	0.212	0.177
May 7	49479	1.983	-0.441	-2.856	0.306	0.301	0.254
May 17	49489	1.960	-0.440	-2.852	0.281	0.185	0.297
May 27	49499	1.926	-0.369	-2.926	0.295	0.085	0.335
Jun 6	49509	1.894	-0.175	-2.958	0.298	-0.032	0.361
Jun 16	49519	1.860	-0.178	-2.903	0.306	-0.072	0.434
Jun 26	49529	1.832	-0.180	-2.862	0.299	-0.095	0.501
Jul 6	49539	1.788	-0.252	-3.701	0.277	0.426	0.562
Jul 16	49549	1.770	-0.294	-3.969	0.241	0.941	0.664
Jul 26	49559	1.746	-0.334	-4.235	0.220	0.956	0.732
Aug 5	49569	1.720	-0.329	-4.249	0.194	1.033	0.827
Aug 15	49579	1.699	-0.343	-4.110	0.191	1.056	0.846
Aug 25	49589	1.672	-0.361	-3.585	0.157	0.517	0.763
Sep 4	49599	1.649	-0.426	-3.124	0.161	-0.150	0.612
Sep 14	49609	1.629	-0.381	-2.747	0.136	-0.539	0.598
Sep 24	49619	1.601	-0.402	-2.455	0.113	-0.324	0.594
Oct 4	49629	1.576	-0.514	-2.279	0.102	0.249	0.575
Oct 14	49639	1.564	-0.470	-2.813	0.099	0.757	0.578
Oct 24	49649	1.539	-0.456	-2.816	0.105	1.002	0.587
Nov 3	49659	1.513	-0.458	-2.781	0.072	1.321	0.594
Nov 13	49669	1.486	-0.438	-2.703	0.092	1.576	0.599
Nov 23	49679	1.467	-0.461	-2.658	0.090	1.294	0.596
Dec 3	49689	1.443	-0.473	-2.528	0.075	0.812	0.592
Dec 13	49699	1.410	-0.424	-2.433	0.057	0.207	0.586
Dec 23	49709	1.381	-0.339	-2.246	0.058	-0.402	0.579

Table 9. (Cont.)

Unit is one microsecond.

Date 1994 0h UTC	MJD	UTC - UTC(k) IFAG (8)	IGMA (9)	INPL	JATC	KRIS	LDS
Jan 7	49359	0.749	-2.32	-0.586	-2.943	-0.270	-0.042
Jan 17	49369	0.480	-2.37	-0.668	-3.156	-0.321	-0.065
Jan 27	49379	0.212	-2.52	-0.722	-3.065	-0.361	-0.089
Feb 6	49389	-0.083	-2.61	-0.799	-2.912	-0.402	-0.146
Feb 16	49399	-0.380	-2.72	-0.873	-3.330	-0.378	-0.160
Feb 26	49409	-0.623	-2.88	-0.940	-3.222	-0.353	-0.181
Mar 8	49419	-0.639	-3.02	-1.006	-3.122	-0.337	-0.193
Mar 18	49429	-0.629	-3.11	-1.104	-2.541	-0.311	-0.229
Mar 28	49439	-0.598	-3.14	-1.135	-1.891	-0.276	-0.282
Apr 7	49449	-0.575	-3.14	-1.280	-1.283	-0.289	-0.281
Apr 17	49459	-0.569	-3.13	-1.398	-0.397	-0.264	-0.323
Apr 27	49469	-0.522	-3.15	-1.474	0.365	-0.251	-0.356
May 7	49479	-0.392	-3.11	-1.521	0.783	-0.244	-0.353
May 17	49489	-0.261	-3.06	-1.571	0.826	-0.202	-0.385
May 27	49499	0.010	-3.02	-1.587	0.991	-0.192	-0.403
Jun 6	49509	0.248	-2.98	-1.560	1.163	-0.171	-0.410
Jun 16	49519	0.487	-2.96	-1.463	1.011	-0.179	-0.436
Jun 26	49529	0.825	-2.96	-1.305	0.879	-0.162	-0.450
Jul 6	49539	1.362	-3.01	-1.131	0.456	-0.171	-0.467
Jul 16	49549	1.869	-3.04	-0.955	0.023	-0.190	-0.460
Jul 26	49559	2.363	-3.08	-0.731	-0.228	-0.197	-0.495
Aug 5	49569	2.955	-3.10	-0.609	-0.535	-0.201	-0.484
Aug 15	49579	3.540	-3.15	-0.538	-0.147	-0.177	-0.499
Aug 25	49589	3.946	-3.17	-0.390	0.291	-0.189	-0.507
Sep 4	49599	0.321	-3.20	-0.262	0.587	-0.188	-0.530
Sep 14	49609	0.134	-3.22	-0.111	0.627	-0.210	-0.527
Sep 24	49619	-0.189	-3.19	0.022	0.364	-0.238	-0.526
Oct 4	49629	-0.436	-3.13	0.122	0.079	-0.205	-0.573
Oct 14	49639	-0.897	-2.92	0.232	0.038	-0.167	-0.591
Oct 24	49649	-1.383	-2.78	0.282	0.036	-0.151	-0.612
Nov 3	49659	-1.877	-2.63	0.230	0.043	-0.159	-0.633
Nov 13	49669	-2.365	-2.39	0.122	0.120	-0.144	-0.678
Nov 23	49679	-2.883	-2.30	-0.010	0.210	-0.104	-0.689
Dec 3	49689	-3.502	-2.46	-0.179	0.301	-0.090	-0.701
Dec 13	49699	-3.958	-2.66	-0.437	0.380	-0.070	-0.734
Dec 23	49709	-4.672	-2.67	-0.662	0.462	-0.052	-0.726

Table 9. (Cont.)

Unit is one microsecond.

Date 1994 0h UTC	MJD	UTC - UTC(k) MSL	NAOM	NAOT (10)	NIM (11)	NIST	NMC
Jan 7	49359	-0.972	-1.355	-1.411	8.15	0.039	-
Jan 17	49369	-0.875	-1.329	-0.613	7.60	0.044	-
Jan 27	49379	-0.801	-1.357	0.167	7.36	0.042	-
Feb 6	49389	-0.796	-1.371	0.119	7.37	0.040	-
Feb 16	49399	-0.581	-1.382	-0.046	7.37	0.026	-
Feb 26	49409	-0.561	-1.403	-0.148	7.25	0.013	-
Mar 8	49419	-0.481	-1.404	-0.290	7.54	-0.006	-
Mar 18	49429	-0.523	-1.427	-0.484	7.72	-0.029	-
Mar 28	49439	-0.434	-1.436	-0.661	7.78	-0.051	-
Apr 7	49449	-0.431	-1.477	-0.876	7.82	-0.068	-
Apr 17	49459	-0.388	-1.513	-1.035	7.78	-0.086	-
Apr 27	49469	-0.346	-1.539	-1.262	7.80	-0.094	-
May 7	49479	-0.395	-1.573	-1.486	7.84	-0.103	-
May 17	49489	-0.512	-1.588	-1.628	7.91	-0.101	-
May 27	49499	-0.501	-1.599	-1.827	7.96	-0.109	-
Jun 6	49509	-0.552	-1.613	-2.084	8.11	-0.109	-
Jun 16	49519	-0.701	-1.631	-2.371	8.18	-0.116	-
Jun 26	49529	-0.692	-1.642	-2.629	8.33	-0.104	-
Jul 6	49539	-0.793	-1.653	-2.869	8.37	-0.086	-
Jul 16	49549	-1.016	-1.667	-2.733	8.45	-0.067	-
Jul 26	49559	-1.099	-1.662	-2.547	8.69	-0.046	-
Aug 5	49569	-1.157	-1.650	-2.406	8.42	-0.030	-
Aug 15	49579	-1.292	-1.651	-2.276	8.21	-0.015	-
Aug 25	49589	-1.540	-1.633	-2.141	8.18	-0.008	-
Sep 4	49599	-1.616	-1.602	-2.183	8.25	-0.004	-
Sep 14	49609	-1.860	-1.600	-2.202	8.27	-0.014	-
Sep 24	49619	-1.968	-1.593	-2.175	8.25	-0.019	-
Oct 4	49629	-2.145	-1.638	-2.136	-	-0.026	-
Oct 14	49639	-2.367	-1.654	-2.070	-	-0.036	-
Oct 24	49649	-2.428	-1.678	-2.014	-	-0.041	-
Nov 3	49659	-2.457	-1.698	-1.928	7.27	-0.051	-
Nov 13	49669	-2.487	-1.701	-1.847	7.28	-0.057	-
Nov 23	49679	-2.592	-1.715	-1.775	7.30	-0.065	-
Dec 3	49689	-2.669	-1.748	-1.668	7.32	-0.074	-
Dec 13	49699	-2.762	-1.759	-1.570	7.32	-0.081	-
Dec 23	49709	-2.822	-1.791	-1.437	7.38	-0.092	-

Table 9. (Cont.)

Unit is one microsecond.

Date 1994 0h UTC	MJD	UTC - UTC(k) NPL (12)	NPLI	NRC (13)	NRLM (14)	OMH	ONBA (15)
Jan 7	49359	0.105	-3.796	4.495	-7.270	5.821	2.02
Jan 17	49369	0.113	-3.695	4.545	-7.542	5.974	2.49
Jan 27	49379	0.117	-3.652	4.630	-7.830	6.122	2.64
Feb 6	49389	0.126	-3.549	4.736	-8.130	6.184	3.35
Feb 16	49399	0.127	-3.430	4.845	-8.425	6.321	3.83
Feb 26	49409	0.135	-3.317	4.956	-8.736	6.530	4.24
Mar 8	49419	0.124	-3.29	5.075	-9.033	6.547	4.75
Mar 18	49429	0.124	-3.03	5.169	-9.338	6.487	5.35
Mar 28	49439	0.119	-3.12	5.265	-9.641	6.489	5.65
Apr 7	49449	0.116	-3.22	5.367	-9.937	6.510	5.57
Apr 17	49459	0.114	-	5.468	-10.233	6.502	5.70
Apr 27	49469	0.113	-3.182	5.567	-10.521	6.559	5.48
May 7	49479	0.100	-3.023	5.662	-10.836	6.562	5.55
May 17	49489	0.090	-2.991	5.769	-11.117	6.572	5.47
May 27	49499	0.086	-2.940	5.873	-11.410	6.585	5.50
Jun 6	49509	0.079	-2.817	5.966	-13.953	6.553	5.23
Jun 16	49519	0.069	-	6.062	-13.795	6.511	5.03
Jun 26	49529	0.063	-2.628	6.153	-13.628	6.513	4.59
Jul 6	49539	0.049	-	6.306	-13.464	6.576	3.85
Jul 16	49549	0.038	-	6.293	-13.307	6.615	3.16
Jul 26	49559	0.024	-	6.223	-13.135	6.603	2.67
Aug 5	49569	0.006	-	6.141	-12.979	6.588	1.95
Aug 15	49579	-0.009	-	6.070	-12.819	6.617	1.51
Aug 25	49589	-0.026	-	5.994	-12.666	6.616	1.03
Sep 4	49599	-0.036	-	5.923	-12.497	6.593	0.41
Sep 14	49609	-0.041	-	5.849	-12.322	6.543	0.13
Sep 24	49619	-0.048	-	5.773	-12.170	6.604	0.28
Oct 4	49629	-0.054	-	5.689	-11.993	6.637	0.32
Oct 14	49639	-0.043	-	5.593	-11.828	6.753	0.43
Oct 24	49649	-0.043	-	5.514	-11.666	6.891	0.53
Nov 3	49659	-0.037	-	5.417	-11.510	7.125	0.32
Nov 13	49669	-0.030	-	5.330	-11.349	7.339	0.70
Nov 23	49679	-0.027	-	5.263	-11.188	7.520	1.03
Dec 3	49689	-0.014	-	5.183	-11.033	7.587	1.35
Dec 13	49699	-0.009	-	5.102	-10.871	7.799	1.88
Dec 23	49709	-0.001	-	5.001	-10.717	8.010	2.37

Table 9. (Cont.)

Unit is one microsecond.

Date 1994 0h UTC	MJD	UTC - UTC(k) ONRJ	OP (16)	ORB (17)	PTB	RC	ROA
Jan 7	49359	-10.081	-0.160	-1.583	2.735	-3.35	2.576
Jan 17	49369	-10.488	-0.151	-1.580	2.732	-3.53	2.591
Jan 27	49379	-10.780	-0.133	-1.593	2.742	-3.19	2.605
Feb 6	49389	-11.462	-0.117	-1.573	2.739	-3.19	2.617
Feb 16	49399	-11.878	-0.102	-1.543	2.742	-3.18	2.628
Feb 26	49409	-12.437	-0.088	-1.509	2.749	-3.12	2.622
Mar 8	49419	-12.783	-0.080	-1.637	2.745	-2.78	2.607
Mar 18	49429	-13.343	-0.059	-1.686	2.746	-2.54	2.601
Mar 28	49439	-13.877	-0.047	-1.673	2.748	-2.36	2.615
Apr 7	49449	-	-0.029	-1.712	2.753	-3.00	2.610
Apr 17	49459	-	-0.010	-1.666	2.754	-3.08	2.632
Apr 27	49469	-	0.005	-1.755	2.772	-2.80	2.637
May 7	49479	-	0.002	-1.796	2.757	-	2.600
May 17	49489	-	0.000	-1.801	2.739	-	2.573
May 27	49499	-	0.007	-1.862	2.735	-	2.553
Jun 6	49509	-	0.012	-1.841	2.722	-	2.510
Jun 16	49519	-17.719	0.008	-1.857	2.714	-	2.496
Jun 26	49529	-18.158	0.004	-1.948	2.708	-	2.514
Jul 6	49539	-18.610	0.001	-0.205	2.697	-	2.482
Jul 16	49549	-18.965	-0.014	-0.177	2.686	-	2.410
Jul 26	49559	-19.401	-0.024	-0.204	2.671	-	2.339
Aug 5	49569	-19.744	-0.016	-0.187	2.652	-	2.249
Aug 15	49579	-20.111	-0.027	-0.206	2.639	-	2.164
Aug 25	49589	-20.418	-0.029	-0.184	2.627	-	2.114
Sep 4	49599	-20.663	-0.036	-0.176	2.616	-	2.054
Sep 14	49609	-20.957	-0.038	-0.205	2.603	-	1.960
Sep 24	49619	-21.143	-0.051	-0.189	2.600	-	1.948
Oct 4	49629	-21.425	-0.061	-0.226	2.597	-0.71	1.975
Oct 14	49639	-21.573	-0.072	-0.197	2.594	-0.46	2.012
Oct 24	49649	-21.409	-0.065	-0.219	2.588	-0.25	2.057
Nov 3	49659	-21.319	-0.083	-0.287	2.577	-0.36	2.101
Nov 13	49669	-21.050	-0.088	-0.308	2.572	-0.50	2.106
Nov 23	49679	-20.725	-0.090	-0.325	2.566	-0.33	2.123
Dec 3	49689	-20.368	-0.099	-0.283	2.565	-	2.187
Dec 13	49699	-19.943	-0.100	-0.262	2.573	-	2.218
Dec 23	49709	-19.437	-0.105	-0.232	2.574	-	2.210

Table 9. (Cont.)

Unit is one microsecond.

Date 1994 0h UTC	MJD	UTC - UTC(k) SCL (18)	SNT (19)	SO	SU	TL (20)	TP (21)
Jan 7	49359	-0.207	0.163	2.16	-2.670	-2.387	-1.262
Jan 17	49369	-0.256	0.206	2.19	-2.761	-2.399	-1.251
Jan 27	49379	-0.399	0.180	2.14	-2.850	-2.507	-1.237
Feb 6	49389	-0.412	0.155	2.18	-2.942	-2.719	-1.222
Feb 16	49399	-0.192	0.141	2.13	-3.032	-2.952	-1.217
Feb 26	49409	-0.070	0.103	2.11	-3.116	-3.184	-1.191
Mar 8	49419	-0.035	0.110	2.15	-3.206	-3.259	-1.179
Mar 18	49429	0.016	0.075	2.11	-3.287	-3.186	-1.158
Mar 28	49439	0.034	0.065	2.14	-3.375	-3.106	-1.147
Apr 7	49449	0.107	0.085	-	-3.461	-3.049	-1.135
Apr 17	49459	0.177	0.086	2.16	-3.548	-2.985	-1.098
Apr 27	49469	0.424	0.067	2.14	-3.624	-2.914	-1.069
May 7	49479	0.664	0.092	2.10	-3.712	-2.844	-1.073
May 17	49489	0.905	0.080	2.10	-3.800	-2.772	-1.079
May 27	49499	1.006	0.083	2.13	-3.884	-2.703	-1.069
Jun 6	49509	0.976	0.084	2.16	-3.971	-2.626	-1.053
Jun 16	49519	0.889	0.062	2.16	-4.058	-2.557	-1.047
Jun 26	49529	0.694	0.076	2.13	-4.141	-2.472	-1.023
Jul 6	49539	0.496	0.109	2.11	-4.228	-2.401	-0.997
Jul 16	49549	0.224	0.136	2.07	-4.319	-2.352	-0.993
Jul 26	49559	0.029	0.094	2.07	-4.410	-2.282	-0.987
Aug 5	49569	-0.047	0.099	2.07	-4.501	-2.211	-0.973
Aug 15	49579	-0.256	0.160	2.04	-4.593	-2.122	-0.972
Aug 25	49589	-0.267	0.179	2.04	-4.685	-2.068	-0.953
Sep 4	49599	-0.262	0.145	2.04	-4.778	-1.989	-0.935
Sep 14	49609	-0.255	0.142	2.04	-4.867	-1.915	-0.910
Sep 24	49619	-0.343	0.150	2.07	-4.958	-1.843	-0.895
Oct 4	49629	-0.480	0.159	2.07	-5.054	-1.772	-0.891
Oct 14	49639	-0.558	0.108	2.08	-5.139	-1.699	-0.875
Oct 24	49649	-0.671	0.084	2.06	-5.230	-1.624	-0.862
Nov 3	49659	-0.832	0.034	2.06	-5.328	-1.560	-0.857
Nov 13	49669	-0.864	-0.017	2.04	-5.421	-1.479	-0.827
Nov 23	49679	-0.582	-0.015	2.05	-5.516	-1.405	-0.824
Dec 3	49689	-0.295	-0.016	2.07	-5.613	-1.319	-0.808
Dec 13	49699	0.071	-0.042	2.08	-5.705	-1.251	-0.807
Dec 23	49709	0.125	-0.091	2.07	-5.799	-1.202	-0.781

Table 9. (Cont.)

