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Table 9 - Offsets and step adjustments of UTC, until 1983 Dec. 31

Date (at 0h UTC)	Offsets	Steps
1961 Jan. 1	-150×10^{-10}	
Aug. 1	"	+ 0.050s
1962 Jan. 1	-130×10^{-10}	
1963 Nov. 1	"	- 0.100s
1964 Jan. 1	-150×10^{-10}	
April 1	"	- 0.100s
Sept. 1	"	- 0.100s
1965 Jan. 1	"	- 0.100s
March 1	"	- 0.100s
July 1	"	- 0.100s
Sept. 1	"	- 0.100s
1966 Jan. 1	-300×10^{-10}	
1968 Feb. 1	"	+ 0.100s

Date (at 0h UTC)	Offsets	Steps
1972 Jan. 1	0	- 0.107 7580s
July 1	"	- 1s
1973 Jan. 1	"	- 1s
1974 Jan. 1	"	- 1s
1975 Jan. 1	"	- 1s
1976 Jan. 1	"	- 1s
1977 Jan 1	"	- 1s
1978 Jan. 1	"	- 1s
1979 Jan. 1	"	- 1s
1980 Jan. 1	"	- 1s
1981 July 1	"	- 1s
1982 July 1	"	- 1s
1983 July 1	"	- 1s

Table 10 - Relationship between TAI and UTC, until 1983 Dec. 31

Limits of validity (at 0h UTC)	TAI – UTC
1961 Jan. 1 - 1961 Aug. 1	1.422 818 0 s + (MJD - 37 300) x 0.001 296 s
Aug. 1 - 1962 Jan. 1	1.372 818 0 s + " "
1962 Jan. 1 - 1963 Nov. 1	1.845 858 0 s + (MJD - 37 665) x 0.001 123 2 s
1963 Nov. 1 - 1964 Jan. 1	1.945 858 0 s + " "
1964 Jan. 1 - April 1	3.240 130 0 s + (MJD - 38 761) x 0.001 296 s
April 1 - Sept. 1	3.340 130 0 s + " "
Sept. 1 - 1965 Jan. 1	3.440 130 0 s + " "
1965 Jan. 1 - March 1	3.540 130 0 s + " "
March 1 - July 1	3.640 130 0 s + " "
July 1 - Sept. 1	3.740 130 0 s + " "
Sept. 1 - 1966 Jan. 1	3.840 130 0 s + " "
1966 Jan. 1 - 1968 Feb. 1	4.313 170 0 s + (MJD - 39 126) x 0.002 592 s
1968 Feb. 1 - 1972 Jan. 1	4.213 170 0 s + " "
1972 Jan. 1 - July 1	10.000 000 0 s
July 1 - 1973 Jan. 1	11.000 000 0 s
1973 Jan. 1 - 1974 Jan. 1	12.000 000 0 s
1974 Jan. 1 - 1975 Jan. 1	13.000 000 0 s
1975 Jan. 1 - 1976 Jan. 1	14.000 000 0 s
1976 Jan. 1 - 1977 Jan. 1	15.000 000 0 s
1977 Jan. 1 - 1978 Jan. 1	16.000 000 0 s
1978 Jan. 1 - 1979 Jan. 1	17.000 000 0 s
1979 Jan. 1 - 1980 Jan. 1	18.000 000 0 s
1980 Jan. 1 - 1981 July 1	19.000 000 0 s
1981 July 1 - 1982 July 1	20.000 000 0 s
1982 July 1 - 1983 July 1	21.000 000 0s
1983 July 1 -	22.000 000 0s

Table 11 - Atomic time, collaborating laboratories

AOS	Astronomical Latitude Observatory, Borowiec, Polska
APL	Applied Physics Laboratory, Laurel, USA
ASMW	Amt für Standardisierung, Messwesen und Warenprüfung, Berlin, Deutsche Demokratische Republik
ASUA	Allgemeine Schweizerische Uhrenindustrie AG, Bienne, Suisse
ATC	Australian Telecommunications Commission, Melbourne, Australia
BEV	Bundesamt für Eich - und Vermessungswesen, Wien, Österreich
BO	Beijing Observatory, Beijing, China
CAO	Astronomical Observatory of Cagliari University, Cagliari, Italy
CSAO	Shaanxi Astronomical Observatory, Lintong, China
DHI	Deutsches Hydrographisches Institut, Hamburg, Bundesrepublik Deutschland
DNM	Division of National Mapping, Canberra, Australia
F	Commission Nationale de l'Heure, Paris, France
FTZ	Fernmeldetechnisches Zentralamt, Darmstadt, Bundesrepublik Deutschland
IEN	Istituto Elettrotecnico, Nazionale, Torino, Italia
IFAG	Institut für Angewandte Geodäsie, Frankfurt am Main, Bundesrepublik Deutschland
IGMA	Instituto Geographico Militar, Buenos-Aires, Argentina
ILOM	International Latitude Observatory, Mizusawa, Japan
KSRI	Korea Standards Research Institute, Korea
MSSD	Measurement Standards and Services Division, Colombo, Sri Lanka
NBS	National Bureau of Standards, Boulder, USA
NIM	National Institute of Metrology, Beijing, China
NIS	National Institute for Standards, Cairo, Arab Republic of Egypt
NML	National Measurement Laboratory, CSIRO, Australia
NPL	National Physical Laboratory, Teddington, U. K.
NPLI	National Physical Laboratory, New-Dehli, India
NPRL	National Physical Research Laboratory, Pretoria, South Africa
NRC	National Research Council of Canada, Ottawa, Canada
NRLM	National Research Laboratory of Metrology, Tsukuba, Japan
OAB	Observatoire Astronomique Bouzaréah, Alger, République Algérienne
OFM	Office fédéral de métrologie, Berne, Suisse
OMH	Országos Mérésügyi Hivatal, Budapest, Hungary
OMSF	Instituto y Observatorio de Marina, San Fernando, España
ON	Observatoire de Neuchâtel, Neuchâtel, Suisse
ONBA	Observatorio Naval, Buenos-Aires, Argentina
ONRJ	Observatorio National, Rio de Janeiro, Brazil
OP	Observatoire de Paris, Paris, France
ORB	Observatoire Royal de Belgique, Bruxelles, Belgique

Table 11 - Atomic time, collaborating laboratories (cont.)