Unit is one microsecond.

Date 1994 0h UTC		MJD	UTC - UTC(k) TUG (22)	UME (23)	USNO	VSL (24)
Jan	7	49359	3.925	-	0.061	-0.300
Jan	17	49369	3.986	-	0.071	-0.286
Jan	27	49379	4.052	-	0.071	-0.219
Feb	6	49389	4.110	-	0.067	-0.145
Feb	16	49399	4.179	-	0.061	-0.061
Feb	26	49409	4.247	-	0.056	-0.025
Mar	8	49419	4.321	-	0.048	0.031
Mar	18	49429	4.410	-	0.045	0.074
Mar	28	49439	4.481	-	0.045	0.094
Apr	7	49449	4.564	-	0.051	0.132
Apr	17	49459	4.643	-	0.051	0.166
Apr	27	49469	4.739	-	0.057	0.174
May	7	49479	4.834	-	0.061	0.217
May	17	49489	4.922	-	0.061	0.223
May	27	49499	-3.994	-	0.063	0.216
Jun	6	49509	-3.895	-	0.060	0.174
Jun	16	49519	-3.825	-	0.054	0.202
Jun	26	49529	-3.737	-	0.055	0.243
Jul	6	49539	-3.648	-	0.046	0.316
Jul	16	49549	-3.568	-	0.034	0.339
Jul	26	49559	-3.485	-	0.033	0.388
Aug	5	49569	-3.393	-	0.022	0.470
Aug	15	49579	-3.297	-	0.013	0.499
Aug	25	49589	-3.200	-	0.000	0.504
Sep	4	49599	-3.101	-	-0.006	0.485
Sep	14	49609	-3.013	-1.876	-0.015	0.504
Sep	24	49619	-2.911	-1.932	-0.019	0.528
Oct	4	49629	-2.801	-2.009	-0.014	0.567
Oct	14	49639	-2.698	-2.072	-0.012	0.662
Oct	24	49649	-2.595	-2.134	-0.005	0.685
Nov	3	49659	-2.480	-2.207	-0.002	0.692
Nov	13	49669	-2.364	-2.270	0.005	0.700
Nov	23	49679	-2.255	-2.338	0.008	0.727
Dec	3	49689	-2.141	-2.406	0.015	0.865
Dec	13	49699	-2.017	-2.470	0.018	0.901
Dec	23	49709	-1.918	-2.527	0.018	1.005

Table 9. (Cont.)

NOTES

(1) AUS . Introduction of a master clock on MJD = 49353.0 at Orroral Observatory, Belconnen, Australia, as source of UTC(AUS). Frequency steps of UTC(AUS) in ns/d :

MJD	Freq. step
49409	+7.08
49449	-1.64
49499	-2.16
49579	+2.68
49639	+1.12
49689	-7.08

(2) CAO . Time step of UTC(CAO) of - 8.00 microseconds on MJD = 49495.

(3) CH . Frequency step of UTC(CH) in ns/d :

MJD	Freq. step
49383	+10
49443	+20
49613	-11
49673	-4

(4) CSIR. Apparent time step of UTC-UTC(CSIR) of +0.250 microsecond on MJD = 49383 due to a simultaneous change of GPS time receiver and master clock.
Change of GPS time receiver on MJD = 49537.59
Change of master clock on MJD = 49636.0

(5) FTZ . Change of master clock on MJD = 49429.4
Frequency steps of UTC(FTZ) in ns/d :

MJD	Freq. step
49358.33	-11.7
49475.47	+4.4
49457.21	-1.6

(6) GUM . Glówny Urzad Miar, (Central Office of Measures), Warszawa, Polska. Formerly PKNM.

(7) IEN . Change of master clock on MJD = 49596.5

(8) IFAG. Time step of UTC(IFAG) of + 2 microseconds on MJD = 49355.6
Frequency step of UTC(IFAG) of - 27 ns/d on MJD = 49406.71
Time step of UTC(IFAG) of + 4 microseconds on MJD = 49597.48

(9) IGMA. Apparent time step of UTC-UTC(IGMA) between MJD = 49349 and MJD = 49359 due to change of GPS receiver.

(10) NAOT. Frequency steps of UTC(NAOT) of +78.624 ns/d on MJD = 49380.1 and of - 22.464 ns/d on MJD = 49539.1

(11) NIM . GPS time link since MJD = 49659.

(12) NPL . Frequency steps of UTC(NPL) in ns/d :

MJD	Freq. step
49407	+1.0
49603.65	-1.0
49624.49	-0.4
49650.74	-0.4

(13) NRC . Frequency step of UTC(NRC) of + 17.28 ns/d on MJD = 49541.

(14) NRLM. Change of master clock on MJD = 49503.

(15) ONBA. Apparent time step of UTC-UTC(ONBA) between MJD = 49349 and MJD = 49359 due to change of GPS receiver at IGMA.

(16) OP . Change of master clock on MJD = 49474.351

(17) ORB . Change of master clok on MJD = 49538.
Time step of UTC(ORB) of - 2.0 microseconds on MJD = 49538.35

(18) SCL . Change of master clock on MJD = 49495.304
Frequency step of UTC(SCL) in ns/d :

MJD	Freq. step
49384.328	-30.24
49408.160	+12.96
49582.031	-17.28
49660.349	-17.28
49671.048	-32.44
49701.044	+35.00

(19) SNT . Change of master clock on MJD = 49699.
Frequency steps of UTC(SNT) in ns/d :

MJD	Freq. step
49366.58	-4
49369.46	+8
49411.50	-2
49582.33	+7
49630.58	+5
49663.54	-5

(20) TL . Change of master clock on MJD = 49413.

(21) TP . Change of master clock on MJD = 49354.0

(22) TUG . Time step of UTC(TUG) of +9.00 microseconds on MJD = 49496.51

(23) UME . Ulusai Metroloji Enstitüsü.
Marmara Research Centre, National Metrology Institute,
Gebze-Kocaeli (Turkey).

(24) VSL . Frequency steps of UTC(VSL) in ns/d :

MJD	Freq. step
49436.70	+6.00
49474.64	+2.59

TABLE 10. INTERNATIONAL GPS TRACKING SCHEDULE N°23 FOR MJD = 49533 (1994 JUNE 30) AT 0hUTC

This is a suggested tracking schedule for international time comparisons in common view of GPS satellites between ten areas of the globe.

Area		Participating laboratories
Europe	E	AOS, CAO, CH, FTZ, GUM*, IEN, IFAG, LDS, Mad*, NPL, OMH, OP, ORB, PTB, ROA, SNT, SU, TP, TUG, VSL
East North America	ENA	AO*, APL, NRC, USNO
West North America	WNA	Gold*, NIST, WWV*
Hawaii	H	WWVH*
East Asia	EA	CRL, CSAO, KRIS, NAOM, NAOT, NIM, NRLM, SCL, SO, TL
Australia and New Zealand	A	Can*, ATC*, ORR*, MSL, NML*
India	I	NPLI
Middle East	ME	INPL
South Africa	SAF	CSIR
South America	SAM	IGMA, ONBA, ONRJ, Kou*

* Mad, Gold, Can : JPL Deep Space Network, Madrid, Goldstone, Canberra.
WWV, WWVH : NIST stations in Colorado and Hawaii.
AO : Arecibo Observatory.
Kou : CNES Kourou Center.
ATC, ORR and NML: Australian Consortium of laboratories.
GUM : Glówny Urzad Miar (Central Office of Measures). Warszawa, Poland. Formerly PKNM
Other laboratories are designated by their usual acronyms.

The start times of the tracks are referenced to UTC. Suggested track duration is 15 minutes. Data taking is to start 2 minutes after the start of the track to allow time to lock on to the satellite signal. The data length is therefore 13 minutes; it has been chosen in order to ensure use of the most current ionospheric correction which is transmitted every 12.5 min. All the track time should be decremented 4 minutes each day, to account for the GPS sidereal orbits. The track times were chosen to maximize elevation angles between pairs of stations. The class bytes are such that in association with the satellite number they form a unique identifyer for each common view.

The European area having numerous possible connections has a heavy schedule. The establishment of sub-schedules permits the sharing of the work. European laboratories are contacted to ensure the coordination of sub-schedules.

TABLE 10. SCHEDULE N° 23, 1994 JUNE 30 (CONT.)

*** Europe ***

Class	PRN	Start h	Start m	Connects	Subschedules E1	E2	E3	E4
10	18	00	16	EA			*	
10	19	01	04	EA,ME,I	*	*	*	*
08	26	01	36	WNA,ENA	*	*	*	*
10	27	02	08	EA,ME,I	*	*	*	*
19	9	03	12	ENA,WNA,SAM				*
68	12	03	44	ENA,SAM		*		
10	2	04	00	EA,ME,I	*	*	*	*
00	23	04	16	ENA,WNA		*		
08	12	04	48	WNA,ENA,ME		*		
10	7	05	20	EA,ME,I		*		
00	5	05	36	ENA,ME,SAM	*	*	*	*
E4	12	06	24	E	*	*	*	*
10	4	06	40	EA,I,ME			*	
19	20	06	56	ENA,WNA,ME,SAM	*	*	*	*
7C	1	07	12	WNA,SAM,ENA	*	*	*	*
8C	9	07	28	ME,SAF	*	*	*	*
4C	12	07	44	SAF,ME,I				*
10	24	08	00	EA,ME,I			*	
00	6	08	32	ENA,ME	*	*	*	*
10	5	08	48	EA,ME,I				*
00	25	09	04	ENA,WNA	*	*	*	*
10	16	10	56	EA,ME,I			*	
00	22	11	12	ENA,WNA,ME	*	*	*	*
10	6	11	28	EA,ME,I			*	
18	28	12	16	ENA,WNA,SAM		*		
4C	23	12	32	SAF,ME,I			*	
10	17	13	04	EA,ME,I	*	*	*	*
4C	21	13	20	SAF,ME	*	*	*	*
4C	22	13	52	SAF				*
00	31	14	08	ENA,WNA,ME	*	*	*	*
10	23	14	24	EA,ME,I	*	*	*	*
08	15	15	28	WNA,ENA,SAM	*	*	*	*
10	21	16	16	EA,ME,I			*	
18	2	16	32	ENA,WNA,H		*		
10	1	17	04	EA,ME,I			*	
4C	31	17	20	SAF				*
00	14	18	24	ENA,WNA,SAM	*	*	*	*
00	7	18	56	ENA,WNA,SAM	*	*	*	*
4C	15	19	12	SAF,ME,I				*
10	25	19	28	EA,ME,I			*	
54	18	19	44	SAM,SAF,ME				*
00	4	20	32	ENA,WNA,ME	*	*	*	*
10	14	20	48	EA,ME,I			*	
00	18	21	36	ENA,ME	*	*	*	*
10	29	21	52	EA,ME,I	*	*	*	*
4C	19	22	08	SAF,ME				*
08	24	22	24	WNA,ENA	*	*	*	*
08	16	23	44	WNA,ENA	*	*	*	*

TABLE 10. SCHEDULE N° 23, 1994 JUNE 30 (CONT.)

*** E. North America ***

Class	PRN	Start (h m)	Connects
08	26	01 36	E,WNA
34	28	02 40	H,WNA,EA
18	17	02 56	WNA,SAM
19	9	03 12	WNA,E,SAM
18	21	03 28	WNA,H
68	12	03 44	SAM,E
00	23	04 16	E,WNA
08	12	04 48	E,WNA,ME
00	5	05 36	E,ME,SAM
20	15	06 08	EA,WNA,H
19	20	06 56	WNA,E,ME,SAM
7C	1	07 12	WNA,SAM,E
28	14	07 28	EA,WNA,H
00	6	08 32	E,ME
00	25	09 04	E,WNA
28	18	10 08	EA,WNA,H
00	22	11 12	E,WNA,ME
68	31	11 28	SAM,WNA
18	29	11 44	WNA,SAM
18	18	12 00	WNA
18	28	12 16	WNA,E,SAM
18	19	12 32	WNA,H
18	27	12 48	WNA,H,EA
68	18	13 36	SAM,WNA
00	31	14 08	E,WNA,ME
08	15	15 28	E,WNA,SAM
18	2	16 32	WNA,H,E
20	12	17 36	EA,WNA,H
20	9	17 52	EA,WNA,H
00	14	18 24	E,WNA,SAM
00	7	18 56	E,WNA,SAM
20	5	19 12	EA,WNA,H
18	24	19 28	WNA,H
28	20	20 16	WNA,EA,H
00	4	20 32	E,WNA,ME
00	18	21 36	E,ME
08	24	22 24	E,WNA
18	16	22 40	WNA
28	17	23 28	WNA,EA,H
08	16	23 44	E,WNA

*** W. North America ***

Class	PRN	Start (h m)	Connects
80	22	01 20	A,EA,H
08	26	01 36	E,ENA
34	28	02 40	H,ENA,EA
18	17	02 56	ENA,SAM
19	9	03 12	ENA,E,SAM
18	21	03 28	ENA,H
00	23	04 16	E,ENA
08	12	04 48	E,ENA,ME
20	15	06 08	EA,ENA,H
19	20	06 56	ENA,E,ME,SAM
7C	1	07 12	SAM,E,ENA
28	14	07 28	EA,ENA,H
00	25	09 04	E,ENA
28	18	10 08	EA,ENA,H
00	22	11 12	E,ENA,ME
68	31	11 28	ENA,SAM
18	29	11 44	ENA,SAM
18	18	12 00	ENA
18	28	12 16	ENA,E,SAM
18	19	12 32	ENA,H
18	27	12 48	ENA,H,EA
68	18	13 36	ENA,SAM
00	31	14 08	E,ENA,ME
08	15	15 28	E,ENA,SAM
28	26	15 44	EA,H
18	2	16 32	ENA,H,E
20	12	17 36	ENA,EA,H
20	9	17 52	ENA,EA,H
00	14	18 24	E,ENA,SAM
00	7	18 56	E,ENA,SAM
20	5	19 12	ENA,EA,H
18	24	19 28	ENA,H
28	20	20 16	EA,H,ENA
00	4	20 32	E,ENA,ME
28	6	21 36	EA,H
80	17	21 52	A,H
08	24	22 24	E,ENA
18	16	22 40	ENA
28	17	23 28	EA,H,ENA
08	16	23 44	E,ENA

*** East Asia ***

Class	PRN	Start (h m)	Connects
10	18	00 16	E
98	29	00 48	A,I
10	19	01 04	E,ME,I
80	22	01 20	WNA,A,H
10	27	02 08	E,ME,I
34	28	02 40	H,WNA,ENA
10	2	04 00	E,ME,I
98	14	04 32	A
98	31	05 04	A,H
10	7	05 20	E,ME,I
20	15	06 08	ENA,WNA,H
36	14	06 24	H
10	4	06 40	E,I,ME
98	2	06 56	A
28	14	07 28	WNA,ENA,H
10	24	08 00	E,ME,I
10	5	08 48	E,ME,I
28	18	10 08	WNA,ENA,H
10	16	10 56	E,ME,I
98	26	11 12	A,I
10	6	11 28	E,ME,I
18	27	12 48	ENA,WNA,H
10	17	13 04	E,ME,I
98	9	13 52	A
10	23	14 24	E,ME,I
98	12	14 40	A
28	26	15 44	WNA,H
10	21	16 16	E,ME,I
10	1	17 04	E,ME,I
98	20	17 20	A
20	12	17 36	ENA,WNA,H
20	9	17 52	ENA,WNA,H
20	5	19 12	ENA,WNA,H
10	25	19 28	E,ME,I
98	22	19 44	A
28	20	20 16	WNA,H,ENA
10	14	20 48	E,ME,I
98	1	21 04	A
28	6	21 36	WNA,H
10	29	21 52	E,ME,I
98	28	22 24	A,I
98	25	23 12	A,H
28	17	23 28	WNA,H,ENA

TABLE 10. SCHEDULE N° 23, 1994 JUNE 30 (CONT.)

*** Hawaii ***

Class	PRN	Start (h m)	Connects
80	22	01 20	WNA,A,EA
34	28	02 40	WNA,ENA,EA
18	21	03 28	ENA,WNA
98	31	05 04	EA,A
20	15	06 08	EA,ENA,WNA
36	14	06 24	EA
28	14	07 28	EA,WNA,ENA
3C	19	08 48	A
28	18	10 08	EA,WNA,ENA
18	19	12 32	ENA,WNA
18	27	12 48	ENA,WNA,EA
28	26	15 44	WNA,EA
18	2	16 32	ENA,WNA,E
20	12	17 36	ENA,EA,WNA
20	9	17 52	ENA,EA,WNA
20	5	19 12	ENA,EA,WNA
18	24	19 28	ENA,WNA
28	20	20 16	WNA,EA,ENA
28	6	21 36	EA,WNA
80	17	21 52	WNA,A
98	25	23 12	EA,A
28	17	23 28	WNA,EA,ENA

*** Australia ***

Class	PRN	Start (h m)	Connects
98	29	00 48	EA,I
80	22	01 20	WNA,EA,H
98	14	04 32	EA
98	31	05 04	EA,H
F9	19	06 24	A
98	2	06 56	EA
F9	27	08 00	A
3C	19	08 48	H
98	26	11 12	EA,I
F9	12	13 20	A
98	9	13 52	EA
98	12	14 40	EA
98	20	17 20	EA
F9	23	19 12	A
98	22	19 44	EA
98	1	21 04	EA
80	17	21 52	WNA,H
98	28	22 24	EA,I
98	25	23 12	EA,H

*** India ***

Class	PRN	Start (h m)	Connects
98	29	00 48	EA,A
10	19	01 04	E,EA,ME
10	27	02 08	E,EA,ME
10	2	04 00	E,EA,ME
10	7	05 20	E,EA,ME
10	4	06 40	E,EA,ME
4C	12	07 44	E,SAF,ME
10	24	08 00	E,EA,ME
10	5	08 48	E,EA,ME
10	16	10 56	E,EA,ME
98	26	11 12	EA,A
10	6	11 28	E,EA,ME
4C	23	12 32	E,SAF,ME
10	17	13 04	E,EA,ME
10	23	14 24	E,EA,ME
BC	1	14 56	ME,SAF
10	21	16 16	E,EA,ME
10	1	17 04	E,EA,ME
4C	15	19 12	E,SAF,ME
10	25	19 28	E,EA,ME
10	14	20 48	E,EA,ME
10	29	21 52	E,EA,ME
98	28	22 24	EA,A

TABLE 10. SCHEDULE N° 23, 1994 JUNE 30 (CONT.)

*** Middle East ***

Class	PRN	Start h m	Connects
10	19	01 04	E,EA,I
10	27	02 08	E,EA,I
BC	7	02 40	SAF
10	2	04 00	E,EA,I
08	12	04 48	E,WNA,ENA
10	7	05 20	E,EA,I
00	5	05 36	E,ENA,SAM
10	4	06 40	E,EA,I
19	20	06 56	ENA,WNA,E,SAM
BC	9	07 28	SAF,E
4C	12	07 44	E,SAF,I
10	24	08 00	E,EA,I
00	6	08 32	E,ENA
10	5	08 48	E,EA,I
10	16	10 56	E,EA,I
00	22	11 12	E,ENA,WNA
10	6	11 28	E,EA,I
4C	23	12 32	E,SAF,I
10	17	13 04	E,EA,I
4C	21	13 20	E,SAF
00	31	14 08	E,ENA,WNA
10	23	14 24	E,EA,I
BC	1	14 56	SAF,I
10	21	16 16	E,EA,I
10	1	17 04	E,EA,I
4C	15	19 12	E,SAF,I
10	25	19 28	E,EA,I
54	18	19 44	E,SAM,SAF
00	4	20 32	E,ENA,WNA
10	14	20 48	E,EA,I
00	18	21 36	E,ENA
10	29	21 52	E,EA,I
4C	19	22 08	E,SAF
BC	14	22 24	SAF
BC	4	22 56	SAF

*** South Africa ***

Class	PRN	Start h m	Connects
BC	7	02 40	ME
BC	9	07 28	ME,E
4C	12	07 44	E,ME,I
4C	23	12 32	E,ME,I
4C	21	13 20	E,ME
4C	22	13 52	E
BC	1	14 56	ME,I
4C	31	17 20	E
CA	19	18 40	SAM
4C	15	19 12	E,ME,I
54	18	19 44	E,SAM,ME
4C	19	22 08	E,ME
BC	14	22 24	ME
BC	4	22 56	ME

*** South America ***

Class	PRN	Start h m	Connects
F8	12	02 40	SAM
18	17	02 56	ENA,WNA
19	9	03 12	ENA,WNA,E
68	12	03 44	ENA,E
00	5	05 36	E,ENA,ME
19	20	06 56	ENA,WNA,E,ME
7C	1	07 12	WNA,E,ENA
68	31	11 28	ENA,WNA
18	29	11 44	ENA,WNA
18	28	12 16	ENA,WNA,E
68	18	13 36	ENA,WNA
08	15	15 28	E,WNA,ENA
00	14	18 24	E,ENA,WNA
CA	19	18 40	SAF
00	7	18 56	E,ENA,WNA
54	18	19 44	E,SAF,ME

TABLE 11. INTERNATIONAL GPS TRACKING SCHEDULE N° 24 FOR MJD = 49702 (1994 DECEMBER 16) AT 0hUTC

This is a suggested tracking schedule for internationaltime comparisons in common view of GPS satellites between ten areas of the globe.

Area		Participating laboratories
Europe	E	AOS, CAO, CH, FTZ, GUM, IEN, IFAG, LDS, Mad*, NPL, OMH, OP, ORB, PTB, ROA, SNT, SU, TP, TUG, UME*, VSL
East North America	ENA	AO*, APL, NRC, USNO
West North America	WNA	Gold*, NIST, WWV*
Hawaii	H	WWVH*
East Asia	EA	CRL, CSAO, KRIS, NAOM, NAOT, NIM, NRLM, SCL, SO, TL
Australia and New Zealand	A	Can*, ATC*, ORR*, MSL, NML*
India	I	NPLI
Middle East	ME	INPL
South Africa	SAF	CSIR
South America	SAM	IGMA, ONBA, ONRJ, Kou*

* Mad, Gold, Can : JPL Deep Space Network, Madrid, Goldstone, Canberra.
WWV, WWVH : NIST stations in Colorado and Hawaii.
AO : Arecibo Observatory.
Kou : CNES Kourou Center.
ATC, ORR and NML: Australian Consortium of laboratories.
UME: Ulusai Metroloji Enstitüsü (Marmara Research Centre, National Metrology Institute), Gebze-Kocaeli, Turkey.

Other laboratories are designated by their usual acronyms.

The start times of the tracks are referenced to UTC. Suggested track duration is 15 minutes. Data taking is to start 2 minutes after the start of the track to allow time to lock on to the satellite signal. The data length is therefore 13 minutes; it has been chosen in order to ensure use of the most current ionospheric correction which is transmitted every 12.5 min. All the track time should be decremented 4 minutes each day, to account for the GPS sidereal orbits. The track times were chosen to maximize elevation angles between pairs of stations. The class bytes are such that in association with the satellite number they form a unique identifyer for each common view.

The European area having numerous possible connections has a heavy schedule. The establishment of sub-schedules permits the sharing of the work. European laboratories are contacted to ensure the coordination of sub-schedules.

TABLE 11. SCHEDULE N° 24, 1994 DECEMBER 16 (CONT.)

*** Europe ***

Class	PRN	Start h	Start m	Connects	Subschedules E1	E2	E3	E4
18	28	00	48	ENA,WNA,SAM		*		
4C	23	01	04	SAF,ME,I			*	
10	17	01	36	EA,ME,I	*	*	*	*
4C	21	01	52	SAF,ME	*	*	*	*
4C	22	02	24	SAF				*
00	31	02	40	ENA,WNA,ME	*	*	*	*
10	23	02	56	EA,ME,I	*	*	*	*
08	15	04	00	WNA,ENA,SAM	*	*	*	*
10	21	04	48	EA,ME,I			*	
18	2	05	04	ENA,WNA,H		*		
10	1	05	36	EA,ME,I			*	
4C	31	05	52	SAF				*
00	14	06	56	ENA,WNA,SAM	*	*	*	*
00	7	07	28	ENA,WNA,SAM	*	*	*	*
4C	15	07	44	SAF,ME,I				*
10	25	08	00	EA,ME,I			*	
54	18	08	16	SAM,SAF,ME				*
00	4	09	04	ENA,WNA,ME	*	*	*	*
10	14	09	20	EA,ME,I			*	
00	18	10	08	ENA,ME	*	*	*	*
10	29	10	24	EA,ME,I	*	*	*	*
4C	19	10	40	SAF,ME				*
08	24	10	56	WNA,ENA	*	*	*	*
08	16	12	16	WNA,ENA	*	*	*	*
10	18	12	48	EA			*	
10	19	13	36	EA,ME,I	*	*	*	*
08	26	14	08	WNA,ENA	*	*	*	*
10	27	14	40	EA,ME,I	*	*	*	*
19	9	15	44	ENA,WNA,SAM				*
68	12	16	16	ENA,SAM		*		
10	2	16	32	EA,ME,I	*	*	*	*
00	23	16	48	ENA,WNA		*		
08	12	17	20	WNA,ENA,ME		*		
10	7	17	52	EA,ME,I		*		
00	5	18	08	ENA,ME,SAM	*	*	*	*
E4	12	18	56	E	*	*	*	*
10	4	19	12	EA,I,ME			*	
19	20	19	28	ENA,WNA,ME,SAM	*	*	*	*
7C	1	19	44	WNA,SAM,ENA	*	*	*	*
BC	9	20	00	ME,SAF	*	*	*	*
4C	12	20	16	SAF,ME,I				*
10	24	20	32	EA,ME,I			*	
00	6	21	04	ENA,ME	*	*	*	*
10	5	21	20	EA,ME,I				*
00	25	21	36	ENA,WNA	*	*	*	*
10	16	23	12	EA,ME,I			*	
00	22	23	28	ENA,WNA,ME	*	*	*	*
10	6	23	44	EA,ME,I			*	

TABLE 11. SCHEDULE N° 24, 1994 DECEMBER 16 (CONT.)

*** E. North America ***

Class	PRN	Start h	Start m	Connects
18	29	00	16	WNA,SAM
18	18	00	32	WNA
18	28	00	48	WNA,E,SAM
18	19	01	04	WNA,H
18	27	01	20	WNA,H,EA
68	18	02	08	SAM,WNA
00	31	02	40	E,WNA,ME
08	15	04	00	E,WNA,SAM
18	2	05	04	WNA,H,E
20	12	06	08	EA,WNA,H
20	9	06	24	EA,WNA,H
00	14	06	56	E,WNA,SAM
00	7	07	28	E,WNA,SAM
20	5	07	44	EA,WNA,H
18	24	08	00	WNA,H
28	20	08	48	WNA,EA,H
00	4	09	04	E,WNA,ME
00	18	10	08	E,ME
08	24	10	56	E,WNA
18	16	11	12	WNA
28	17	12	00	WNA,EA,H
08	16	12	16	E,WNA
08	26	14	08	E,WNA
34	28	15	12	H,WNA,EA
18	17	15	28	WNA,SAM
19	9	15	44	WNA,E,SAM
18	21	16	00	WNA,H
68	12	16	16	SAM,E
00	23	16	48	E,WNA
08	12	17	20	E,WNA,ME
00	5	18	08	E,ME,SAM
20	15	18	40	EA,WNA,H
19	20	19	28	WNA,E,ME,SAM
7C	1	19	44	WNA,SAM,E
28	14	20	00	EA,WNA,H
00	6	21	04	E,ME
00	25	21	36	E,WNA
28	18	22	40	EA,WNA,H
00	22	23	28	E,WNA,ME
68	31	23	44	SAM,WNA

*** W. North America ***

Class	PRN	Start h	Start m	Connects
18	29	00	16	ENA,SAM
18	18	00	32	ENA
18	28	00	48	ENA,E,SAM
18	19	01	04	ENA,H
18	27	01	20	ENA,H,EA
68	18	02	08	ENA,SAM
00	31	02	40	E,ENA,ME
08	15	04	00	E,ENA,SAM
28	26	04	16	EA,H
18	2	05	04	ENA,H,E
20	12	06	08	ENA,EA,H
20	9	06	24	ENA,EA,H
00	14	06	56	E,ENA,SAM
00	7	07	28	E,ENA,SAM
20	5	07	44	ENA,EA,H
18	24	08	00	ENA,H
28	20	08	48	EA,H,ENA
00	4	09	04	E,ENA,ME
28	6	10	08	EA,H
80	17	10	24	A,H
08	24	10	56	E,ENA
18	16	11	12	ENA
28	17	12	00	EA,H,ENA
08	16	12	16	E,ENA
80	22	13	52	A,EA,H
08	26	14	08	E,ENA
34	28	15	12	H,ENA,EA
18	17	15	28	ENA,SAM
19	9	15	44	ENA,E,SAM
18	21	16	00	ENA,H
00	23	16	48	E,ENA
08	12	17	20	E,ENA,ME
20	15	18	40	EA,ENA,H
19	20	19	28	ENA,E,ME,SAM
7C	1	19	44	SAM,E,ENA
28	14	20	00	EA,ENA,H
00	25	21	36	E,ENA
28	18	22	40	EA,ENA,H
00	22	23	28	E,ENA,ME
68	31	23	44	ENA,SAM

*** East Asia ***

Class	PRN	Start h	Start m	Connects
18	27	01	20	ENA,WNA,H
10	17	01	36	E,ME,I
98	9	02	24	A
10	23	02	56	E,ME,I
98	12	03	12	A
28	26	04	16	WNA,H
10	21	04	48	E,ME,I
10	1	05	36	E,ME,I
98	20	05	52	A
20	12	06	08	ENA,WNA,H
20	9	06	24	ENA,WNA,H
20	5	07	44	ENA,WNA,H
10	25	08	00	E,ME,I
98	22	08	16	A
28	20	08	48	WNA,H,ENA
10	14	09	20	E,ME,I
98	1	09	36	A
28	6	10	08	WNA,H
10	29	10	24	E,ME,I
98	28	10	56	A,I
98	25	11	44	A,H
28	17	12	00	WNA,H,ENA
10	18	12	48	E
98	29	13	20	A,I
10	19	13	36	E,ME,I
80	22	13	52	WNA,A,H
10	27	14	40	E,ME,I
34	28	15	12	H,WNA,ENA
10	2	16	32	E,ME,I
98	14	17	04	A
98	31	17	36	A,H
10	7	17	52	E,ME,I
20	15	18	40	ENA,WNA,H
36	14	18	56	H
10	4	19	12	E,I,ME
98	2	19	28	A
28	14	20	00	WNA,ENA,H
10	24	20	32	E,ME,I
10	5	21	20	E,ME,I
28	18	22	40	WNA,ENA,H
10	16	23	12	E,ME,I
98	26	23	28	A,I
10	6	23	44	E,ME,I

TABLE 11. SCHEDULE N° 24, 1994 DECEMBER 16 (CONT.)

*** Hawaii ***					*** Australia ***					*** India ***				
Class	PRN	Start		Connects	Class	PRN	Start		Connects	Class	PRN	Start		Connects
		h	m				h	m				h	m	
18	19	01	04	ENA,WNA	F9	12	01	52	A	4C	23	01	04	E,SAF,ME
18	27	01	20	ENA,WNA,EA	98	9	02	24	EA	10	17	01	36	E,EA,ME
28	26	04	16	WNA,EA	98	12	03	12	EA	10	23	02	56	E,EA,ME
18	2	05	04	ENA,WNA,E	98	20	05	52	EA	BC	1	03	28	ME,SAF
20	12	06	08	ENA,EA,WNA	F9	23	07	44	A	10	21	04	48	E,EA,ME
20	9	06	24	ENA,EA,WNA	98	22	08	16	EA	10	1	05	36	E,EA,ME
20	5	07	44	ENA,EA,WNA	98	1	09	36	EA	4C	15	07	44	E,SAF,ME
18	24	08	00	ENA,WNA	80	17	10	24	WNA,H	10	25	08	00	E,EA,ME
28	20	08	48	WNA,EA,ENA	98	28	10	56	EA,I	10	14	09	20	E,EA,ME
28	6	10	08	EA,WNA	98	25	11	44	EA,H	10	29	10	24	E,EA,ME
80	17	10	24	WNA,A	98	29	13	20	EA,I	98	28	10	56	EA,A
98	25	11	44	EA,A	80	22	13	52	WNA,EA,H	98	29	13	20	EA,A
28	17	12	00	WNA,EA,ENA	98	14	17	04	EA	10	19	13	36	E,EA,ME
80	22	13	52	WNA,A,EA	98	31	17	36	EA,H	10	27	14	40	E,EA,ME
34	28	15	12	WNA,ENA,EA	F9	19	18	56	A	10	2	16	32	E,EA,ME
18	21	16	00	ENA,WNA	98	2	19	28	EA	10	7	17	52	E,EA,ME
98	31	17	36	EA,A	F9	27	20	32	A	10	4	19	12	E,EA,ME
20	15	18	40	EA,ENA,WNA	3C	19	21	20	H	4C	12	20	16	E,SAF,ME
36	14	18	56	EA	98	26	23	28	EA,I	10	24	20	32	E,EA,ME
28	14	20	00	EA,WNA,ENA						10	5	21	20	E,EA,ME
3C	19	21	20	A						10	16	23	12	E,EA,ME
28	18	22	40	EA,WNA,ENA						98	26	23	28	EA,A
										10	6	23	44	E,EA,ME

TABLE 11. SCHEDULE N° 24, 1994 DECEMBER 16 (CONT.)