PAGA	Philippine Atmospheric, Geophysical and Astronomical Services Administration, Philippine
PEL	Physics and Engineering Laboratory, New-Zealand
PKNM	Polski Komitet Normalizacji i Miar, Warszawa, Polska
PTB	Physikalisch-Technische Bundesanstalt, Braunschweig, Bundesrepublik Deutschland
PTCH	Direction générale des PTT, Berne, Suisse
RGO	Royal Greenwich Observatory, Herstmonceux, U. K.
RO	Royal Observatory, Hong-Kong
RRL	Radio Research Laboratories, Tokyo, Japan
SIS	Singapore Institute of Standards and Industrial Research, Singapore
SO	Shanghaï Observatory, Shanghaï, China
STA	Swedish Telecommunications Administration, Stockholm, Sweden
SU	Laboratoire d'état de l'étalon de temps et de fréquences, URSS
TAO	Tokyo Astronomical Observatory, Tokyo, Japan
TL	Telecommunication Laboratories, Taiwan, China
TP (1)	Ústav Radiotechniky a Electroniky, Praha, Československo Astronomický Ústav, Praha, Československo
TPC	Telecommunication Public Corporation, Indonesia
TUG	Technische Universität Graz, Österreich
USNO	U. S. Naval Observatory, Washington D. C., USA
VSL	Van Swinden Laboratorium, Den Haag, Nederland
ZIPE	Zentralinstitut Physik der Erde, Potsdam, Deutsche Demokratische Republik

(1) Both laboratories cooperate in the derivation of UTC (TP).

Table 12 - Laboratories keeping an independent local atomic time

Laboratory (i)	Equipment in atomic standards (1)	Information on TA(i) - UTC(i): Interval of validity (in MJD at 0h UT)	TA(i) - UTC(i) in s
F(2)	17 Ind. Cs	year 1982	TA(F) - UTC(OP) is published in Bulletin H by OP (LPTF)
NBS	13 Ind. Cs 2 lab. Cs 1 H. Maser (3)	44970 - 45151	20.045 064 346 $-(5.09 \times 10^{-9})$ (MJD - 44970)
		45151 - 45213	20.045 063 425 $-(2.09 \times 10^{-9})$ (MJD - 45151) $+(11.83 \times 10^{-12})$ (MJD - 45151) 2
		45213 - 45335	TA(NBS) - UTC (NBS) is published in the NBS T and F Bulletin
NRC	1 Ind. Cs 1 2.1 m lab. Cs 3 1 m lab. Cs (4)	44970 - 45151	19.999 968 931
		45151 - 45335	20.999 968 931
OFM	4 Ind. Cs 4 prototype Cs	45125 - 45151	20.000 000 $+(25.346 \times 10^{-9})$ (MJD - 45125)
		45151 - 45281	21.000 000 659 $+(25.346 \times 10^{-9})$ (MJD - 45151)
		45281 - 45335	21.000 003 954 $+(20.376 \times 10^{-9})$ (MJD - 45281)
PTB	10 Ind. Cs 1 lab. Cs (5)	44970 - 45151	20.000 363 400
		45151 - 45335	21.000 363 400
RGO	7 Ind. Cs	44970 - 45151	19.999 926 09
		45151 - 45335	20.999 926 09
RRL	7 Ind. Cs 2 H. Masers	year 1982	published in RRL Standard Frequency and Time Service Bulletin
USNO	35 Ind. Cs	year 1982	A.1 (USNO, MEAN) - UTC(USNO, MC) : provisional values in USNO series 7 ; final values in USNO series 11. (6)

Table 12 (cont.)

(1) Ind. Cs designates an industry made Cs standard ; lab. Cs a laboratory Cs standard and H. Maser an Hydrogen Maser.

(2) The standards are located as follows (at the end of 1982).

Centre Electronique de l'Armement (Rennes)	1 Cs
Centre National d'Études Spatiales	2 Cs
Centre National d'Études des Télécommunications	3 Cs
Centre d'Études et de Recherches Géodynamiques et Astronomiques	2 Cs
Électronique Marcel Dassault (Suresnes)	1 Cs
Hewlett - Packard (Orsay)	1 Cs
Observatoire de Paris : Laboratoire Primaire du Temps et des Fréquences (LPTF)	5 Cs
Observatoire de Besançon	1 Cs
Société Nationale Industrielle Aérospatiale (Toulouse)	1 Cs

They are intercompared by the TV method and linked to the foreign laboratories through OP (LPTF) (see Table 13).

(3) The laboratory primary standards control TA (NBS) via an accuracy algorithm. One of the two primary standards usually operates as a contributing member clock. Three of the commercial standards provide the reference for WWV and WWVB but do not contribute directly to TA(NBS) ; they are available for NBS time scales back-up and are compared to TA(NBS) to within 0.1 μs. The hydrogen masers are passively operated.

(4) The 2.1 meter primary cesium clock, CsV, operated continuously during 1982, producing the scale of proper time PT(NRC CsV). The time scales UTC(NRC) and TA(NRC) were derived from PT(NRC CsV) according to the following expressions given in microseconds :

$$\mathrm{UTC(NRC)} = \mathrm{PT(NRC\ CsV)} - (\mathrm{MJD} - 43144) \times 0.000\,97 + 52.041$$

$$\mathrm{TA(NRC)} = \mathrm{PT(NRC\ CsV)} - (\mathrm{MJD} - 43144) \times 0.000\,97 + 20.972$$

with integral seconds disregarded.

Three 1 meter laboratory cesium clocks, CsVIA, -B, and -C, operated continuously as primary standards during 1982 - except the clock CsVIB which was stopped during three months at the beginning of 1982 - producing the scales of proper time PT (NRC,CsVIA), PT(NRC CsVIB) and PT(NRC CsVIC).

(5) TA(PTB) and UTC(PTB) are derived directly from a local oscillator monitored by the primary clock CS1.
MEZ(D) = UTC(PTB) + 1 h or MESZ(D) = UTC(PTB) + 2 h (summer time) is the legal time of the Federal Republic of Germany.

(6) TA(USNO) is designated by A.1 (USNO, MEAN) in USNO publications.