*** Middle East ***

Class	PRN	Start h	Start m	Connects
4C	23	01	04	E,SAF,I
10	17	01	36	E,EA,I
4C	21	01	52	E,SAF
00	31	02	40	E,ENA,WNA
10	23	02	56	E,EA,I
BC	1	03	28	SAF,I
10	21	04	48	E,EA,I
10	1	05	36	E,EA,I
4C	15	07	44	E,SAF,I
10	25	08	00	E,EA,I
54	18	08	16	E,SAM,SAF
00	4	09	04	E,ENA,WNA
10	14	09	20	E,EA,I
00	18	10	08	E,ENA
10	29	10	24	E,EA,I
4C	19	10	40	E,SAF
BC	14	10	56	SAF
BC	4	11	28	SAF
10	19	13	36	E,EA,I
10	27	14	40	E,EA,I
BC	7	15	12	SAF
10	2	16	32	E,EA,I
08	12	17	20	E,WNA,ENA
10	7	17	52	E,EA,I
00	5	18	08	E,ENA,SAM
10	4	19	12	E,EA,I
19	20	19	28	ENA,WNA,E,SAM
BC	9	20	00	SAF,E
4C	12	20	16	E,SAF,I
10	24	20	32	E,EA,I
00	6	21	04	E,ENA
10	5	21	20	E,EA,I
10	16	23	12	E,EA,I
00	22	23	28	E,ENA,WNA
10	6	23	44	E,EA,I

*** South Africa ***

Class	PRN	Start h	Start m	Connects
4C	23	01	04	E,ME,I
4C	21	01	52	E,ME
4C	22	02	24	E
BC	1	03	28	ME,I
4C	31	05	52	E
CA	19	07	12	SAM
4C	15	07	44	E,ME,I
54	18	08	16	E,SAM,ME
4C	19	10	40	E,ME
BC	14	10	56	ME
BC	4	11	28	ME
BC	7	15	12	ME
BC	9	20	00	ME,E
4C	12	20	16	E,ME,I

*** South America ***

Class	PRN	Start h	Start m	Connects
18	29	00	16	ENA,WNA
18	28	00	48	ENA,WNA,E
68	18	02	08	ENA,WNA
08	15	04	00	E,WNA,ENA
00	14	06	56	E,ENA,WNA
CA	19	07	12	SAF
00	7	07	28	E,ENA,WNA
54	18	08	16	E,SAF,ME
F8	12	15	12	SAM
18	17	15	28	ENA,WNA
19	9	15	44	ENA,WNA,E
68	12	16	16	ENA,E
00	5	18	08	E,ENA,ME
19	20	19	28	ENA,WNA,E,ME
7C	1	19	44	WNA,E,ENA
68	31	23	44	ENA,WNA

TABLE 12. [TAI - GPS time] AND [UTC - GPS time]

(FILE AVAILABLE VIA INTERNET UNDER THE NAME UTCGPS94.AR)

The GPS satellites disseminate a common time scale designated as 'GPS time'. The relation between GPS time and TAI is :

$$[\mathrm{TAI} - \mathrm{GPS\ time}] = 19\ \mathrm{s} + C0,$$

where the time difference of 19 seconds is kept constant and C0 is a quantity of the order of a few hundreds of nanoseconds, varying with time.

The relation between GPS time and UTC involves a variable number of seconds as a consequence of the leap seconds of the UTC system and is as follows :

from 1993 July 1, 0h UTC, until 1994 July 1, 0h UTC :

$$[\mathrm{UTC} - \mathrm{GPS\ time}] = -9\ \mathrm{s} + C0$$

from 1994 July 1, 0h UTC, until further notice :

$$[\mathrm{UTC} - \mathrm{GPS\ time}] = -10\ \mathrm{s} + C0.$$

Here C0 is given at 0h UTC every day.

C0 is computed as follows: the GPS data taken at the Paris Observatory, from satellites with 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)] from Table 9.
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 $\sigma/\sqrt{N}$.

TABLE 12. (CONT.)

Date 1994 0h UTC	MJD	C0 (ns)	σ (ns)	σ/√N (ns)
Jan 1	49353	89	34	7
Jan 2	49354	86	31	7
Jan 3	49355	93	51	11
Jan 4	49356	100	30	6
Jan 5	49357	102	40	9
Jan 6	49358	101	46	10
Jan 7	49359	101	43	9
Jan 8	49360	101	42	9
Jan 9	49361	98	45	10
Jan 10	49362	96	23	5
Jan 11	49363	97	49	11
Jan 12	49364	98	29	6
Jan 13	49365	95	31	7
Jan 14	49366	103	54	11
Jan 15	49367	111	27	6
Jan 16	49368	107	37	8
Jan 17	49369	104	45	10
Jan 18	49370	110	37	8
Jan 19	49371	111	40	9
Jan 20	49372	105	50	11
Jan 21	49373	100	34	7
Jan 22	49374	100	37	8
Jan 23	49375	104	56	12
Jan 24	49376	104	47	10
Jan 25	49377	101	44	10
Jan 26	49378	98	50	11
Jan 27	49379	100	33	7
Jan 28	49380	107	38	8
Jan 29	49381	112	45	10
Jan 30	49382	113	60	13
Jan 31	49383	111	47	10

TABLE 12. (CONT.)

Date 1994 0h UTC	MJD	C0 (ns)	σ (ns)	σ/√N (ns)
Feb 1	49384	113	36	8
Feb 2	49385	114	37	8
Feb 3	49386	113	37	9
Feb 4	49387	109	44	9
Feb 5	49388	104	49	10
Feb 6	49389	100	34	7
Feb 7	49390	96	36	8
Feb 8	49391	90	38	9
Feb 9	49392	89	37	8
Feb 10	49393	93	35	8
Feb 11	49394	96	37	8
Feb 12	49395	90	43	9
Feb 13	49396	87	33	7
Feb 14	49397	96	45	10
Feb 15	49398	108	53	11
Feb 16	49399	110	35	8
Feb 17	49400	107	52	11
Feb 18	49401	105	43	9
Feb 19	49402	104	34	7
Feb 20	49403	104	35	8
Feb 21	49404	103	48	10
Feb 22	49405	105	42	9
Feb 23	49406	107	38	8
Feb 24	49407	103	46	10
Feb 25	49408	99	42	9
Feb 26	49409	94	24	5
Feb 27	49410	91	52	12
Feb 28	49411	90	40	9

TABLE 12. (CONT.)

Date 1994 0h UTC	MJD	C0 (ns)	σ (ns)	σ/√N (ns)
Mar 1	49412	86	45	10
Mar 2	49413	85	34	8
Mar 3	49414	93	45	10
Mar 4	49415	100	38	9
Mar 5	49416	101	46	10
Mar 6	49417	100	44	10
Mar 7	49418	100	37	8
Mar 8	49419	95	38	8
Mar 9	49420	88	30	7
Mar 10	49421	84	37	8
Mar 11	49422	84	34	8
Mar 12	49423	82	38	8
Mar 13	49424	80	33	8
Mar 14	49425	77	29	6
Mar 15	49426	77	39	9
Mar 16	49427	77	-	-
Mar 17	49428	77	49	13
Mar 18	49429	79	53	12
Mar 19	49430	82	38	9
Mar 20	49431	83	37	9
Mar 21	49432	82	39	9
Mar 22	49433	76	42	9
Mar 23	49434	67	44	10
Mar 24	49435	64	34	7
Mar 25	49436	66	42	9
Mar 26	49437	65	47	10
Mar 27	49438	61	34	7
Mar 28	49439	61	51	11
Mar 29	49440	61	31	7
Mar 30	49441	60	48	11
Mar 31	49442	63	40	10

TABLE 12. (CONT.)

Date 1994 0h UTC	MJD	C0 (ns)	σ (ns)	σ/√N (ns)
Apr 1	49443	70	44	11
Apr 2	49444	73	41	10
Apr 3	49445	73	50	12
Apr 4	49446	75	42	11
Apr 5	49447	80	53	13
Apr 6	49448	81	40	10
Apr 7	49449	80	37	10
Apr 8	49450	83	48	12
Apr 9	49451	91	45	12
Apr 10	49452	101	46	11
Apr 11	49453	104	39	10
Apr 12	49454	96	34	9
Apr 13	49455	92	42	11
Apr 14	49456	96	35	9
Apr 15	49457	97	29	7
Apr 16	49458	97	38	9
Apr 17	49459	97	45	11
Apr 18	49460	90	39	10
Apr 19	49461	81	20	5
Apr 20	49462	76	42	10
Apr 21	49463	75	45	11
Apr 22	49464	75	50	12
Apr 23	49465	72	47	11
Apr 24	49466	70	50	12
Apr 25	49467	75	48	11
Apr 26	49468	79	43	11
Apr 27	49469	73	42	10
Apr 28	49470	66	30	6
Apr 29	49471	67	22	4
Apr 30	49472	71	33	7

TABLE 12. (CONT.)

Date 1994 0h UTC	MJD	C0 (ns)	σ (ns)	σ/√N (ns)
May 1	49473	74	33	7
May 2	49474	74	35	8
May 3	49475	73	52	11
May 4	49476	78	27	6
May 5	49477	80	33	7
May 6	49478	83	41	9
May 7	49479	87	34	8
May 8	49480	88	37	8
May 9	49481	91	41	9
May 10	49482	99	36	8
May 11	49483	108	45	10
May 12	49484	104	30	6
May 13	49485	95	29	7
May 14	49486	95	22	5
May 15	49487	99	33	7
May 16	49488	97	42	9
May 17	49489	88	31	7
May 18	49490	81	26	6
May 19	49491	78	34	7
May 20	49492	80	40	9
May 21	49493	81	26	6
May 22	49494	83	32	7
May 23	49495	80	16	3
May 24	49496	75	27	6
May 25	49497	74	27	6
May 26	49498	74	31	7
May 27	49499	74	34	7
May 28	49500	79	18	4
May 29	49501	87	50	11
May 30	49502	94	36	8
May 31	49503	93	33	7

TABLE 12. (CONT.)

Date 1994 0h UTC	MJD	C0 (ns)	σ (ns)	σ/√N (ns)
Jun 1	49504	91	23	5
Jun 2	49505	91	38	8
Jun 3	49506	95	33	7
Jun 4	49507	97	36	8
Jun 5	49508	99	40	9
Jun 6	49509	101	42	9
Jun 7	49510	101	30	6
Jun 8	49511	101	28	6
Jun 9	49512	106	27	5
Jun 10	49513	110	24	5
Jun 11	49514	109	28	6
Jun 12	49515	99	40	8
Jun 13	49516	86	35	7
Jun 14	49517	78	28	6
Jun 15	49518	74	28	6
Jun 16	49519	73	34	7
Jun 17	49520	73	29	6
Jun 18	49521	74	33	7
Jun 19	49522	74	22	5
Jun 20	49523	69	37	8
Jun 21	49524	68	36	8
Jun 22	49525	67	27	6
Jun 23	49526	67	27	6
Jun 24	49527	65	30	6
Jun 25	49528	60	49	10
Jun 26	49529	60	18	4
Jun 27	49530	60	29	7
Jun 28	49531	55	26	6
Jun 29	49532	51	22	6
Jun 30	49533	52	57	20

TABLE 12. (CONT.)

Date 1994 0h UTC	MJD	C0 (ns)	σ (ns)	σ/√N (ns)
Jul 1	49534	52	34	9
Jul 2	49535	52	40	10
Jul 3	49536	46	43	10
Jul 4	49537	45	60	14
Jul 5	49538	48	44	9
Jul 6	49539	55	39	9
Jul 7	49540	59	45	12
Jul 8	49541	56	41	10
Jul 9	49542	57	45	10
Jul 10	49543	64	41	10
Jul 11	49544	70	31	7
Jul 12	49545	70	33	7
Jul 13	49546	69	46	11
Jul 14	49547	69	47	11
Jul 15	49548	71	59	14
Jul 16	49549	75	44	10
Jul 17	49550	75	53	13
Jul 18	49551	70	36	9
Jul 19	49552	66	37	9
Jul 20	49553	66	40	10
Jul 21	49554	63	51	13
Jul 22	49555	52	39	12
Jul 23	49556	44	40	10
Jul 24	49557	46	41	10
Jul 25	49558	54	41	15
Jul 26	49559	52	51	18
Jul 27	49560	39	60	19
Jul 28	49561	27	39	12
Jul 29	49562	24	38	12
Jul 30	49563	28	44	9
Jul 31	49564	31	32	7

TABLE 12. (CONT.)

Date 1994 0h UTC	MJD	C0 (ns)	σ (ns)	σ/√N (ns)
Aug 1	49565	31	39	8
Aug 2	49566	33	39	8
Aug 3	49567	33	38	8
Aug 4	49568	35	40	11
Aug 5	49569	40	44	10
Aug 6	49570	40	48	10
Aug 7	49571	41	36	8
Aug 8	49572	43	41	9
Aug 9	49573	44	42	9
Aug 10	49574	41	42	9
Aug 11	49575	37	50	11
Aug 12	49576	39	41	9
Aug 13	49577	42	61	13
Aug 14	49578	38	54	12
Aug 15	49579	33	48	10
Aug 16	49580	28	45	10
Aug 17	49581	20	62	13
Aug 18	49582	11	31	7
Aug 19	49583	10	37	8
Aug 20	49584	10	38	8
Aug 21	49585	13	43	9
Aug 22	49586	17	42	9
Aug 23	49587	19	35	8
Aug 24	49588	22	39	8
Aug 25	49589	25	42	9
Aug 26	49590	21	60	13
Aug 27	49591	20	42	9
Aug 28	49592	19	43	10
Aug 29	49593	14	46	10
Aug 30	49594	8	46	10
Aug 31	49595	3	57	12

TABLE 12. (CONT.)

Date 1994 0h UTC	MJD	C0 (ns)	σ (ns)	σ/√N (ns)
Sep 1	49596	-1	37	8
Sep 2	49597	-3	44	9
Sep 3	49598	-2	61	13
Sep 4	49599	-1	41	9
Sep 5	49600	2	39	8
Sep 6	49601	6	33	7
Sep 7	49602	9	49	10
Sep 8	49603	11	49	10
Sep 9	49604	14	64	13
Sep 10	49605	16	46	10
Sep 11	49606	14	33	7
Sep 12	49607	9	48	10
Sep 13	49608	2	34	7
Sep 14	49609	-4	39	8
Sep 15	49610	-4	46	10
Sep 16	49611	-1	45	10
Sep 17	49612	1	24	5
Sep 18	49613	2	7	1
Sep 19	49614	2	9	2
Sep 20	49615	2	10	2
Sep 21	49616	7	9	2
Sep 22	49617	12	10	2
Sep 23	49618	14	8	2
Sep 24	49619	15	35	7
Sep 25	49620	17	47	10
Sep 26	49621	15	52	11
Sep 27	49622	7	36	8
Sep 28	49623	-1	61	13
Sep 29	49624	2	33	10
Sep 30	49625	12	65	22

Table 12. (Cont.)

Date 1994 0h UTC	MJD	C0 (ns)	σ (ns)	σ/√N (ns)
Oct 1	49626	18	26	8
Oct 2	49627	16	37	12
Oct 3	49628	8	81	31
Oct 4	49629	-2	26	8
Oct 5	49630	-7	73	28
Oct 6	49631	-3	50	13
Oct 7	49632	8	45	10
Oct 8	49633	12	50	11
Oct 9	49634	9	38	8
Oct 10	49635	6	43	9
Oct 11	49636	2	46	10
Oct 12	49637	0	54	12
Oct 13	49638	3	38	8
Oct 14	49639	1	45	10
Oct 15	49640	-8	40	8
Oct 16	49641	-12	47	10
Oct 17	49642	-7	43	10
Oct 18	49643	-4	44	9
Oct 19	49644	-4	38	8
Oct 20	49645	0	40	8
Oct 21	49646	7	33	7
Oct 22	49647	14	36	7
Oct 23	49648	15	40	8
Oct 24	49649	15	35	7
Oct 25	49650	15	52	11
Oct 26	49651	20	52	11
Oct 27	49652	24	40	9
Oct 28	49653	23	45	9
Oct 29	49654	21	53	11
Oct 30	49655	21	46	10
Oct 31	49656	22	43	9

TABLE 12. (CONT.)

Date 1994 0h UTC	MJD	C0 (ns)	σ (ns)	σ/√N (ns)
Nov 1	49657	22	43	9
Nov 2	49658	20	49	10
Nov 3	49659	20	37	8
Nov 4	49660	20	52	11
Nov 5	49661	18	38	8
Nov 6	49662	20	45	10
Nov 7	49663	20	42	9
Nov 8	49664	19	42	9
Nov 9	49665	13	26	5
Nov 10	49666	13	54	12
Nov 11	49667	16	42	9
Nov 12	49668	17	40	8
Nov 13	49669	12	45	9
Nov 14	49670	8	35	8
Nov 15	49671	10	39	8
Nov 16	49672	13	34	7
Nov 17	49673	12	36	8
Nov 18	49674	11	34	7
Nov 19	49675	18	30	6
Nov 20	49676	24	50	11
Nov 21	49677	24	42	9
Nov 22	49678	21	60	13
Nov 23	49679	22	36	7
Nov 24	49680	29	35	8
Nov 25	49681	35	38	8
Nov 26	49682	35	38	8
Nov 27	49683	33	44	9
Nov 28	49684	34	47	10
Nov 29	49685	37	35	7
Nov 30	49686	39	33	7

TABLE 12. (CONT.)

Date 1994 0h UTC	MJD	C0 (ns)	σ (ns)	σ/√N (ns)
Dec 1	49687	36	41	9
Dec 2	49688	31	38	8
Dec 3	49689	32	39	8
Dec 4	49690	38	41	9
Dec 5	49691	38	39	8
Dec 6	49692	32	33	7
Dec 7	49693	24	43	9
Dec 8	49694	19	45	10
Dec 9	49695	19	50	11
Dec 10	49696	23	55	12
Dec 11	49697	27	32	7
Dec 12	49698	28	44	9
Dec 13	49699	33	42	9
Dec 14	49700	37	36	8
Dec 15	49701	29	34	12
Dec 16	49702	28	42	11
Dec 17	49703	27	32	7
Dec 18	49704	28	42	9
Dec 19	49705	34	35	7
Dec 20	49706	40	43	10
Dec 21	49707	45	36	8
Dec 22	49708	55	44	9
Dec 23	49709	73	42	9
Dec 23	49709	74	42	9
Dec 24	49710	93	35	7
Dec 25	49711	106	37	8
Dec 26	49712	118	52	11
Dec 27	49713	130	33	7
Dec 28	49714	141	32	7
Dec 29	49715	152	49	11
Dec 30	49716	166	45	11
Dec 31	49717	181	47	11

TABLE 13. [UTC - GLONASS time]

(File available via INTERNET under the name UTCGLO94.AR)

The GLONASS satellites disseminate a common time scale designated as 'GLONASS time'. The relation between UTC and GLONASS time can be written as :

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

From his current observation 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 the standard deviation σ of his daily GLONASS data. C1 is then derived using [UTC - GPS time] of Table 12.