Table 13 - Equipment and links of the collaborating laboratories

Laboratory (i)	Equipment (1)	Source of UTC(i)	LORAN-C receptions (2)	VLF and LF receptions (3)	Television link with	Satellite link with
AOS	1 Ind. Cs	1 Cs		DCF77, OMA 50, HBG 75	TP, ZIPE	
APL (4)	3 Ind. Cs	1 Cs + microstepper			USNO	
ASMW	2 Ind. Cs	corrected mean of 2 Cs	7970-W	DCF77, OMA	ZIPE, TP, PTB, PKNM, SU	
ATC	7 Ind. Cs	1 Cs + microstepper		OMEGA/H,/J, /LR,/AUS	other lab. in Australia	
BEV	1 Ind. Cs	1 Cs	7970-W 7990-M 7990-X 7990-Y (5)	GBR, OMA 50, MSF60, HBG, DCF77	TUG, lab. in Czechoslovakia	
CAO	2 Ind. Cs	1 Cs	7990-M 7990-X 7990-Z	DCF77, HBG	IEN, other lab. in Italy	
CSAO	3 Ind. Cs 2 H Masers	1 Cs	9970-Y	NWC, GBR	lab. in China	
DHI	2 Ind. Cs	1 Cs + microstepper	7970-W	DCF77	PTB, TP, ZIPE	
DNM (6)	5 Ind. Cs	all the Cs			other lab. in Australia	
FTZ	7 Ind. Cs	1 Cs	7970-W	DCF77, MSF		
IEN	7 Ind. Cs	1 Cs + microstepper	7990-M 7990-X 7990-Z	GBR	CAO, other lab. in Italy	NPL, PTB, VSL via OTS-2 (7)
IFAG	3 Ind. Cs	1 Cs	7970-W			
IGMA	3 Ind. Cs	1 Cs + microstepper		OMEGA/A GBR	ONBA, other lab. in Argentina	
ILOM	4 Ind. Cs	1 Cs	9970-M 9970-X	OMEGA/H	RRL, TAO, NRLM	
NBS	see Table 12	10 Cs 1 lab. Cs 1 H Maser	9940-M 9960-Z	OMEGA/ND, OMEGA/H	NRC, USNO	USNO, VSL via GPS
NIM	4 Ind. Cs	all the Cs	9970-Y		lab. in China	
NML	3 Ind. Cs 2 H. Masers			OMEGA/J, /AUS	other lab. in Australia	
NPL	7 Ind. Cs 1 lab. Cs	1 Cs	7970-W	GBR, MSF60	RGO, transmitting station at Rugby	IEN, PTB, VSL via OTS-2 (7)

Table 13 - (cont.)

Laboratory (i)	Equipment (1)	Source of UTC(i)	LORAN-C receptions (2)	VLF and LF receptions (3)	Television link with	Satellite link with
NPLI	3 Ind. Cs	1 Cs		GBR, OMEGA/J, OMEGA/LR, /L, /N		
NPRL	2 Ind. Cs	1 Cs		OMEGA/L, /LR, /A		
NRC	see Table 12	Cs V	9960-M		NBS, USNO	OP, PTB via Symphonie (8)
NRLM	3 Ind. Cs 2 lab. Cs	1 Cs	9970-M		ILOM, RRL, TAO	
OAB	3 Ind. Cs	1 Cs	7990-Z			
OFM	See Table 12	all the Cs	7970-W 7990-Z		HBG	PTCH
OMH	1 Ind. Cs	1 Cs			TP	
OMSF	5 Ind. Cs	all the Cs	7990-Z			
ON	5 Ind. Cs	all the Cs	7970-W 7990-Z			
ONBA	2 Ind. Cs	2 Cs		OMEGA/T	IGMA	
ONRJ	2 Ind. Cs	2 Cs		GBR, OMEGA	other lab. in Brasil	
OP	5 Ind. Cs	1 Cs	7970-W 7990-Z		19 lab. in France, ORB, Hewlett-Packard (Switzerland), PTCH	NRC, PTB via Symphonie (8)
ORB	2 Ind. Cs	1 Cs	7970-W		OP	
PKNM	4 Ind. Cs	corrected mean of 4 Cs	7970-W (5)	DCF77, OMA50, RBU66	ASMW	
PTB	see Table 12	Ind. Cs steered by PTB primary standard	7970-W	GBR, DCF77	ASMW, DHI, TP, ZIPE and other lab.	NRC, OP via Symphonie (8) IEN, NPL, VSL via OTS-2 (7)
PTCH	2 Ind. Cs	2 Cs	7970-W	DCF77, HBG	OFM, OP and other lab. in Switzerland	
RGO	see Table 12	selection of the Cs	7930-X 7970-M 7970-W 7990-Z	GBR, MSF60	NPL	
RRL	see Table 12	1 Cs	9970-M	OMEGA/H, OMEGA/J	ILOM, TAO, NRLM	
SO	1 lab. Cs 3 H Masers	1 Rb + microstepper	9970-Y		lab. in China	
STA	3 Ind. Cs	1 Cs	7970-W	GBR	other lab. in Sweden	

Table 13 - (cont.)

Laboratory (i)	Equipment (1)	Source of UTC(i)	LORAN-C receptions (2)	VLF and LF receptions (3)	Television link with	Satellite link with
SU	1 lab. Cs 4 Ind. Cs 4 H. Masers 4 H clocks	1 lab. Cs 4 Cs 4 H Masers 4 H clocks	7970-W 7990-X 7990-Y 9970-X	GBR, OMA50, RBU, OMEGA/J	other lab. in URSS, ASMW, TP	
TAO	5 Ind. Cs	1 Cs + microstepper	9970-M		ILOM, RRL, NRLM	NBS, USNO via GPS (7)
TL	4 Ind. Cs	all the Cs	9970-M	NDT, NWC		
TP	1 Ind. Cs	1 Cs + microstepper		DCF77	DHI, PTB, AOS, SU ZIPE, ASMW, OMH	
TUG	2 Ind. Cs	1 Cs	7970-W 7990-M	OMEGA, GBR, DCF77	BEV	USNO via GPS (7)
USNO (9)	see Table 12	Cs	(10)	(10)	APL, NBS	NBS , VSL via GPS TAO,TUG via GPS(7)
VSL	4 Ind. Cs	Cs	7970-M 7970-W 7930-X	DCF77	other lab. in Holland	IEN, NPL, PTB via OTS-2 (7) NBS, USNO via GPS
ZIPE	1 Ind. Cs	1 Cs	7970-W	DCF77, GBR, OMA50, HBG, OMEGA/N	ASMW, DHI, PTB, TP, AOS	

Notes

(1) Ind. Cs designated an industry made Cs standard ; lab. Cs a laboratory Cs standard and H. Maser an Hydrogen Maser. Rb designates a Rubidium standard.

(2) LORAN – C stations :

7930-M	North Atlantic chain, Angissog	9940-M	West Coast chain, Fallon
7930-X	" " Ejde		
7970-M	Norwegian Sea chain, Ejde	9960-M	Northeast Coast chain, Seneca
7970-W	" " Sylt	9960-X	" " Nantucket
7990-M	Mediterranean chain, Simeri Crichi	9960-Z	" " Dana
7990-X	" " Lampedusa		
7990-Y	" " Kargabarun	9970-M	Northwest Pacific chain, Iwo Jima
7990-Z	" " Estartit	9970-X	" " Hokkaido
		9970-Y	" " Gesashi

(3) OMEGA stations :

/A	Argentine	/N	Aldra, Norway	/L	Liberia	/H	Hawaii /Trinidad, West Indies
/J	Japan	/AUS	Australia	/ND	Lamoure, North Dakota USA	/LR	La Réunion

(4) Weekly Cesium transfers are carried out between APL and USNO

(5) Reception of the Soviet Union LORAN chain 8000

(6) Microware link with Orroral facility of NASA (National Aeronautics and Space Administration).

(7) Experimental time link

(8) The Symphonie time intercomparisons were stopped on August 1982.

(9) USNO Time Service Publication,Series 16, entitled Precise Time Transfer Report, lists UTC(USNO MC) - UTC (Reference Clock). Difference from Satellite Communication terminals as well as many international timing centers are reported. USNO Time Service Publication, Series 17, entitled Transit Satellite Reports, lists UTC(USNO MC) - UTC (Satellite Clock) and also the frequency offset of each satellite. Series 17 is available via the Automated Data Service only.

(10) The daily phase values Series 4 of THE USNO give the values of UTC(USNO MC) – transmitting station for :

the LORAN-C chains
the OMEGA stations A, H, L, ND
the VLF station GBR
the US TV Network NBC
the NNSS and GPS satellite systems

TABLE 14 - TIME COMPARISONS BETWEEN LABORATORIES BY CLOCK TRANSPORTATION IN 1982

UNLESS OTHERWISE STATED, THE TRANSPORTATION WAS CARRIED OUT BY THE FIRST MENTIONED LABORATORY

DATE		MJD	TIME COMPARISONS		UNCERT.	SOURCE	
1982			(UNIT : 1 MICROSECOND)				
JAN	7	44976.5	UTC(USNO) - UTC(OMSF) =	-2.96	0.05	USNO DPV 791	(1)
JAN	12	44981.5	UTC(USNO) - UTC(IEN) =	-11.5	0.1	USNO DPV 791	
JAN	15	44984.2	UTC(USNO) - UTC(NPRL) =	-21.71		NPRL LETTER	
JAN	20	44989.5	UTC(NPL) - UTC(VSL) =	-1.52	0.05	NPL LETTER	
JAN	20	44989.6	UTC(PTB) - UTC(VSL) =	2.065	0.020	PTB LETTER	
JAN	20	44989.6	UTC(IEN) - UTC(VSL) =	12.2	0.1	VSL LETTER	
JAN	21	44990.3	UTC(USNO) - UTC(VSL) =	0.67	0.07	USNO DPV 791	
JAN	24	44993.5	UTC(USNO) - UTC(NPL) =	2.14	0.03	USNO DPV 791	
FEB	3	45003.3	UTC(ILOM) - UTC(RRL) =	75.8	0.2	ILOM LETTER	
FEB	8	45008.5	UTC(USNO) - UTC(NRC) =	-9.7	0.1	USNO DPV 791	
FEB	26	45026.5	UTC(NBS) - UTC(USNO) =	2.341	0.01	NBS BULL 292	
MAR	12	45040.6	UTC(USNO) - UTC(NBS) =	-2.36	0.01	USNO DPV 797	
MAR	24	45052.4	UTC(PTB) - UTC(FTZ) =	-0.311	0.020	PTB LETTER	
MAR	30	45058.4	UTC(USNO) - UTC(NPL) =	1.53	0.04	USNO DPV 792	
MAY	18	45107.8	UTC(PTB) - UTC(VSL) =	2.940	0.020	PTB LETTER	
MAY	18	45107.8	UTC(IEN) - UTC(VSL) =	13.813	0.02	VSL LETTER	
MAY	18	45107.8	UTC(NPL) - UTC(VSL) =	0.57	0.02	NPL LETTER	
MAY	21	45110.0	UTC(USNO) - UTC(ATC) =	-18.3	0.1	USNO DPV 806	
MAY	25	45114.0	UTC(TAO) - UTC(ILOM) =	1.06	0.04	TAO LETTER	
MAY	28	45117.5	UTC(IEN) - UTC(CAO) =	27.95	0.05	IEN LETTER	
JUN	1	45121.1	UTC(NBS) - UTC(USNO) =	2.199	0.01	NBS BULL 296	
JUN	2	45122.0	UTC(TAO) - UTC(RRL) =	2.80	0.01	TAO LETTER	
JUN	4	45124.0	UTC(TAO) - UTC(NRLM) =	-36.96	0.01	TAO LETTER	
JUN	7	45127.5	UTC(USNO) - UTC(ON) =	11.27	0.04	USNO DPV 806	
JUN	8	45128.3	UTC(OFM) - UTC(ON) =	12.759		OFM LETTER	(2)
JUN	9	45129.3	UTC(USNO) - UTC(BEV) =	-6.90	0.07	USNO DPV 806	
JUN	10	45130.3	UTC(USNO) - UTC(TUG) =	3.55	0.09	USNO DPV 806	
JUN	16	45136.3	UTC(USNO) - UTC(DHI) =	-0.74	0.09	USNO DPV 806	
JUN	17	45137.3	UTC(USNO) - UTC(VSL) =	2.29	0.07	USNO DPV 806	
JUN	18	45138.4	UTC(USNO) - UTC(NPL) =	1.54	0.02	USNO DPV 806	
JUN	30	45150.4	UTC(USNO) - UTC(DNM) =	-2.2	0.1	USNO DPV 811	
JUL	18	45168.0	UTC(USNO) - UTC(ATC) =	-26.5	0.1	USNO DPV 811	
JUL	29	45179.3	UTC(ILOM) - UTC(RRL) =	2.7	0.2	ILOM LETTER	
AUG	17	45198.3	UTC(ASMW) - UTC(ZIPE) =	0.810	0.020	ASMW LETTER	
AUG	26	45207.0	UTC(USNO) - UTC(NBS) =	-2.21	0.01	USNO DPV 819	
SEP	9	45221.5	UTC(USNO) - UTC(NRC) =	-9.81	0.06	USNO DPV 817	
SEP	9	45221.5	UTC(USNO) - UTC(RGO) =	-16.7	0.1	USNO DPV 818	
SEP	10	45222.3	UTC(USNO) - UTC(NPL) =	1.8	0.2	USNO DPV 818	
SEP	13	45225.3	UTC(USNO) - UTC(OP) =	-0.5	0.3	USNO LETTER	
SEP	14	45226.3	UTC(USNO) - UTC(ORB) =	-7.8	0.3	USNO DPV 818	
SEP	16	45228.6	UTC(USNO) - UTC(VSL) =	4.1	0.4	USNO DPV 818	
SEP	16	45228.6	UTC(PTB) - UTC(VSL) =	5.465	0.020	PTB LETTER	
SEP	27	45239.6	UTC(ASMW) - UTC(TP) =	0.430	0.020	ASMW LETTER	
OCT	2	45244.0	UTC(OMH) - UTC(SU) =	26.50	0.1	OMH LETTER	
OCT	5	45247.0	UTC(USNO) - UTC(DNM) =	-2.6	0.4	USNO DPV 823	
OCT	7	45249	UTC(USNO) - UTC(OP) =	-0.464		NRL LETTER	(3)
OCT	18	45260.2	UTC(TAO) - UTC(RRL) =	0.321	0.01	TAO LETTER	
OCT	18	45260.2	UTC(USNO) - UTC(RRL) =	-6.5	0.2	USNO DPV 823	
OCT	18	45260.9	UTC(USNO) - UTC(TAO) =	-6.2	0.2	USNO DPV 823	
OCT	19	45261.0	UTC(USNO) - UTC(NRLM) =	-38.0	0.2	USNO DPV 823	
OCT	21	45263.1	UTC(USNO) - UTC(SO) =	-8.3	0.2	USNO DPV 823	
OCT	24	45266.5	UTC(USNO) - UTC(CSAO) =	0.5	0.1	USNO DPV 823	
OCT	25	45267.5	UTC(USNO) - UTC(BO) =	-1.8	0.1	USNO DPV 823	
OCT	26	45268.0	UTC(TAO) - UTC(NRLM) =	-31.664	0.01	TAO LETTER	
NOV	9	45282.0	UTC(TAO) - UTC(ILOM) =	-4.078	0.05	TAO LETTER	
NOV	23	45296.5	UTC(PKNM) - UTC(TP) =	8.03		PKNM LETTER	
DEC	16	45319.8	UTC(PTB) - UTC(VSL) =	6.704	0.020	PTB LETTER	
DEC	16	45319.8	UTC(NPL) - UTC(VSL) =	3.380	0.02	NPL LETTER	