Date 1994 0h UTC	MJD	C1 (μs)	σ (μs)
Jan 7	49359	-18.95	0.05
Jan 17	49369	-18.84	0.04
Jan 27	49379	-18.74	0.03
Feb 6	49389	-18.62	0.04
Feb 16	49399	-18.52	0.04
Feb 26	49409	-18.44	0.04
Mar 8	49419	-18.33	0.04
Mar 18	49429	-18.21	0.04
Mar 28	49439	-18.12	0.04
Apr 7	49449	-18.03	0.04
Apr 17	49459	-17.90	0.04
Apr 27	49469	-17.81	0.04
May 7	49479	-17.70	0.03
May 17	49489	-17.57	0.03
May 27	49499	-17.46	0.04
Jun 6	49509	-17.36	0.07
Jun 16	49519	-17.24	0.04
Jun 26	49529	-17.14	0.03
Jul 6	49539	-17.04	0.03
Jul 16	49549	-16.91	0.03
Jul 26	49559	-16.85	0.07
Aug 5	49569	-16.73	0.04
Aug 15	49579	-16.67	0.04
Aug 25	49589	-16.55	0.03
Sep 4	49599	-16.45	0.03
Sep 14	49609	-16.35	0.04
Sep 24	49619	-16.22	0.05
Oct 4	49629	-16.16	0.04
Oct 14	49639	-16.06	0.04
Oct 24	49649	-15.97	0.04
Nov 3	49659	-15.89	0.03
Nov 13	49669	-15.75	0.03
Nov 23	49679	-15.65	0.04
Dec 3	49689	-15.61	0.04
Dec 13	49699	-15.60	0.04
Dec 23	49709	-15.56	0.03

TABLE 14A. RATES RELATIVE TO TAI OF CONTRIBUTING CLOCKS IN 1994

(FILE AVAILABLE VIA INTERNET UNDER THE NAME RTAI94.AR)

Mean clock rates relative to TAI are computed for two-month intervals ending at the dates given in the table.
When an intentional frequency adjustment has been applied to a clock, the data prior to this adjustment are corrected, so that Table 14A gives homogeneous rates for the whole year 1994. For studies including the clock rates of previous years, corrections must be brought to the data published in the Annual Reports for 1988, 1989, 1990, 1991, 1992 and 1993 and in the BIH Annual Reports for the previous years. These corrections are given in Table 14B.
Unit is ns/day, *** denotes that the clock was not used.

LAB.	CLOCK		49409	49469	49529	49589	49649	49709
AOS	23	67	5.45	-16.07	16.35	-2.26	2.45	8.32
APL	14	793	-7.84	-8.86	6.17	10.60	11.21	2.84
APL	31	571	-3.79	1.38	9.95	8.50	11.07	11.31
APL	40	3101	5.07	-5.02	4.86	-2.59	-4.37	0.85
APL	40	3102	7.17	-4.12	3.67	-9.51	-5.36	***
APL	40	3106	8.75	-1.09	-0.05	3.68	6.58	1.77
AUS	12	1708	***	29.33	31.07	35.44	-0.63	***
AUS	14	1443	***	-229.10	-234.68	***	***	***
AUS	14	2010	-112.85	-110.81	-115.82	***	***	***
AUS	14	2020	***	-38.97	***	***	***	***
AUS	36	207	-0.01	-6.45	-5.32	-4.29	-5.76	-4.44
AUS	36	338	***	31.37	***	***	***	***
AUS	36	339	***	-2.06	***	***	***	***
AUS	36	340	***	9.39	8.75	7.83	8.40	7.67
AUS	36	424	***	***	***	***	-0.64	-0.93
AUS	40	5401	28.61	31.90	33.34	32.07	33.69	33.06
AUS	44	2	57.13	56.86	57.39	56.27	56.00	55.91
CAO	16	183	-20.84	-22.85	-24.87	-25.57	-24.14	-24.32
CAO	23	62	-136.55	-132.18	-119.94	-121.29	-127.99	-135.65
CAO	30	384	70.39	65.61	46.15	35.99	41.46	39.36
CH	12	285	153.10	157.80	146.72	157.33	158.96	151.32
CH	16	64	-68.05	***	***	***	***	***
CH	16	69	-157.17	-146.99	-155.40	-158.44	-164.43	-160.71
CH	16	77	-67.92	-71.87	-71.33	-71.09	-75.03	-71.86
CH	16	140	40.55	42.10	46.92	78.92	66.48	76.27
CH	17	206	-5.30	10.47	-10.85	-44.72	-45.70	-49.31
CH	21	179	55.46	64.23	67.56	72.97	71.64	74.23
CH	21	194	-87.92	-84.06	-77.49	-67.92	-67.02	-62.19
CH	21	217	74.65	70.80	72.24	72.80	68.93	75.66
CH	21	243	203.17	137.45	***	***	***	***
CH	31	403	-7.65	-7.45	-21.92	-50.36	-45.36	-48.58
CH	35	413	***	***	***	-2.86	-2.10	-2.53
CH	36	354	***	***	***	42.63	40.76	40.83
CRL	14	764	5.80	7.78	9.96	11.95	10.31	7.67
CRL	14	865	-31.20	***	***	***	***	***

TABLE 14A. (CONT.)

LAB.	CLOCK		49409	49469	49529	49589	49649	49709
CRL	14	932	-265.63	***	***	***	***	***
CRL	14	1729	-59.77	-57.65	-55.69	-52.30	-50.07	7.35
CRL	14	2456	31.66	33.64	35.28	36.49	37.65	38.88
CRL	34	131	-287.24	-284.78	-283.41	-278.18	-275.12	-271.35
CRL	35	112	***	***	-3.54	-4.99	-5.18	-5.80
CRL	35	144	2.40	2.63	2.72	2.32	2.44	2.88
CRL	35	332	***	***	***	24.01	24.78	24.42
CRL	35	342	***	***	***	13.66	13.89	13.06
CRL	35	343	***	***	***	6.14	6.74	6.74
CRL	40	2008	***	***	***	***	***	2.95
CSAO	12	1646	-208.28	***	***	***	***	***
CSAO	12	1648	68.76	81.32	80.53	77.36	72.05	68.10
CSAO	12	2068	124.66	119.67	121.48	96.20	81.33	85.79
CSAO	30	152	***	477.02	492.14	476.02	522.81	548.99
CSAO	40	4902	83.81	***	***	***	-9.97	107.96
F	12	2405	98.55	***	***	***	***	***
F	14	51	-136.45	-128.07	-127.54	-133.87	-135.66	-135.27
F	14	134	81.93	69.43	65.21	31.84	21.56	31.91
F	14	158	93.81	97.35	***	***	***	***
F	14	195	-124.11	-124.26	-126.70	-130.23	-130.40	-132.02
F	14	475	-38.41	-36.56	-37.11	-44.27	-42.31	-35.71
F	14	500	-5.68	-8.50	-8.71	***	***	-0.55
F	14	560	-84.21	-81.03	-82.06	***	***	***
F	14	753	-39.17	-40.32	-43.84	-47.19	-46.98	-41.87
F	14	1120	-56.32	-55.06	-53.16	-51.81	-53.56	-54.55
F	14	1407	-52.03	-57.37	-55.29	-56.92	-58.16	***
F	14	1645	36.07	41.02	41.18	55.56	53.46	52.56
F	14	1842	-54.86	-71.02	***	2.51	14.10	16.12
F	16	106	-13.38	-12.46	-13.60	***	***	-14.90
F	16	178	***	1.16	***	***	***	***
F	16	187	***	***	***	***	***	-42.15
F	17	489	48.87	46.76	***	***	57.87	54.33
F	35	122	***	-22.28	-23.04	-22.94	-22.37	-22.77
F	35	124	***	-3.41	-3.46	-4.02	-4.31	-4.85
F	35	131	15.25	15.65	15.74	14.93	14.47	15.43
F	35	158	10.35	10.59	10.39	10.18	10.19	9.75
F	35	172	-1.37	-1.40	-1.68	-1.37	-0.75	-1.11
F	35	198	***	***	***	1.17	0.82	1.01
F	35	396	***	***	***	***	4.74	4.75
F	40	816	***	***	***	***	-14.92	-16.66
GUM	14	1144	-51.36	-52.98	-37.90	-29.77	-8.30	-9.93
GUM	30	652	-52.68	-52.04	-54.05	3.16	5.41	-28.54
GUM	30	664	-173.11	-171.18	-170.55	-148.37	-162.84	-183.08
IEN	12	303	-96.07	-99.19	-99.15	***	***	***
IEN	14	469	-238.97	-237.51	-235.26	-231.75	***	***

TABLE 14A. (CONT.)

LAB.	CLOCK		49409	49469	49529	49589	49649	49709
IEN	14	893	16.99	16.41	19.58	21.68	***	***
IEN	31	659	-49.02	-50.50	-55.43	-49.63	-49.88	-50.14
IEN	35	219	3.67	4.31	4.13	3.87	-0.62	-0.14
IFAG	14	1105	-41.55	-37.51	-16.39	13.94	-11.35	-35.22
IFAG	16	131	-13.73	-14.26	-14.25	-8.38	-17.17	-15.32
IFAG	16	138	137.28	135.23	92.43	53.31	76.73	130.49
IFAG	16	173	170.36	146.96	107.39	82.82	113.25	153.60
IGMA	14	2407	-112.00	-112.51	-106.71	-113.64	-101.45	-81.11
IGMA	16	112	-7.25	-29.27	-15.85	-8.85	3.91	17.01
IGMA	17	127	39.27	37.47	39.15	25.33	36.51	37.80
INPL	14	2308	-12.72	***	-18.87	-20.77	***	***
INPL	14	2426	23.10	***	2.71	***	34.54	32.77
INPL	31	145	-100.43	***	-10.37	-12.85	-25.15	-34.24
INPL	31	619	-32.27	***	-33.75	-30.85	-33.46	-45.60
KRIS	12	1406	-34.14	-36.70	-38.65	-36.59	-26.97	-8.42
KRIS	12	1902	13.22	20.15	34.32	39.33	50.14	56.79
KRIS	12	1903	-24.46	-25.31	-14.82	-12.63	-10.29	4.51
KRIS	21	280	58.26	67.12	54.75	42.34	***	***
KRIS	36	321	***	3.48	3.14	1.30	2.35	3.58
KRIS	40	5623	***	-4.99	-4.22	-7.34	-9.22	-11.39
LDS	12	202	***	***	87.06	***	***	***
LDS	35	289	-2.69	-2.99	-1.69	-0.93	-1.73	-2.01
MSL	12	381	1.92	-41.79	-44.86	***	***	***
MSL	12	933	9.58	3.29	-6.03	-13.16	-15.90	-7.04
MSL	12	1770	-13.60	-39.68	-42.12	-39.44	-21.58	-15.11
MSL	36	274	12.64	12.12	13.71	9.74	6.22	6.51
NAOM	14	885	-23.28	-24.33	-18.47	-9.44	-7.42	-10.06
NAOM	14	1315	-50.96	-52.60	-51.65	-49.91	-51.19	-52.03
NAOM	34	2146	-73.21	-69.60	-67.32	-70.47	-72.49	-74.51
NAOT	31	284	-196.11	-207.86	-211.81	-198.49	-209.28	-202.29
NAOT	34	1075	-20.53	-22.21	-22.70	-18.57	-19.45	-18.28
NAOT	34	2494	-30.53	-36.29	-41.71	-41.68	-34.98	-34.98
NIM	12	1615	-479.69	***	***	***	***	***
NIM	12	1633	-3.17	16.79	17.89	4.94	***	***
NIM	12	1640	-13.31	5.89	6.76	-4.94	***	***
NIST	13	61	-85.38	-83.04	-87.38	-90.40	-91.17	-87.93
NIST	14	324	-40.68	-44.72	-47.44	***	***	***
NIST	14	601	8.84	5.80	***	***	***	***
NIST	14	1316	-33.79	-31.78	-29.84	-27.44	-28.13	-32.75
NIST	16	217	32.83	30.83	31.34	27.46	19.44	29.52
NIST	18	1007	-125.86	-124.23	-130.81	-146.78	-209.79	-221.87
NIST	31	569	-118.14	-121.08	-121.97	-125.14	-132.91	-132.92
NIST	34	493	-86.22	-87.79	-88.59	-85.10	-86.16	-87.69
NIST	35	132	***	***	***	-6.84	-6.44	-6.82
NIST	35	182	-5.71	-5.21	-5.63	-6.33	-5.79	-5.78

TABLE 14A. (CONT.)

LAB.	CLOCK		49409	49469	49529	49589	49649	49709
NIST	35	408	***	***	-10.29	-10.77	-9.61	-9.93
NIST	40	201	5.30	2.73	3.16	3.10	3.70	4.93
NPL	12	316	-27.89	-35.29	-36.05	-37.12	-16.32	***
NPL	14	418	-2.26	-10.43	-13.42	-12.16	-5.62	-3.08
NPL	14	1334	-157.02	-163.37	-158.65	-154.24	-128.34	-151.64
NPL	14	1813	-65.57	-64.86	-66.88	-68.57	-60.16	-61.48
NPL	14	2064	-27.35	-26.84	-24.61	-20.84	-15.11	-13.89
NPL	31	328	45.97	80.00	***	***	***	***
NPL	35	123	1.93	2.62	2.00	2.74	2.82	2.99
NPL	35	404	***	***	16.98	14.02	13.73	13.11
NPL	40	1701	-4.38	-4.32	-9.45	-5.50	-5.26	-5.08
NRC	14	267	-341.05	-347.60	-341.18	-323.20	-335.84	-360.39
NRC	35	234	3.61	3.32	3.98	3.43	3.63	2.69
NRC	90	63	7.87	9.09	8.86	8.39	8.35	8.08
NRLM	14	1632	-29.24	-29.84	-25.29	-19.44	-22.09	-24.67
NRLM	31	312	326.52	***	371.44	257.02	267.79	290.30
NRLM	35	224	13.34	***	15.66	16.08	16.66	15.87
OMH	12	1067	14.13	0.07	-0.92	1.29	4.42	17.70
ORB	12	205	-26.09	-46.26	***	***	***	***
ORB	21	312	16.88	14.14	20.54	22.09	23.15	19.37
ORB	35	201	-3.22	-2.55	-3.71	-3.59	-2.61	-3.01
ORB	35	202	4.38	4.05	4.40	4.20	4.44	3.85
ORB	40	2601	***	***	***	-50.67	-67.04	-76.37
PTB	14	394	-32.69	-14.31	***	***	***	***
PTB	14	1103	-65.28	-66.83	-61.80	-55.47	-61.43	***
PTB	14	2379	-58.19	-59.69	-55.60	-46.91	-56.06	-59.28
PTB	35	128	15.23	16.01	15.96	15.22	15.03	***
PTB	35	271	-0.71	1.53	3.39	3.74	3.21	***
PTB	35	415	***	***	***	-0.32	-0.96	-1.14
PTB	40	505	12.96	14.88	14.67	1.74	-11.69	***
PTB	40	537	-18.21	-12.23	-4.57	1.76	5.74	7.35
PTB	92	1	0.85	0.18	0.37	-0.40	0.55	0.83
PTB	92	2	0.28	0.33	-1.05	-1.41	-0.60	-0.19
RC	40	6483	***	-5.11	***	***	***	***
ROA	12	1223	***	***	6.50	-11.01	-18.07	-32.76
ROA	14	896	-20.61	-23.98	-22.94	-9.96	***	0.01
ROA	14	1569	***	***	-21.65	-16.51	-15.20	-16.97
ROA	16	113	58.86	49.25	41.64	41.77	41.33	45.70
ROA	16	121	16.95	0.38	-44.75	-30.32	-32.45	-8.94
ROA	31	422	-4.25	-4.63	-7.28	-12.14	-8.61	-6.68
SCL	14	2127	75.42	77.11	94.32	104.35	95.70	92.04
SCL	31	838	-110.53	-121.09	-117.42	-125.95	-132.54	-142.10
SNT	14	900	-66.46	-74.37	-78.27	-82.85	-86.73	-85.66
SNT	14	1376	-110.16	-110.46	-110.10	-108.15	-102.95	-103.11
SNT	16	137	-17.54	-14.59	-18.35	-15.44	-16.05	-17.27

TABLE 14A. (CONT.)

LAB.	CLOCK		49409	49469	49529	49589	49649	49709
SO	12	2067	-72.14	***	-66.25	-69.42	-62.44	-70.16
SO	40	5101	-68.81	***	-57.75	-72.16	-60.01	-69.40
SU	40	3803	4.16	4.95	***	***	***	***
SU	40	3804	-20.94	***	***	***	***	***
SU	40	3805	-27.64	-27.46	-28.05	-28.29	-28.59	-28.68
SU	40	3806	-6.40	-5.51	-5.84	-5.78	-4.97	-4.77
SU	40	3807	-11.45	-10.67	-10.60	-9.73	-8.95	-8.14
SU	40	3808	-8.77	-9.67	-10.85	-12.61	-14.18	-15.82
TL	12	1455	-145.86	-122.81	-117.21	***	***	***
TL	12	2276	***	-197.58	-195.52	-284.58	-291.56	-294.83
TL	16	283	***	***	***	***	13.35	20.69
TL	31	317	-54.70	-62.26	-73.38	-91.78	-41.92	-55.42
TL	35	160	5.87	6.45	7.27	6.85	7.34	***
TL	35	300	***	13.19	14.27	12.03	12.05	11.88
TP	12	335	-101.82	-104.42	-102.66	-96.57	-95.34	-90.25
TP	36	154	13.76	13.92	12.75	12.29	13.83	10.82
TP	36	163	10.41	10.23	8.51	8.29	10.29	10.39
TP	36	326	***	12.34	11.18	11.39	11.84	11.70
TUG	14	1654	29.62	30.33	28.92	28.75	30.31	27.44
TUG	18	108	689.74	706.69	722.61	737.52	746.53	774.94
TUG	35	107	-0.84	-0.98	-0.49	-0.16	0.11	-0.23
TUG	35	247	6.41	8.12	8.71	8.88	10.11	11.37
UME	35	251	***	***	***	***	***	10.31
UME	35	252	***	***	***	***	***	-6.56
USNO	14	532	-221.00	-222.86	***	***	***	***
USNO	14	654	-79.91	***	-77.49	-75.42	-74.55	-75.48
USNO	14	656	94.58	***	***	32.83	***	***
USNO	14	752	121.12	***	***	***	***	***
USNO	14	837	-135.44	***	***	***	***	***
USNO	14	862	-11.92	-8.01	-18.50	***	-14.53	-34.23
USNO	14	1100	-153.23	***	***	***	***	***
USNO	14	1255	-49.34	***	***	***	***	***
USNO	14	1264	48.94	***	***	***	***	***
USNO	14	1423	-39.35	-33.03	-39.62	***	-32.62	-30.80
USNO	14	1653	-45.28	***	***	***	***	***
USNO	14	2314	-2.55	-4.74	-11.62	***	-15.30	-4.49
USNO	14	2481	-95.51	***	38.03	***	20.45	12.91
USNO	14	2482	-80.23	-75.22	***	***	***	***
USNO	14	2484	-89.36	***	***	***	***	***
USNO	14	2485	38.06	***	***	***	***	***
USNO	31	333	***	-48.10	-56.34	***	-60.49	-59.03
USNO	31	336	-157.08	***	***	***	***	***
USNO	31	340	-26.50	***	***	***	***	***
USNO	31	341	***	***	***	-25.42	-25.54	-19.83
USNO	31	527	28.59	***	***	***	***	***

TABLE 14A. (CONT.)