COMPLEMENTARY RESULTS FOR THE PREVIOUS YEAR

1981					
SEP	21	44868	UTC(SU) - UTC(ASMW) =	-22.7	SU LETTER
OCT	13	44890	UTC(SU) - UTC(TP) =	-22.1	SU LETTER
DEC	7	44945	UTC(PKNM) - UTC(SU) =	26.4	SU LETTER

(1) UTC(USNO) STANDS FOR UTC(USNO MC)
DPV: DAILY PHASE VALUES, SERIES 4, PUBLISHED BY USNO
(2) CARRIED OUT BY PTCH
(3) CARRIED OUT BY BENDIX FIELD ENGINEERING CORPORATION ON BEHALF OF NRL, NAVAL RESEARCH LABORATORY, WASHINGTON D.C., USA

TABLE 15 - INDEPENDENT ATOMIC TIMES

TA(I) DENOTES THE ATOMIC TIME OF THE LABORATORY I

UNIT IS ONE MICROSECOND

DATE 1982	MJD	TAI - TA(I) F	NBS	NRC	OFM
JAN 10	44979	-47.24	-45064.41	23.03	
JAN 20	44989	-46.96	-45064.37	23.02	
JAN 30	44999	-46.53	-45064.42	23.08	
FEB 9	45009	-46.15	-45064.38	23.16	
FEB 19	45019	-45.76	-45064.50	23.20	
MAR 1	45029	-45.40	-45064.55	23.23	
MAR 11	45039	-44.98	-45064.55	23.29	
MAR 21	45049	-44.63	-45064.54	23.37	
MAR 31	45059	-44.26	-45064.48	23.44	
APR 10	45069	-43.89	-45064.46	23.44	
APR 20	45079	-43.47	-45064.48	23.46	
APR 30	45089	-43.13	-45064.44	23.45	
MAY 10	45099	-42.70	-45064.40	23.43	
MAY 20	45109	-42.30	-45064.34	23.42	
MAY 30	45119	-41.93	-45064.32	23.34	
JUN 9	45129	-41.52	-45064.25	23.28	-0.71
JUN 19	45139	-41.06	-45064.24	23.22	-1.09
JUN 29	45149	-40.61	-45064.18	23.18	-1.30
JUL 9	45159	-40.11	-45064.17	23.14	-1.59
JUL 19	45169	-39.63	-45064.07	23.12	-1.86
JUL 29	45179	-39.26	-45064.08	23.12	-1.99
AUG 8	45189	-38.90	-45064.02	23.09	-2.25
AUG 18	45199	-38.46	-45064.04	22.90	-2.48
AUG 28	45209	-38.07	-45063.89	22.90	-2.70
SEP 7	45219	-37.56	-45063.97	22.85	-2.98
SEP 17	45229	-37.15	-45063.89	22.93	-3.23
SEP 27	45239	-36.74	-45063.84	22.88	-3.36
OCT 7	45249	-36.34	-45063.79	22.93	-3.58
OCT 17	45259	-35.95	-45063.73	22.86	-3.74
OCT 27	45269	-35.54	-45063.65	22.91	-3.92
NOV 6	45279	-35.16	-45063.53	23.00	-4.14
NOV 16	45289	-34.73	-45063.50	23.02	-4.27
NOV 26	45299	-34.26	-45063.43	23.13	-4.42
DEC 6	45309	-33.86	-45063.47	23.15	-4.52
DEC 16	45319	-33.43	-45063.45	23.12	-4.67
DEC 26	45329	-33.14	-45063.48	23.18	-4.77

TABLE 15 - (CONT.)

UNIT IS ONE MICROSECOND

DATE 1982		MJD	TAI - TA(I)			
			PTB	RGO	RRL (1)	USNO
JAN	10	44979	-363.21	64.51	10.3	-34459.96
JAN	20	44989	-363.19	64.23	10.0	-34460.36
JAN	30	44999	-363.21	63.99	9.6	-34460.82
FEB	9	45009	-363.17	63.71	9.6	-34461.18
FEB	19	45019	-363.18	63.49	9.4	-34461.71
MAR	1	45029	-363.16	63.14	9.1	-34462.19
MAR	11	45039	-363.19	62.94	8.6	-34462.61
MAR	21	45049	-363.21	62.70	8.1	-34463.05
MAR	31	45059	-363.23	62.26	8.6	-34463.45
APR	10	45069	-363.24	62.11	8.7	-34463.81
APR	20	45079	-363.22	61.93	8.8	-34464.26
APR	30	45089	-363.20	61.62	8.9	-34464.64
MAY	10	45099	-363.17	61.32	9.0	-34465.05
MAY	20	45109	-363.16	61.04	9.0	-34465.41
MAY	30	45119	-363.23	60.87	8.8	-34465.80
JUN	9	45129	-363.28	60.73	8.1	-34466.14
JUN	19	45139	-363.27	60.46	7.9	-34466.46
JUN	29	45149	-363.32	60.21	8.0	-34466.78
JUL	9	45159	-363.32	60.06	8.0	-34467.10
JUL	19	45169	-363.32	59.92	8.0	-34467.47
JUL	29	45179	-363.30	59.79	8.2	-34467.82
AUG	8	45189	-363.41	59.51	8.1	-34468.12
AUG	18	45199	-363.38	59.27	7.7	-34468.48
AUG	28	45209	-363.47	58.89	7.8	-34468.73
SEP	7	45219	-363.45	58.78	7.7	-34469.07
SEP	17	45229	-363.48	58.55	7.8	-34469.37
SEP	27	45239	-363.49	58.21	7.7	-34469.70
OCT	7	45249	-363.56	58.01	7.6	-34469.96
OCT	17	45259	-363.61	58.00	7.7	-34470.30
OCT	27	45269	-363.60	58.05	9.0	-34470.57
NOV	6	45279	-363.65	58.06	8.9	-34470.86
NOV	16	45289	-363.60	58.10	8.8	-34471.18
NOV	26	45299	-363.60	58.15	8.7	-34471.46
DEC	6	45309	-363.59	58.25	8.7	-34471.83
DEC	16	45319	-363.56	58.32	8.5	-34472.13
DEC	26	45329	-363.53	58.37	8.2	-34472.53

(1) Starting from MJD=45269, the values TAI-TA(RRL) have been computed by taking into account the clock transportation result between USNO and RRL carried out on 1982 Oct. 18 (see Table 14).

TABLE 16 - PRIMARY STANDARDS USED AS CLOCKS

UNIT IS ONE MICROSECOND

DATE 1982	MJD	TAI-LAB.STD.				
			NRC			
		PTB CS1	CSV	CSVI A	CSVI B	CSVI C
JAN 10	44979	0.19	42.22	36.48		38.43
JAN 20	44989	0.21	42.20	36.50		38.36
JAN 30	44999	0.20	42.25	36.53		38.39
FEB 9	45009	0.23	42.32	36.52		38.41
FEB 19	45019	0.22	42.35	36.38		38.38
MAR 1	45029	0.23	42.37	36.33		38.34
MAR 11	45039	0.21	42.43	36.30		38.34
MAR 21	45049	0.19	42.50	36.29		38.39
MAR 31	45059	0.17	42.56	36.25		38.44
APR 10	45069	0.16	42.55	36.13		38.44
APR 20	45079	0.17	42.56	36.03		38.43
APR 30	45089	0.21	42.53	35.90	40.48	38.39
MAY 10	45099	0.24	42.50	35.74	40.52	38.31
MAY 20	45109	0.24	42.48	35.53	40.54	38.23
MAY 30	45119	0.17	42.39	35.28	40.55	38.16
JUN 9	45129	0.12	42.33	34.99	40.56	38.11
JUN 19	45139	0.12	42.26	34.81	40.59	38.08
JUN 29	45149	0.07	42.20	34.76	40.64	38.13
JUL 9	45159	0.08	42.16	34.68	40.61	38.14
JUL 19	45169	0.07	42.12	34.64	40.60	38.16
JUL 29	45179	0.09	42.12	34.58	40.61	38.17
AUG 8	45189	0.01	42.08	34.50	40.59	38.20
AUG 18	45199	0.01	41.88	34.41	40.42	38.19
AUG 28	45209	-0.07	41.86	34.42	40.42	38.32
SEP 7	45219	-0.05	41.81	34.27	40.27	38.28
SEP 17	45229	-0.07	41.88	34.27	40.23	38.36
SEP 27	45239	-0.09	41.82	34.13	40.10	38.34
OCT 7	45249	-0.16	41.86	34.09	40.11	38.42
OCT 17	45259	-0.20	41.78	33.97	40.02	38.39
OCT 27	45269	-0.21	41.82	33.95	40.03	38.40
NOV 6	45279	-0.25	41.90	33.99	40.07	38.41
NOV 16	45289	-0.21	41.91	33.91	40.02	38.32
NOV 26	45299	-0.20	42.02	33.95	40.10	38.36
DEC 6	45309	-0.19	42.03	33.84	40.05	38.23
DEC 16	45319	-0.16	41.98	33.66	40.01	37.99
DEC 26	45329	-0.13	42.04	33.58	39.96	37.84

See notes, p. B-45.

NOTES

(1) The primary frequency standard CS 1 of PTB was operated continuously as a clock in 1982, except for the interval MJD = 44986 - 45002. It produced a scale of proper time. After the date MJD = 45002, the phase and the frequency of TAI - PTB CS 1 were almost the same as before MJD = 44986. So, the values TAI - PTB CS 1 were interpolated for MJD = 44989 and 44999. The time scale under the headline PTB CS 1 is a coordinate time scale at sea level derived from the scale of proper time applying a gravitational frequency correction of - 0.00066 μs/d.

(2) The time scales under the headline NRC Cs V, Cs VI A, Cs VI B, Cs VI C are the scales of proper time PT (NRC Cs V), PT (NRC Cs VI A), PT (NRC Cs VI B), PT (NRC Cs VI C) produced directly by the primary frequency standards Cs V, Cs VI A, Cs VI B, Cs VI C of NRC used as clocks. The gravitational frequency correction to these time scales of proper time to obtain coordinate times at sea level is - 0.00097 μs/d.

(3) The NBS - 4 primary frequency standard worked as a clock in 1982. However the uses of NBS - 4 as a clock and as a standard are distinct from each other.