LAB.	CLOCK	49409	49469	49529	49589	49649	49709
USNO	31 2483	***	***	72.36	77.16	***	***
USNO	34 651	-68.00	-67.19	***	***	***	***
USNO	34 653	-27.14	-26.47	-25.63	-25.48	-24.78	-26.30
USNO	34 1452	***	-400.09	-408.97	***	-424.72	-434.37
USNO	34 1586	***	***	-34.34	-34.83	-36.16	-34.52
USNO	34 1605	-72.54	***	***	-83.69	***	***
USNO	34 1710	-22.77	***	***	-57.85	-63.42	***
USNO	34 1809	-45.99	***	***	***	***	***
USNO	34 2081	-34.30	-27.35	-23.40	***	-16.82	-15.64
USNO	34 2100	6.70	6.63	3.76	-1.33	1.02	6.31
USNO	34 2312	72.04	***	***	***	***	***
USNO	34 2313	***	***	48.71	50.15	48.63	46.68
USNO	34 2315	14.06	***	***	***	***	***
USNO	34 2486	3.27	7.50	7.95	***	***	***
USNO	34 2487	-7.93	***	-37.51	-37.84	-37.26	-35.74
USNO	34 2488	-64.27	-59.75	-50.86	-44.24	-42.74	-38.66
USNO	35 101	***	17.39	17.04	17.40	17.26	16.75
USNO	35 104	12.31	12.69	12.67	13.02	12.70	***
USNO	35 106	***	***	10.46	9.55	9.51	9.62
USNO	35 108	14.15	14.04	14.28	13.60	13.21	13.58
USNO	35 114	15.83	16.71	17.19	16.66	17.79	17.84
USNO	35 142	3.29	3.85	4.53	3.91	4.76	4.86
USNO	35 145	1.78	1.20	1.52	2.07	1.92	1.83
USNO	35 146	1.14	2.35	2.93	2.80	3.13	4.02
USNO	35 148	-16.96	-17.10	-16.77	-17.05	-17.32	-17.70
USNO	35 150	21.92	21.78	21.33	20.61	21.96	21.41
USNO	35 152	4.07	1.83	-0.87	***	-0.07	1.50
USNO	35 153	18.34	17.68	17.46	16.54	***	***
USNO	35 156	6.24	6.95	6.31	6.11	5.90	6.25
USNO	35 161	2.91	2.89	2.94	2.21	2.99	2.91
USNO	35 164	6.60	7.42	7.16	6.91	7.41	7.33
USNO	35 165	19.66	20.43	19.91	19.75	19.63	19.75
USNO	35 166	-3.24	-3.46	-3.29	-3.18	-3.62	-3.26
USNO	35 167	11.32	11.77	11.73	11.68	11.55	11.36
USNO	35 169	-7.84	-7.58	-7.60	-7.42	-7.58	-8.51
USNO	35 171	13.30	14.35	16.44	17.27	18.89	19.42
USNO	35 213	-10.71	-11.58	-11.38	-11.97	-12.36	-12.37
USNO	35 217	-6.72	-6.51	-6.61	-6.44	-5.90	-5.62
USNO	35 225	6.52	7.67	7.00	***	6.91	7.14
USNO	35 226	-0.21	-0.12	-0.54	0.33	0.00	0.58
USNO	35 227	9.21	9.63	9.48	***	10.68	11.09
USNO	35 229	13.08	14.02	14.24	14.41	15.27	14.97
USNO	35 231	-27.36	-28.41	-28.51	-28.96	-28.95	-28.11
USNO	35 233	-0.43	-0.72	0.02	-1.09	-1.47	-1.05
USNO	35 242	13.95	14.54	15.66	16.55	17.27	18.16

TABLE 14A. (CONT.)

LAB.	CLOCK	49409	49469	49529	49589	49649	49709
USNO	35 244	14.21	14.77	14.60	14.92	14.07	14.08
USNO	35 246	***	***	***	5.97	4.92	4.99
USNO	35 249	-4.74	-4.62	-4.21	-5.15	-5.28	-5.08
USNO	35 253	-9.54	-9.23	-9.15	-9.80	-9.69	-9.13
USNO	35 254	-0.69	-0.53	-0.72	***	-3.60	-3.48
USNO	35 255	-10.26	-10.28	-10.69	-11.82	-12.07	-12.49
USNO	35 256	-14.52	-17.62	-19.94	-22.25	-21.69	-21.21
USNO	35 260	3.54	2.87	3.31	3.92	3.28	3.41
USNO	35 266	***	***	1.56	0.27	2.07	2.21
USNO	35 268	3.00	2.62	2.84	2.72	2.39	2.11
USNO	35 270	6.07	5.96	6.34	6.09	6.14	6.08
USNO	35 279	-16.34	-15.77	-16.01	-15.85	-15.58	-15.66
USNO	35 389	***	***	***	***	***	-15.71
USNO	35 392	***	***	1.33	-0.30	-0.90	-0.80
USNO	35 394	***	***	13.38	13.17	13.70	13.12
USNO	35 416	***	***	***	***	-1.16	***
USNO	40 702	-0.10	-0.35	-1.07	-2.22	-2.61	-3.09
USNO	40 703	***	***	1.46	***	-1.86	-1.31
USNO	40 704	-54.98	-55.21	-55.36	-55.77	-55.50	-55.53
USNO	40 705	-31.32	-31.28	-31.28	-31.81	-31.91	-32.12
USNO	40 708	***	***	-28.15	-30.14	-30.99	-31.71
USNO	40 709	-44.02	-45.50	-47.32	-49.26	-49.86	-50.94
USNO	40 710	-26.37	-27.09	-27.61	-28.16	-27.37	-26.71
USNO	40 711	1.94	***	***	***	4.33	5.40
USNO	40 712	-2.26	***	-10.30	-13.97	-16.30	-18.48
USNO	40 718	-24.94	-27.14	-29.14	-33.26	***	***
USNO	40 719	-25.50	-28.28	-32.46	-36.66	***	***
USNO	40 722	-31.41	-35.96	-41.06	-46.73	-53.52	-61.26
USNO	40 723	7.31	4.26	-0.62	-6.32	-11.93	-15.99
USNO	40 6201	8.57	8.89	***	***	-26.02	***
VSL	12 1489	-25.01	-55.52	-39.44	-34.32	***	***
VSL	14 1034	-56.90	-55.61	-53.28	-49.00	-50.14	-48.05
VSL	21 125	68.49	66.29	66.64	70.15	68.78	70.09
VSL	31 288	-3.01	11.94	17.98	46.16	52.01	66.70
VSL	35 179	23.42	22.85	22.92	22.69	22.33	21.40
VSL	35 456	***	***	***	***	***	10.70

The clocks are designated by their type (2 digits) and serial number in the type. The codes for the types are:

12 HEWLETT-PACKARD 5061A
13 EBAUCHES, OSCILLATOM B5000
14 HEWLETT-PACKARD 5061A OPT. 4
16 OSCILLOQUARTZ 3200
17 OSCILLOQUARTZ 3000
18 FREQ. AND TIME SYSTEMS INC. 4000
4x HYGROGEN MASERS
9x PRIMARY CLOCKS AND PROTOTYPES
21 OSCILLOQUARTZ 3210
23 OSCILLOQUARTZ EUDICS 3020
30 HEWLETT-PACKARD 5061B
31 HEWLETT-PACKARD 5061B OPT. 4
34 H-P 5061A/B WITH 5071A TUBE
35 HEWLETT-PACKARD 5071A High perf.
36 HEWLETT-PACKARD 5071A Low. perf.

TABLE 14B. CORRECTIONS FOR AN HOMOGENEOUS USE OF THE CLOCK RATES PUBLISHED IN THE CURRENT AND PREVIOUS ANNUAL REPORTS.

Each line refers to the same clock working without interruption.

	1994	1993		1992		1991	
	clock n°	clock n°	corr. (ns/d)	clock n°	corr. (ns/d)	clock n°	corr. (ns/d)
APL	40 3101	40 3101		40 3101		40 3101(1)	+18.00
	40 3102	40 3102		40 3102		40 3102(2)	+12.00
	40 3106	40 3106		40 3106		40 3106(3)	+10.00
CH	16 69	16 69		16 69		16 69(4)	-28.00
	21 243	21 243	+70.00	21 243	+70.00	21 243(5)	+70.00
CRL	14 764	14 764		14 764		14 764(6)	
	14 1729	14 1729		14 1729		14 1729(7)	
	14 865	14 865		14 865	+23.39	14 865(8)	+23.39
CSAO	12 1646	12 1646		12 1646		12 1646(9)	+31.60
	12 1648	12 1648		12 1648		12 1648(10)	
IFAG	14 1105	14 1105		14 1105	+27.00		
NIST	13 61	13 61		13 61		13 61(11)	-25.32
	14 324	14 324		14 324		14 324(12)	
	14 601	14 601		14 601		14 601	+17.28
	14 1316	14 1316		14 1316		14 1316(13)	
	16 217	16 217		16 217		16 217(14)	
NPL	14 1813	14 1813	-40.00	14 1813	-40.00	14 1813(15)	-40.00
	40 1701	40 1701		40 1701		40 1701	+27.00
ROA	16 121	16 121	-113.00	16 121	-113.00	16 121(16)	-113.00
SNT	14 900	14 900		14 900	+14.00	14 900(17)	+14.00
SU	40 3806	40 3806		40 3806	-13.00	40 3806	-13.00
VSL	31 288	31 288		31 288		31 288	-30.00

(1) A correction of +7.0 ns/d has to be applied in 1990 and for the last two-month interval of 1989.
(2) A correction of +8.0 ns/d has to be applied in 1990.
(3) A correction of +10.0 ns/d has to be applied in 1990 and for the last two-month interval of 1989.
(4) A correction of -28.00 ns/d has to be applied in 1990 and in 1989.
(5) A correction of +70.00 ns/d has to be applied in 1990, 1989, 1988 and 1987.
(6) A correction of +40.02 ns/d has to be applied in 1990 and for the last five two-month intervals of 1989.
(7) A correction of +51.40 ns/d has to be applied in 1990, 1989, 1988 and for the last two-month interval of 1987.
(8) A correction of +23.39 ns/d has to be applied in 1990, 1989, 1988 and for the last two-month interval of 1987.

(9) A correction of +31.60 ns/d has to be applied in 1990, 1989 and 1988. A correction of +73.20 ns/d has to be applied in 1987 and for the last three two-month intervals of 1986.

(10) A correction of +98.60 ns/d has to be applied in 1990, 1989, 1988, 1987 1986 and 1985.

(11) A correction of -25.32 ns/d has to be applied in 1990 and 1989.

(12) A correction of +17.07 ns/d has to be applied in 1990.

(13) A correction of +10.70 ns/d has to be applied in 1990. A correction of +27.63 ns/d has to be applied in 1989, 1988, 1987, 1986, 1985 and for the last three two-month intervals of 1984.

(14) A correction of +58.63 ns/d has to be applied in 1990. A correction of +52.50 ns/d has to be applied in 1989 and 1988.

(15) A correction of -40.00 ns/d has to be applied in 1990 and for the last four two-month intervals of 1989.

(16) A correction of -113.00 ns/d has to be applied in 1990, 1989, 1988, 1987, and 1986.

(17) A correction of +14.00 ns/d has to be applied in 1990, 1989, 1988, 1987, 1986, 1985 and 1984.

TABLE 15A. WEIGHTS OF CONTRIBUTING CLOCKS IN 1994

(FILE AVAILABLE VIA INTERNET UNDER THE NAME WTAI94.AR)

Clock weights are computed for two-month intervals ending at the dates given in the table.
Since 1988 January 1st, the absolute weight of a given clock cannot exceed the value 100. For the year 1994, it corresponds to a maximum relative weight of about 0.8 % .

*** denotes that the clock was not used.

LAB.	CLOCK		49409	49469	49529	49589	49649	49709
AOS	23	67	33	0	6	9	9	8
APL	14	793	17	11	11	13	13	13
APL	31	571	40	100	46	35	26	26
APL	40	3101	100	53	50	40	44	50
APL	40	3102	100	50	50	21	25	***
APL	40	3106	67	53	48	48	63	68
AUS	12	1708	***	0	0	50	0	***
AUS	14	1443	***	0	0	***	***	***
AUS	14	2010	49	71	94	***	***	***
AUS	14	2020	***	0	***	***	***	***
AUS	36	207	87	100	100	100	100	100
AUS	36	338	***	0	***	***	***	***
AUS	36	339	***	0	***	***	***	***
AUS	36	340	***	0	0	100	100	100
AUS	36	424	***	***	***	***	0	0
AUS	40	5401	100	100	100	100	100	100
AUS	44	2	100	100	100	100	100	100
CAO	16	183	90	100	100	100	100	100
CAO	23	62	0	0	7	10	17	20
CAO	30	384	0	0	0	3	4	5
CH	12	285	0	3	4	4	8	45
CH	16	64	46	***	***	***	***	***
CH	16	69	4	4	4	4	5	29
CH	16	77	49	29	23	21	49	100
CH	16	140	15	11	9	0	4	3
CH	17	206	3	2	3	2	2	2
CH	21	179	4	3	3	5	14	20
CH	21	194	57	69	31	11	9	9
CH	21	217	11	26	22	22	37	100
CH	21	243	0	0	***	***	***	***
CH	31	403	100	71	33	0	3	2
CH	35	413	***	***	***	0	0	100
CH	36	354	***	***	***	0	0	100
CRL	14	764	64	68	100	79	91	100
CRL	14	865	0	***	***	***	***	***

TABLE 15A. (CONT.)

LAB.	CLOCK		49409	49469	49529	49589	49649	49709
CRL	14	932	100	***	***	***	***	***
CRL	14	1729	6	5	5	10	36	0
CRL	14	2456	100	100	100	100	84	100
CRL	34	131	56	46	35	46	30	26
CRL	35	112	***	***	0	0	100	100
CRL	35	144	100	100	100	100	100	100
CRL	35	332	***	***	***	0	0	100
CRL	35	342	***	***	***	0	0	100
CRL	35	343	***	***	***	0	0	100
CRL	40	2008	***	***	***	***	***	0
CSAO	12	1646	0	***	***	***	***	***
CSAO	12	1648	11	5	3	3	5	29
CSAO	12	2068	5	8	8	6	3	3
CSAO	30	152	***	0	0	6	0	1
CSAO	40	4902	0	***	***	***	0	0
F	12	2405	31	***	***	***	***	***
F	14	51	100	100	91	85	70	63
F	14	134	4	4	12	0	2	2
F	14	158	6	7	***	***	***	***
F	14	195	46	100	100	100	100	87
F	14	475	100	85	79	99	100	84
F	14	500	100	100	100	***	***	0
F	14	560	100	100	100	***	***	***
F	14	753	100	100	100	97	68	88
F	14	1120	100	100	100	100	100	100
F	14	1407	100	54	56	68	95	***
F	14	1645	100	55	53	0	12	15
F	14	1842	0	0	***	0	0	9
F	16	106	0	84	100	***	***	0
F	16	178	***	0	***	***	***	***
F	16	187	***	***	***	***	***	0
F	17	489	9	15	***	***	0	0
F	35	122	***	0	0	100	100	100
F	35	124	***	0	0	100	100	100
F	35	131	0	100	100	100	100	100
F	35	158	100	100	100	100	100	100
F	35	172	100	100	100	100	100	100
F	35	198	***	***	***	0	0	100
F	35	396	***	***	***	***	0	0
F	40	816	***	***	***	***	0	0
GUM	14	1144	10	9	9	8	4	3
GUM	30	652	9	40	100	0	1	1
GUM	30	664	8	9	23	0	8	7
IEN	12	303	100	100	100	***	***	***
IEN	14	469	100	100	100	100	***	***

TABLE 15A. (CONT.)