TABLE 17 - COORDINATED UNIVERSAL TIME

UTC(I) DENOTES THE APPROXIMATION TO UTC KEPT BY THE LABORATORY I

UNIT IS ONE MICROSECOND

DATE 1982	MJD	UTC - UTC(I) AOS (1)	APL	ASMW	AUS (2)	BEV	CAO (3)	CSAO*
JAN 10	44979	10.33	2.60	-0.46	0.1	-7.99	16.42	-4.2
JAN 20	44989	11.77	2.73	-0.16	0.0	-7.60	16.49	-4.7
JAN 30	44999	12.23	2.75	-0.17	-0.2	-7.72	16.70	-5.1
FEB 9	45009	13.27	2.79	0.05	-0.3	-7.61	16.74	-5.1
FEB 19	45019	13.88	2.70	0.19	-0.6	-7.31	16.81	-5.4
MAR 1	45029	14.56	2.68	0.13	-0.8	-7.36	17.07	-5.8
MAR 11	45039	15.64	2.73	0.16	-1.0	-7.25	16.98	-6.0
MAR 21	45049	15.82	2.80	0.02	-1.2	-6.89	16.91	-6.4
MAR 31	45059	16.49	2.84	-0.04	-1.3	-6.64	16.74	-6.1
APR 10	45069	16.80	2.88	-0.09	-1.4	-6.32	16.87	-5.8
APR 20	45079	18.16	2.79	-0.05	-1.6	-6.09	16.89	-6.2
APR 30	45089	-1.61	2.78	-0.19	-1.7	-5.85	16.70	-5.8
MAY 10	45099	-1.11	2.68	-0.22	-1.8	-5.65	16.75	-5.6
MAY 20	45109	-0.75	2.62	-0.40	-2.0	-5.59	16.96	-5.5
MAY 30	45119	-0.62	2.57	-0.53	-2.1	-5.75	17.00	-5.4
JUN 9	45129	0.16	2.55	-0.53	-2.2	-5.85	17.14	-5.7
JUN 19	45139	0.76	2.57	-0.56	-2.3	-5.85	17.02	-5.5
JUN 29	45149	1.19	2.61	-0.78	-2.3	-5.82	16.99	-5.0
JUL 9	45159	1.92	2.63	-0.93	-2.4	-5.81	16.87	-4.5
JUL 19	45169	1.82	2.61	-1.00	-2.5	-5.87	16.92	-4.0
JUL 29	45179	2.30	2.56	-0.80	-2.6	-5.77	17.07	-3.3
AUG 8	45189	2.72	2.61	-0.95	-2.6	-5.78	16.96	-3.0
AUG 18	45199	3.35	2.64	-0.94	-2.7	-5.66	16.82	-2.9
AUG 28	45209	3.79	2.70	-1.18	-2.7	-5.69	16.80	-2.5
SEP 7	45219	4.27	2.69	-1.09	-2.8	-5.66	16.72	-2.2
SEP 17	45229	4.84	2.61	-0.98	-2.8	-5.66	16.62	-1.8
SEP 27	45239	5.46	2.38	-0.99	-2.9	-5.55	16.51	-1.5
OCT 7	45249	5.92	2.33	-0.99	-4.9	-5.67	16.35	-1.2
OCT 17	45259	6.72	1.84	-0.93	-5.1	-5.71	16.41	-0.8
OCT 27	45269	7.61	1.59	-0.81	-5.2	-5.63	16.32	0.7
NOV 6	45279	8.11	1.43	-0.83	-5.3	-5.58	16.29	1.0
NOV 16	45289	8.71	1.11	-0.75	-5.4	-5.65	16.21	1.1
NOV 26	45299	9.03	0.86	-0.68	-5.5	-5.66	16.04	1.3
DEC 6	45309	10.23	0.47	-0.51	-5.8	-5.74	16.09	1.4
DEC 16	45319	-0.19	0.28	-0.45	-5.9	-5.72	16.05	1.4
DEC 26	45329	0.62	0.00	-0.38	-6.1	-5.66	16.14	1.1

TABLE 17 - (CONT.)

UNIT IS ONE MICROSECOND

DATE 1982	MJD	UTC - UTC(I) DHI	FTZ (4)	IEN	IFAG	IGMA (5)	ILOM* (6)	NBS
JAN 10	44979	-1.62	-0.97	-9.75	-29.04	5	-75.2	-0.11
JAN 20	44989	-1.42	-0.90	-9.82	-29.68	6		-0.13
JAN 30	44999	-1.32	-0.79	-9.84	-30.58	3		-0.22
FEB 9	45009	-1.17	-0.65	-9.90	-31.46	7	-81.3	-0.23
FEB 19	45019	-1.01	-0.52	-10.01	-32.29	9	-83.1	-0.40
MAR 1	45029	-0.93	-0.42	-10.06	-33.23	11	-84.9	-0.50
MAR 11	45039	-0.76	-0.27	-10.21	-34.29	15	-86.6	-0.56
MAR 21	45049	-0.63	-0.13	-10.55	-35.33	13	-88.7	-0.59
MAR 31	45059	-0.50	-0.12	-10.57	-36.53	11	-90.0	-0.59
APR 10	45069	-0.33	-0.06	-10.88	-37.73	14	-5.9	-0.62
APR 20	45079	-0.22	-0.04	-11.01	-39.01	15	-6.1	-0.69
APR 30	45089	-0.17	0.03	-11.12	-40.30	16	-6.2	-0.70
MAY 10	45099	-0.20	0.11	-11.10	-41.78	17	-6.3	-0.71
MAY 20	45109	-0.30	0.16	-10.94	-43.49	17	-6.6	-0.70
MAY 30	45119	-0.24	0.23	-10.96	-45.25	15	-7.0	-0.73
JUN 9	45129	-0.16	0.31	-11.01	-47.43	15	-7.7	-0.71
JUN 19	45139	0.06	0.36	-11.07	-49.80	17	-8.0	-0.75
JUN 29	45149	0.32	0.45	-11.14	-52.42	20	-8.0	-0.75
JUL 9	45159	0.27	0.56	-11.20	-55.43	17	-8.1	-0.76
JUL 19	45169	0.00	0.63	-11.19	-58.74	18	-8.1	-0.68
JUL 29	45179	-0.31	0.75	-11.07	-60.48	19	-8.1	-0.70
AUG 8	45189	-0.63	0.73	-11.02	-60.35	15	-8.3	-0.65
AUG 18	45199	-0.66	0.81	-10.97	-59.64	15	-8.7	-0.69
AUG 28	45209	-0.69	0.83	-10.79	-58.48	16	-8.8	-0.55
SEP 7	45219	-0.41	0.88	-10.59	-57.58	17	-8.9	-0.61
SEP 17	45229	-0.19	0.87	-10.67	-56.82	19	-8.9	-0.50
SEP 27	45239	-0.01	0.97	-10.43	-55.98	18	-9.0	-0.40
OCT 7	45249	0.11	0.95	-10.41	-55.15	17	-9.0	-0.31
OCT 17	45259	0.00	1.10	-10.35	-54.28	18	-9.1	-0.22
OCT 27	45269	-0.15	1.23	-10.36	-53.40	17	-7.9	-0.09
NOV 6	45279	-0.31	1.28	-10.31	-52.44	18	-8.1	0.05
NOV 16	45289	-0.38	1.35	-10.44	-52.73	19	-8.3	0.12
NOV 26	45299	-0.36	1.53	-10.71	-52.32	17	-8.3	0.23
DEC 6	45309	-0.37	1.65	-10.71	-51.55	19	-8.5	0.21
DEC 16	45319	0.12	1.77	-10.82	-50.77	18	-8.7	0.24
DEC 26	45329	0.39	1.90	-10.78	-50.00	19	-9.0	0.22