LAB.	CLOCK		49409	49469	49529	49589	49649	49709
IEN	14	893	13	28	100	100	***	***
IEN	31	659	100	100	100	100	100	100
IEN	35	219	100	100	100	100	100	100
IFAG	14	1105	2	2	3	2	2	2
IFAG	16	131	100	100	100	76	100	100
IFAG	16	138	1	1	1	1	1	1
IFAG	16	173	1	1	1	1	1	1
IGMA	14	2407	0	0	0	0	0	0
IGMA	16	112	0	0	0	0	0	0
IGMA	17	127	0	0	0	0	0	0
INPL	14	2308	7	***	0	0	***	***
INPL	14	2426	23	***	0	***	0	0
INPL	31	145	2	***	0	0	0	5
INPL	31	619	19	***	0	0	100	0
KRIS	12	1406	6	8	10	26	0	0
KRIS	12	1902	4	9	0	7	5	4
KRIS	12	1903	4	5	8	32	25	8
KRIS	21	280	15	16	16	14	***	***
KRIS	36	321	***	0	0	100	100	100
KRIS	40	5623	***	0	0	100	100	95
LDS	12	202	***	***	0	***	***	***
LDS	35	289	0	100	100	100	100	100
MSL	12	381	0	0	1	***	***	***
MSL	12	933	0	0	8	7	7	11
MSL	12	1770	0	0	2	4	5	6
MSL	36	274	0	0	100	100	93	97
NAOM	14	885	0	5	10	12	15	18
NAOM	14	1315	42	56	83	100	100	100
NAOM	34	2146	56	39	34	45	99	100
NAOT	31	284	24	0	7	8	9	25
NAOT	34	1075	30	100	100	100	100	100
NAOT	34	2494	2	2	2	5	22	53
NIM	12	1615	13	***	***	***	***	***
NIM	12	1633	23	17	15	14	***	***
NIM	12	1640	22	17	16	15	***	***
NIST	13	61	48	37	69	100	96	100
NIST	14	324	6	7	10	***	***	***
NIST	14	601	100	100	***	***	***	***
NIST	14	1316	91	58	49	47	95	100
NIST	16	217	32	31	33	34	0	43
NIST	18	1007	100	100	100	0	0	1
NIST	31	569	81	69	78	69	0	25
NIST	34	493	100	100	100	100	100	100
NIST	35	132	***	***	***	0	0	100
NIST	35	182	100	100	100	100	100	100

TABLE 15A. (CONT.)

LAB.	CLOCK		49409	49469	49529	49589	49649	49709
NIST	35	408	***	***	0	0	100	100
NIST	40	201	100	100	100	100	100	100
NPL	12	316	8	8	8	8	0	***
NPL	14	418	0	25	25	25	26	43
NPL	14	1334	100	46	55	96	0	7
NPL	14	1813	73	73	62	48	100	97
NPL	14	2064	63	71	69	73	0	29
NPL	31	328	0	0	***	***	***	***
NPL	35	123	100	100	100	100	100	100
NPL	35	404	***	***	0	0	100	100
NPL	40	1701	100	100	100	100	100	100
NRC	14	267	4	3	3	7	15	7
NRC	35	234	100	100	100	100	100	100
NRC	90	63	100	100	100	100	100	100
NRLM	14	1632	100	100	100	68	57	62
NRLM	31	312	1	***	0	0	0	0
NRLM	35	224	100	***	0	0	100	100
OMH	12	1067	36	16	17	22	22	16
ORB	12	205	0	0	***	***	***	***
ORB	21	312	16	92	100	90	61	88
ORB	35	201	100	100	100	100	100	100
ORB	35	202	97	97	96	100	100	100
ORB	40	2601	***	***	***	0	0	3
PTB	14	394	30	23	***	***	***	***
PTB	14	1103	72	82	83	59	63	***
PTB	14	2379	56	50	50	42	49	45
PTB	35	128	100	100	100	100	100	***
PTB	35	271	100	100	100	100	100	***
PTB	35	415	***	***	***	0	0	100
PTB	40	505	100	100	100	0	0	***
PTB	40	537	19	14	10	8	8	10
PTB	92	1	100	100	100	100	100	100
PTB	92	2	100	100	100	100	100	100
RC	40	6483	***	0	***	***	***	***
ROA	12	1223	***	***	0	0	3	3
ROA	14	896	66	31	27	26	***	0
ROA	14	1569	***	***	0	0	43	84
ROA	16	113	8	9	14	19	21	21
ROA	16	121	19	18	0	2	2	2
ROA	31	422	81	72	94	89	100	100
SCL	14	2127	0	0	0	3	5	8
SCL	31	838	0	0	17	16	12	8
SNT	14	900	10	17	28	15	11	17
SNT	14	1376	26	40	67	100	100	79
SNT	16	137	55	36	37	50	80	100

TABLE 15A. (CONT.)

LAB.	CLOCK	49409	49469	49529	49589	49649	49709
SO	12 2067	39	***	0	0	41	54
SO	40 5101	1	***	0	0	8	14
SU	40 3803	100	100	***	***	***	***
SU	40 3804	100	***	***	***	***	***
SU	40 3805	100	100	100	100	100	100
SU	40 3806	100	100	100	100	100	100
SU	40 3807	0	0	100	100	100	100
SU	40 3808	0	0	100	100	100	100
TL	12 1455	0	0	0	***	***	***
TL	12 2276	***	0	0	0	0	0
TL	16 283	***	***	***	***	0	0
TL	31 317	9	5	4	2	2	3
TL	35 160	100	100	100	100	100	***
TL	35 300	***	0	0	100	100	100
TP	12 335	35	47	100	100	65	34
TP	36 154	100	100	100	100	100	100
TP	36 163	100	100	100	100	100	100
TP	36 326	***	0	0	100	100	100
TUG	14 1654	100	100	100	100	100	100
TUG	18 108	1	1	1	1	1	1
TUG	35 107	0	0	100	100	100	100
TUG	35 247	100	100	100	100	100	100
UME	35 251	***	***	***	***	***	0
UME	35 252	***	***	***	***	***	0
USNO	14 532	1	1	***	***	***	***
USNO	14 654	14	***	0	0	100	100
USNO	14 656	0	***	***	0	***	***
USNO	14 752	6	***	***	***	***	***
USNO	14 837	0	***	***	***	***	***
USNO	14 862	0	0	18	***	0	0
USNO	14 1100	12	***	***	***	***	***
USNO	14 1255	100	***	***	***	***	***
USNO	14 1264	0	***	***	***	***	***
USNO	14 1423	13	13	19	***	0	0
USNO	14 1653	0	***	***	***	***	***
USNO	14 2314	11	14	16	***	0	0
USNO	14 2481	1	***	0	***	0	0
USNO	14 2482	0	15	***	***	***	***
USNO	14 2484	0	***	***	***	***	***
USNO	14 2485	0	***	***	***	***	***
USNO	31 333	***	0	0	***	0	0
USNO	31 336	0	***	***	***	***	***
USNO	31 340	42	***	***	***	***	***
USNO	31 341	***	***	***	0	0	47
USNO	31 527	0	***	***	***	***	***

TABLE 15A. (CONT.)

LAB.	CLOCK	49409	49469	49529	49589	49649	49709
USNO	31 2483	***	***	0	0	***	***
USNO	34 651	5	4	***	***	***	***
USNO	34 653	0	100	100	100	100	100
USNO	34 1452	***	0	0	***	0	0
USNO	34 1586	***	***	0	0	100	100
USNO	34 1605	0	***	***	0	***	***
USNO	34 1710	0	***	***	0	0	***
USNO	34 1809	0	***	***	***	***	***
USNO	34 2081	0	0	16	***	0	0
USNO	34 2100	0	69	100	73	98	88
USNO	34 2312	0	***	***	***	***	***
USNO	34 2313	***	***	0	0	100	100
USNO	34 2315	0	***	***	***	***	***
USNO	34 2486	80	50	51	***	***	***
USNO	34 2487	0	***	0	0	100	100
USNO	34 2488	0	56	21	13	13	10
USNO	35 101	***	0	0	100	100	100
USNO	35 104	0	0	100	100	100	***
USNO	35 106	***	***	0	0	100	100
USNO	35 108	100	100	100	100	100	100
USNO	35 114	100	100	100	100	100	100
USNO	35 142	100	100	100	100	100	100
USNO	35 145	100	100	100	100	100	100
USNO	35 146	100	100	100	100	100	100
USNO	35 148	100	100	100	100	100	100
USNO	35 150	100	100	100	100	100	100
USNO	35 152	100	100	100	***	0	0
USNO	35 153	100	100	100	100	***	***
USNO	35 156	100	100	100	100	100	100
USNO	35 161	100	100	100	100	100	100
USNO	35 164	100	100	100	100	100	100
USNO	35 165	100	100	100	100	100	100
USNO	35 166	100	100	100	100	100	100
USNO	35 167	100	100	100	100	100	100
USNO	35 169	100	100	100	100	100	100
USNO	35 171	100	100	100	100	100	100
USNO	35 213	100	100	100	100	100	100
USNO	35 217	100	100	100	100	100	100
USNO	35 225	100	100	100	***	0	0
USNO	35 226	100	100	100	100	100	100
USNO	35 227	100	100	100	***	0	0
USNO	35 229	100	100	100	100	100	100
USNO	35 231	100	100	100	100	100	100
USNO	35 233	100	100	100	100	100	100
USNO	35 242	100	100	100	100	100	100

TABLE 15A. (CONT.)

LAB.	CLOCK		49409	49469	49529	49589	49649	49709
USNO	35	244	100	100	100	100	100	100
USNO	35	246	***	***	***	0	0	100
USNO	35	249	100	100	100	100	100	100
USNO	35	253	100	100	100	100	100	100
USNO	35	254	100	100	100	***	0	0
USNO	35	255	100	100	100	100	100	100
USNO	35	256	0	100	100	92	100	100
USNO	35	260	100	100	100	100	100	100
USNO	35	266	***	***	0	0	100	100
USNO	35	268	100	100	100	100	100	100
USNO	35	270	45	63	93	100	100	100
USNO	35	279	0	100	100	100	100	100
USNO	35	389	***	***	***	***	***	0
USNO	35	392	***	***	0	0	100	100
USNO	35	394	***	***	0	0	100	100
USNO	35	416	***	***	***	***	0	***
USNO	40	702	0	100	100	100	100	100
USNO	40	703	***	***	0	***	0	0
USNO	40	704	100	100	100	100	100	100
USNO	40	705	100	100	100	100	100	100
USNO	40	708	***	***	0	0	100	100
USNO	40	709	0	71	76	72	79	100
USNO	40	710	100	100	100	100	100	100
USNO	40	711	0	***	***	***	0	0
USNO	40	712	0	***	0	0	55	54
USNO	40	718	21	18	19	25	***	***
USNO	40	719	18	25	31	29	***	***
USNO	40	722	0	0	21	15	11	8
USNO	40	723	9	10	12	13	12	12
USNO	40	6201	0	100	***	***	0	***
VSL	12	1489	5	5	5	5	***	***
VSL	14	1034	56	66	64	65	51	75
VSL	21	125	27	54	90	100	100	100
VSL	31	288	0	2	1	1	1	1
VSL	35	179	100	100	100	100	100	100
VSL	35	456	***	***	***	***	***	0

The clocks are designated by their type (2 digits) and serial number in the type. The codes for the types are:

12 HEWLETT-PACKARD 5061A
13 EBAUCHES, OSCILLATOM B5000
14 HEWLETT-PACKARD 5061A OPT. 4
16 OSCILLOQUARTZ 3200
17 OSCILLOQUARTZ 3000
18 FREQ. AND TIME SYSTEMS INC. 4000
4x HYDROGEN MASERS
9x PRIMARY CLOCKS AND PROTOTYPES
21 OSCILLOQUARTZ 3210
23 OSCILLOQUARTZ EUDICS 3020
30 HEWLETT-PACKARD 5061B
31 HEWLETT-PACKARD 5061B OPT. 4
34 H-P 5061A/B WITH 5071A TUBE
35 HEWLETT-PACKARD 5071A High perf.
36 HEWLETT-PACKARD 5071A Low. perf.

TABLE 15B. STATISTICAL DATA ON THE WEIGHTS ATTRIBUTED TO THE CLOCKS IN 1994

Interval 1994	Total number of clocks	Number of clocks with a given weight							
		weights 0*	0**	weight 1-19	weight 20-39	weight 40-59	weight 60-79	weight 80-99	weight 100
Jan-Feb	240	50	8	51	15	15	6	7	88
Mar-Apr	221	38	6	44	11	16	12	5	89
May-Jun	230	44	5	44	15	10	8	8	96
Jul-Aug	221	41	9	41	12	10	9	7	92
Sep-Oct	229	38	13	40	10	8	7	9	104
Nov-Dec	225	32	5	42	11	9	5	9	112

* A priori null weight (test interval of new clocks).
** Null weight resulting from the statistics.
Clocks with missing data during a two-month interval of computation are excluded.

ANNEX I

Access to the BIPM Time Section data via anonymous FTP

The BIPM Time section is making available several publications and data files via anonymous ftp. To access it, one should use the following procedure (precise syntax may depend on the machine one is running):

```
ftp 145.238.2.2         ! to connect
user anonymous          ! system requests that you enter your identity as a
                          password
cd [anonymous.tai]      ! to access the [.tai] subdirectory
get read.me             ! the read.me file is listed below
cd [.subdirectory]      ! to go to one of the subdirectories
```

Of course, when logged on, one can go directly to the proper subdirectory by issuing the command:
cd [anonymous.tai.subdirectory]
or just,
cd [.tai.subdirectory]
and get the files needed.

Listing of the READ.ME file:

last update: 31 March 1995

BUREAU INTERNATIONAL DES POIDS ET MESURES
TIME SECTION

The [.tai] subdirectory offers via ANONYMOUS FTP (node 145.238.2.2) informations of interest for the time & frequency community. This service is under development. It presently contains 3 subdirectories:

```
    [.tai.gps]              A selection of recent GPS time data
                            (presently upon request)

    [.tai.publication]      Latest issue of Time Section publications
        Circular T#xx in file cirt.xx
        GPS schedule #xx in file schgps.xx

    [.tai.scale]            Time scales data (most recent year or update)
                            (previous years upon request)
        TT(BIPMxx) in file TTBIPM.xx
        For year xx until 92:
            UTC-UTC(labs) in file UTC.xx
            TAI-TA(labs) in file TA.xx
        For year xx starting with 93:
        Files issued from tables of the Annual Report
            Frequency difference of EAL and TAI in file EALTAIxx.AR
            TAI frequency in file FTAIxx.AR
            Duration of TAI scale interval in file SITAIxx.AR
            TAI-TA(labs) in file TAIxx.AR
            UTC-UTC(labs) in file UTCxx.AR
            UTC-GPS time in file UTCGPSxx.AR
            UTC-GLONASS time in file UTCGLOxx.AR
            Rates of clocks in file RTAIxx.AR
            Weights of clocks in file WTAIxx.AR
```

For any comment or query send a message to: bipm@mesiob.obspm.fr
or tai@bipm.fr

TIME SIGNALS

The time signal emissions reported here follow the UTC system, in accordance with the Recommendation 460-4 of the Radiocommunication Bureau (RB) of the International Telecommunication Union (ITU) unless otherwise stated.

Their maximum departure from the Universal Time UT1 is thus 0.9 second.

The following tables are based on information received at the BIPM in January and February 1995.

AUTHORITIES RESPONSIBLE FOR THE TIME SIGNAL EMISSIONS

Signal	Authority
ATA	National Physical Laboratory Dr. K.S. Krishnan Road New Delhi - 110012, India
BPM	Shaanxi Astronomical Observatory Chinese Academy of Sciences P.O. Box 18 - Lintong Shaanxi, China
BSF	Telecommunication Laboratories Ministry of Transportation and Communications P.O. Box 71 - Chung-Li 320 Taiwan, Rep. of China
CHU	National Research Council of Canada Institute for National Measurement Standards - Time Standards Ottawa, Ontario, K1A OR6, Canada
DCF77	Physikalisch-Technische Bundesanstalt, Lab. Zeiteinheit Bundesallee 100 W-38116 Braunschweig Germany
EBC	Real Instituto y Observatorio de la Armada - San Fernando Cadiz, Spain
HBG	Service horaire HBG Observatoire Cantonal CH - 2000 Neuchâtel, Suisse
HLA	Time and Frequency Laboratory Korea Research Institute of Standards and Science Yusong P.O. Box 102, Taejon 305-600 Republic of Korea

Signal	Authority
IAM	Istituto Superiore delle Poste e delle Telecomunicazioni Viale Europa 190 00144 - Roma, Italia
JG2AS, JJY	Standards and Measurements Division Communications Research Laboratory 2-1, Nukui-kitamachi 4-chome Koganei-shi, Tokyo 184 Japan
LOL	Servicio de Hidrográfica Naval Observatorio Naval Av. España 2099 1107 - Buenos-Aires, Argentina
MSF	National Physical Laboratory Division of Electrical Science Teddington, Middlesex TW11 0LW United Kingdom
OMA	Institute of Radio Engineering and Electronics - Academy of Sciences of Czech Republic - Chaberská 57 182 51 Praha 8 - Kobylisy, Czech Republic
PPE, PPR	Departemento Serviço da hora Observatorio Nacional (CNPq) Rua General Bruce, 586, Sao Cristovao 20921-030 - Rio de Janeiro, Brasil
RAB-99, RBU, RCH, RID, RJH-63, RJH-69, RJH-77, RJH-86, RJH-90, RTZ, RWM	Institute of Metrology for Time and Space (IMVP), GP "VNIIFTRI" Mendeleevo, Moscow Region 141570 Russia

Signal	Authority
TDF	France Telecom Centre National d'Etudes des Télécommunications - PAB - STC Etalons de fréquence et de temps 196 avenue Henri Ravera 92220 - Bagneux, France
VNG	National Standards Commission P.O. Box 282 North Ryde NSW 2113 Australia
WWV, WWVB, WWVH	Time and Frequency Division, 847.00 National Institute of Standards and Technology - 325 Broadway Boulder, Colorado 80303, U.S.A.
YVTO	Direccion de Hidrografia y Navegacion Observatorio Cagigal Apartado Postal No 6745 Caracas, Venezuela

Note

The emission of time signals by LOL3, Buenos-Aires, Argentina, and by PPE, Rio-de-Janeiro, Brazil, are momentaneouly interrupted.

Station	Location Latitude Longitude	Frequency (kHz)	Schedule (UTC)	Form of the signal
ATA	Greater Kailash New Delhi India 28° 34'N 77° 19'E	10 000	continuous	Second pulses of 5 cycles of a 1 kHz modulation. Minute pulses of 100 ms duration. (The time signals are advanced by 50 ms on UTC).
BPM	Pucheng China 35° 0'N 109° 31'E	2 500 5 000 10 000 15 000	7 h 30 m to 1 h continuous continuous 1 h to 9 h	Signals emitted in advance on UTC by 20 ms. Second pulses of 10 ms of 1 kHz modulation. Minute pulses of 300 ms of 1 kHz modulation. UTC time signals are emitted from minutes 0 to 10, 15 to 25, 30 to 40, 45 to 55. UT1 time signals are emitted from minutes 25 to 29, 55 to 59.
BSF	Chung-Li Taiwan Rep. of China 24° 57'N 121° 9'E	5 000 15 000	continuous except interruption between minutes 35 and 40	From min. 5 to 10, 15 to 20, 25 to 30, 45 to 50, 55 to 60, second pulses of 5 ms duration without 1 kHz modulation. From min. 0 to 5, 10 to 15, ..., 50 to 55, second pulses of 5 ms duration with 1 kHz modulation. The 1 kHz modulation is interrupted 40 ms before and after the pulses. Minute pulses are extended to 300 ms. DUT1: ITU-R code by pulse lengthening.
CHU	Ottawa Canada 45° 18'N 75° 45'W	3 330 7 335 14 670	continuous	Second pulses of 300 cycles of a 1 kHz modulation, with 29th and 51st to 59th pulses of each minute omitted. Minute pulses are 0.5 s long. Hour pulses are 1.0 s long, with the following 1st to 10th pulses omitted. A bilingual (Fr. Eng.) announcement of time (UTC) is made each minute following the 50th second pulse. FSK code (300 bps, Bell 103) after 10 cycles of 1 kHz on seconds 31 to 39. Year, DUT1, leap second information, TAI-UTC and Canadian summer time format on 31, and time code on 32-39. Broadcast is single sideband; upper sideband with carrier reinsert. DUT1 : ITU-R code by double pulse.
DCF77	Mainflingen Germany 50° 1'N 9° 0'E	77.5	continuous	At the beginning of each second (except the 59th second) the carrier amplitude is reduced to about 25 % for a duration of 0.1 s or 0.2 s. Coded transmission of year, month, day, hour, minute and day of the week in a BCD code from second marker No 21 to No 58 (The second marker durations of 0.1 s or 0.2 s correspond to a binary 0 or a binary 1 respectively). The coded time information is related to legal time of Germany and second markers 17 and 18 indicate if the transmitted time refers to UTC(PTB) + 2 h (summer time) or UTC(PTB) + 1 h. Second marker No 15 is prolonged to 0.2 s, if the reserve antenna is in use. To achieve a more accurate time transfer and better use of the frequency spectrum available, an additional pseudo random phase - shift keying of the carrier is superimposed to the AM second markers. No transmission of DUT1.

Station	Location Latitude Longitude	Frequency (kHz)	Schedule (UTC)	Form of the signal
EBC	San Fernando Spain 36° 28'N 6° 12'W	12 008 6 840	10 h 00 m to 10 h 25 m 10 h 30 m to 10 h 55 m	Second pulses of 0.1 s duration of a 1 kHz modulation. Minute pulses of 0.5 s duration of 1 250 Hz modulation. DUT1: ITU-R code by double pulse.
HBG	Prangins Switzerland 46° 24'N 6° 15'E	75	continuous	Interruption of the carrier at the beginning of each second, during 100 ms. The minutes are identified by a double pulse, the hours by a triple pulse. No transmission of DUT1. Time code and other coded information.
HLA	Taedok Science Town Republic of Korea 36° 23'N 127° 22'E	5 000	continuous	Pulses of 9 cycles of 1800 Hz modulation. 29th and 59th second pulses omitted. Hour identified by 0.8 second long 1500 Hz tone. Beginning of each minute identified by 0.8 second long 1800 Hz tone. Voice announcement of hours and minutes each minute following 52nd second pulse. BCD time code given on 100 Hz subcarrier. DUT1 : ITU-R code by double pulse.
IAM	Rome Italy 41° 47'N 12° 27'E	5 000	7 h 30 m to 8 h 30 m 10 h 30 m to 11 h 30 m except sunday and national holidays. Advance by 1 hour in summer.	Second pulses of 5 cycles of 1 kHz modulation. Minute pulses of 20 cycles. Voice announcements every 15 m beginning at 0 h 0 m. DUT1 : ITU-R code by double pulse.
JG2AS	Sanwa Ibaraki Japan 36° 11'N 139° 51'E	40	continuous, except interruptions during communications.	During experimental coded transmission of the total day, hour, minute and DUT1, second pulses are 0.2 s, 0.5 s and 0.8 s duration. In case of no coded transmission, A1A type second pulses of 0.5 s duration.
JJY	Sanwa Ibaraki Japan 36° 11'N 139° 51'E	2 500 5 000 8 000 10 000 15 000	continuous, except interruption between minutes 35 and 39.	Second pulses of 8 cycles of 1 600 Hz modulation. Minute pulses are preceded by a 600 Hz modulation. DUT1 : ITU-R code by lengthening.
LOL1	Buenos-Aires Argentina 34° 37'S 58° 21'W	5 000 10 000 15 000	11 h to 12 h 14 h to 15 h 17 h to 18 h 20 h to 21 h 23 h to 24 h	Second pulses of 5 cycles of 1 000 Hz modulation. Second 59 is omitted. Announcement of hours and minutes every 5 minutes, followed by 3 m of 1 000 Hz or 440 Hz modulation. DUT1 : ITU-R code by lengthening.

Station	Location Latitude Longitude	Frequency (kHz)	Schedule (UTC)	Form of the signal
MSF	Rugby United Kingdom 52° 22'N 1° 11'W	60	continuous except for an interruption for maintenance from 10 h 0 m to 14 h 0 m on the first Tuesday of each month. A longer period of maintenance during summer is announced annually.	Interruptions of the carrier of 100 ms for the second pulses, of 500 ms for the minute pulses. The signal is given by the beginning of the interruption. BCD NRZ code, 100 bits/s (month, day of month, hour, minute), during minute interruption. BCD NRZ code, 1 bit/s (year, month, day of month, day of week, hour, minute) from seconds 17 to 59 in each minute, following the seconds interruption. DUT1 : ITU-R code by double pulse.
OMA	Liblice Czech Republic 50° 4'N 14° 53'E	50	continuous, interrupted on the first Tuesday of each month.	Interruption of the carrier of 100 ms at the beginning of every second, of 500 ms at the beginning of every minute. The precise time is given by the beginning of the interruption. Phase coded announcement of date, UTC and local civil time, leap second and civil time change. No DUT1 code.
PPR	Rio-de-Janeiro Brazil 22° 59'S 43° 11'W	435 4 244 8 634 13 105 17 194.4	1 h 30 m, 14 h 30 m, 21 h 30 m	Second ticks, of A1 type, during the five minutes preceding the indicated times. The minute ticks are longer.
RAB-99	Khabarovsk Russia 48° 30'N 134° 50'E	25	Winter schedule : 2 h 13 m to 2 h 22 m 8 h 13 m to 8 h 22 m 14 h 13 m to 14 h 22 m Summer schedule : 1 h 13 m to 1 h 22 m 7 h 13 m to 7 h 22 m 13 h 13 m to 13 h 22 m	A1N type 0.1 second pulses of 0.025 s duration. Second pulses are prolonged to 0.1 s. 10 second pulses are prolonged to 1 s and minute pulses are prolonged to 10 s. No transmission of DUT1 code.
RBU	Moscow Russia 55° 48'N 38° 18'E	200/3	continuous	DXXXW type signals. The numbers of the minute, hour, day of the month, day of the week, month, year of the century, difference between the universal time and the local time, TJD and DUT1+dUT1 are transmitted each minute from the 1st to the 59th second. From 9 h to 11 h, 19 h to 23 h are NON type signals.
RCH (*)	Tashkent Uzbekistan 41° 19'N 69° 15'E	2 500 5 000 10 000	0 h to 3 h 50 m 5 h to 23 h 50 m 0 h to 3 h 50 m 14 h to 23 h 50 m 5 h to 14 h 20 m	A1X type second pulses are transmitted between minutes 0 and 10, 30 and 40. The pulses at the beginning of the minute are prolonged to 0.5 s. A1N type 0.1 seconds pulses of 0.02 s duration are transmitted between minutes 10 and 20, 40 and 50. The pulses at the beginning of the second are prolonged to 0.04 s and of the minute to 0.5 s. DUT1+dUT1: by double pulses.

(*) CIS radiostation emitting DUT1 information in accordance with the ITU-R code and also giving an additional information, dUT1, which specifies more precisely the difference UT1-UTC down to multiples of 0,02 s, the total value of the correction being DUT1 + dUT1. Positive values of dUT1 are transmitted by the marking of p second markers within the range between the 21th and 24th second so that dUT1 = +p.0,02 s. Negative values of dUT1 are transmitted by the marking of q second markers within the range between the 31th and the 34th second, so that dUT1 = -q.0,02 s.

Station	Location Latitude Longitude	Frequency (kHz)	Schedule (UTC)	Form of the signal
RID (•)	Irkutsk Russia 52° 26'N 104° 2'E	5 004 10 004 15 004	The station simultaneously operates on three frequencies.	A1X type second pulses are transmitted between minutes 20 and 30, 50 and 60. The pulses at the beginning of the minute are prolonged to 0.5 s. A1N type 0.1 second pulses of 0.02 s duration are transmitted between minutes 0 and 10, 30 and 40. The pulses at the beginning of the second are prolonged to 0.04 s, and of the minute to 0.5 s. DUT1+dUT1 : by double pulses.
RJH-63	Krasnodar Russia 44° 46'N 39° 34'E	25	Winter schedule : 9 h 13 m to 9 h 22 m 17 h 13 m to 17 h 22 m Summer schedule : 8 h 13 m to 8 h 22 m 20 h 13 m to 20 h 22 m	A1N type 0.1 second pulses of 0.025 s duration. Second pulses are prolonged to 0.1 s. 10 second pulses are prolonged to 1 s and minute pulses are prolonged to 10 s. No transmission of DUT1 code.
RJH-69	Molodechno Belarus 54° 28'N 26° 47'E	25	Winter schedule : 7 h 13 m to 7 h 22 m 13 h 13 m to 13 h 22 m Summer schedule : 6 h 13 m to 6 h 22 m 12 h 13 m to 12 h 22 m	A1N type 0.1 second pulses of 0.025 s duration. Second pulses are prolonged to 0.1 s. 10 second pulses are prolonged to 1 s and minute pulses are prolonged to 10 s. No transmission of DUT1 code.
RJH-77	Arkhangelsk Russia 64° 22'N 41° 35'E	25	Winter schedule : 11 h 13 m to 11 h 22 m 21 h 13 m to 21 h 22 m Summer schedule : 2 h 13 m to 2 h 22 m 10 h 13 m to 10 h 22 m	A1N type 0.1 second pulses of 0.025 s duration. Second pulses are prolonged to 0.1 s. 10 second pulses are prolonged to 1 s and minute pulses are prolonged to 10 s. No transmission of DUT1 code.
RJH-86	Bishkek Kirgizstan 43° 03'N 73° 37'E	25	Winter schedule : 4 h 13 m to 4 h 22 m 10 h 13 m to 10 h 22 m Summer schedule : 3 h 13 m to 3 h 22 m 9 h 13 m to 9 h 22 m	A1N type 0.1 second pulses of 0.025 s duration. Second pulses are prolonged to 0.1 s. 10 second pulses are prolonged to 1 s and minute pulses are prolonged to 10 s. No transmission of DUT1 code.
RJH-90	Nizhni Novgorod Russia 56° 11'N 43° 57'E	25	Winter schedule : 5 h 13 m to 5 h 22 m 19 h 13 m to 19 h 22 m Summer schedule : 4 h 13 m to 4 h 22 m 18 h 13 m to 18 h 22 m	A1N type 0.1 second pulses of 0.025 s duration. Second pulses are prolonged to 0.1 s. 10 second pulses are prolonged to 1 s and minute pulses are prolonged to 10 s. No transmission of DUT1 code.
RTZ (•)	Irkutsk Russia 52° 26'N 104° 2'E	50	between minutes 0 and 5 0 h to 21 h 05 m 23 h to 23 h 05 m	A1X type second pulses. The pulses at the beginning of the minute are prolonged to 0.5 s.

(•) CIS radiostation emitting DUT1 information in accordance with the ITU-R code and also giving an additional information, dUT1, which specifies more precisely the difference UT1-UTC down to multiples of 0,02 s, the total value of the correction being DUT1 + dUT1. Positive values of dUT1 are transmitted by the marking of p second markers within the range between the 21th and 24th second so that dUT1 = +p.0,02 s. Negative values of dUT1 are transmitted by the marking of q second markers within the range between the 31th and the 34th second, so that dUT1 = -q.0,02 s.

TIME SIGNALS EMITTED IN THE UTC SYSTEM

Station	Location Latitude Longitude	Frequency (kHz)	Schedule (UTC)	Form of the signal
RWM (*)	Moscow Russia 55° 48'N 38° 18'E	4 996 9 996 14 996	The station simultaneously operates on three frequencies.	A1X type second pulses are transmitted between minutes 10 and 20, 40 and 50. The pulses at the beginning of the minute are prolonged to 0.5 s. A1N type 0.1 seconds pulses of 0.02 s duration are transmitted between minutes 20 and 30, 50 and 60. The pulses at the beginning of the second are prolonged to 0.04 s and of the minute to 0.5 s. DUT1+dUT1 : by double pulses.
TDF	Allouis France 47° 10'N 2° 12'E	162	continuous except every Tuesday from 1 h to 5 h	Phase modulation of the carrier by + and - 1 radian in 0.1 s every second except the 59th second of each minute. This modulation is doubled to indicate binary 1. The numbers of the minute, hour, day of the month, day of the week, month and year are transmitted each minute from the 21st to the 58th second, in accordance with the French legal time scale. In addition a binary 1 at the 17th second indicates that the local time is 2 hours ahead of UTC(summer time); a binary 1 at the 18th second indicates that the local time is one hour ahead of UTC(winter time); a binary 1 at the 14th second indicates that the current day is a public holiday (Christmas, 14 July, etc...); a binary 1 at the 13th second indicates that the current day is a day before a public holiday.
VNG	Llandilo New South Wales Australia 33° 43'S 150° 48'E	2 500 5 000 8 638 12 984 16 000	continuous continuous continuous continuous 22 h to 10 h	Second pulses of 50 ms of 1 kHz modulation. Second pulses 55 to 58 of 5 ms of 1 kHz. Second pulse 59 omitted. Minute pulses of 0.5 seconds of 1 kHz modulation. During minutes 5, 10, 15,... second pulses 50 to 58 are 5 ms of 1 kHz. BCD time code giving day of year, hour and minute at the next minute is given between seconds 20 and 46. Voice announcement on 2 500, 5 000 and 16 000 kHz during minutes 15, 30 ,45 and 60. Morse station identification on 8 638 and 12 984 kHz during minutes 15, 30, 45 and 60. DUT1 : ITU-R code by double.

(*) CIS radiostation emitting DUT1 information in accordance with the ITU-R code and also giving an additional information, dUT1, which specifies more precisely the difference UT1-UTC down to multiples of 0,02 s, the total value of the correction being DUT1 + dUT1. Positive values of dUT1 are transmitted by the marking of p second markers within the range between the 21th and 24th second so that dUT1 = +p.0,02 s. Negative values of dUT1 are transmitted by the marking of q second markers within the range between the 31th and the 34th second, so that dUT1 = -q.0,02 s.

TIME SIGNALS EMITTED IN THE UTC SYSTEM

Station	Location Latitude Longitude	Frequency (kHz)	Schedule (UTC)	Form of the signal
WWV	Fort-Collins, CO USA 40° 41'N 105° 2'W	2 500 5 000 10 000 15 000 20 000	continuous	Pulses of 5 cycles of 1 kHz modulation. 29th and 59th second pulses omitted. Hour is identified by 0.8 second long 1 500 Hz tone. Beginning of each minute identified by 0.8 second long 1 000 Hz tone. DUT1 : ITU-R code by double pulse. BCD time code given on 100 Hz subcarrier, includes DUT1 correction.
WWVB	Fort-Collins, CO USA 40° 40'N 105° 3'W	60	continuous	Second pulses given by reduction of the amplitude of the carrier. coded announcement of the date, time, DUT1 correction, daylight savings time in effect, leap year and leap second.
WWVH	Kauai, HI USA 21° 59'N 159° 46'W	2 500 5 000 10 000 15 000	continuous	Pulses of 6 cycles of 1 200 Hz modulation. 29th and 59th second pulses omitted. Hour identified by 0.8 second long 1 500 Hz tone. Beginning of each minute identified by 0.8 second long 1 200 Hz tone. DUT1 : ITU-R code by double pulse. BCD time code given on 100 Hz subcarrier, includes DUT1 correction.
YVTO	Caracas Venezuela 10° 30'N 66° 56'W	5 000	continuous	Second pulses of 1 kHz modulation with 0.1 s duration. The minute is identified by a 800 Hz tone and a 0.5 s duration. Second 30 is omitted. Between seconds 40 and 50 of each minute, voice announcement of the identification of the station. Between seconds 52 and 57 of each minute, voice announcement of hour, minute and second.

ACCURACY OF THE CARRIER FREQUENCY

Station	Relative uncertainty of the carrier frequency in 10^{-10}
ATA	0.1
BPM	0.1
BSF	0.1
CHU	0.05
DCF77	0.005 (10d-mean)
EBC	0.1
HBG	0.005
HLA	0.1
IAM	0.5
JG2AS, JJY	0.1
LOL	0.1
MSF	0.02
OMA	0.5
RAB-99, RBU	0.05
RCH, RID, RWM	0.5
RJH-63, RTZ	0.05
RJH-69, RJH-77	0.05
RJH-86, RJH-90	0.05
TDF	0.02
VNG	0.1
WWV	0.1
WWVB	0.1
WWVH	0.1

Imprimerie Durand
B. P. n°69 - 28600 Luisant - Tél. : 37 24 48 00
Dépôt légal : avril 1995
Numéro d'impression : 8754