TABLE 17 - (CONT.)

UNIT IS ONE MICROSECOND

DATE 1982	MJD	UTC - UTC(I) NIM*	NPL	NPRL (7)	NRC	NRLM*	OAB (8)	OFM (9)
JAN 10	44979	-11.8	3.79	-24	-8.04	-52.8	-161.65	
JAN 20	44989	-12.1	3.67	-16	-8.05	-51.9	-161.93	
JAN 30	44999	-12.2	3.53	-7	-7.99	-51.4	-162.48	
FEB 9	45009	-12.0	3.46	0	-7.91	-50.4	-163.14	
FEB 19	45019	-12.0	3.47	3	-7.87	-49.8	-163.67	
MAR 1	45029	-12.3	3.44	2	-7.84	-49.6	-163.73	
MAR 11	45039	-12.1	3.29	3	-7.78	-49.3	-164.06	
MAR 21	45049	-12.4	3.21	2	-7.70	-48.9	-164.55	
MAR 31	45059	-12.0	3.08	8	-7.63	-48.1	-164.97	
APR 10	45069	-11.6	2.87	3	-7.63	-47.4	-165.36	
APR 20	45079	-11.4	2.80	0	-7.61	-47.0	-165.92	
APR 30	45089	-11.1	2.86	1	-7.62	-46.5	-166.20	
MAY 10	45099	-10.9	2.88	1	-7.64	-45.8	-166.41	
MAY 20	45109	-10.7	2.86	-1	-7.65	-45.3	-166.87	
MAY 30	45119	-10.8	2.96	-1	-7.73	-45.0	-167.32	
JUN 9	45129	-11.2	2.99	4	-7.79	-45.0	-168.12	-0.61
JUN 19	45139	-11.3	3.03	5	-7.85	-44.7	-168.93	-0.73
JUN 29	45149	-11.0	3.04	-6	-7.89	-44.0	-169.75	-0.69
JUL 9	45159	-10.8	3.19	-3	-7.93	-43.3	-170.32	-0.73
JUL 19	45169	-10.7	3.20	-4	-7.95	-42.8	-170.87	-0.75
JUL 29	45179	-10.2	3.26	-6	-7.95	-42.0	-171.60	-0.62
AUG 8	45189	-10.1	3.22	-6	-7.98	-41.5	-172.40	-0.63
AUG 18	45199	-10.2	3.29	-9	-8.17	-41.3	-173.18	-0.60
AUG 28	45209	-9.8	3.27	-3	-8.17	-40.6	-173.69	-0.57
SEP 7	45219	-9.5	3.37	-4	-8.22	-40.0	-174.37	-0.59
SEP 17	45229	-9.2	3.45	-6	-8.14	-39.4	-175.19	-0.60
SEP 27	45239	-8.9	3.54	-7	-8.19	-38.8	-175.80	-0.47
OCT 7	45249	-8.7	3.44	-8	-8.14	-38.2	-176.49	-0.44
OCT 17	45259	-8.4	3.50	-8	-8.21	-37.6	-176.88	-0.35
OCT 27	45269	-6.9	3.47	-7	-8.16	-35.7	-177.49	-0.27
NOV 6	45279	-6.7	3.45	-5	-8.07	-35.2	-178.09	-0.24
NOV 16	45289	-6.7	3.45	-4	-8.05	-34.8	-178.57	-0.15
NOV 26	45299	-6.5	3.52	-4	-7.93	-34.1	-179.30	-0.10
DEC 6	45309	-6.4	3.48	-6	-7.92	-33.5	-179.81	0.00
DEC 16	45319	-6.4	3.33	-7	-7.95	-33.0	-180.49	0.06
DEC 26	45329	-6.7	3.16	-8	-7.89	-32.6	-147.47	0.16

TABLE 17 - (CONT.)

UNIT IS ONE MICROSECOND

DATE 1982		MJD	UTC - UTC(I) OMH	OMSF	ON	OP	ORB	PKNM	PTB
JAN	10	44979	-0.41	-1.60	12.23	-1.18	-0.10	-3.01	0.19
JAN	20	44989	-0.68	-1.33	12.34	-1.43	-0.69	-3.20	0.21
JAN	30	44999	-0.50	-1.39	12.40	-1.41	-1.27	-3.68	0.19
FEB	9	45009	-0.59	-1.39	12.43	-1.36	-1.24	-4.08	0.23
FEB	19	45019	-0.35	-1.27	12.48	-1.28	-1.51	-4.42	0.22
MAR	1	45029	-0.19	-1.06	12.65	-1.26	-1.83	-4.80	0.24
MAR	11	45039	-0.03	-1.09	12.68	-1.15	-2.69	-5.18	0.21
MAR	21	45049	-0.25	-1.06	12.60	-1.09	-3.02	-5.54	0.19
MAR	31	45059	-0.19	-0.83	12.45	-1.06	-3.29	-5.85	0.17
APR	10	45069	-0.13	-1.15	12.36	-1.01	-3.19	-6.06	0.16
APR	20	45079	-0.03	-0.97	12.20	-0.94	-3.87	-6.00	0.18
APR	30	45089	-0.19	-1.02	12.17	-0.94	-3.93	-6.04	0.20
MAY	10	45099	-0.34	-0.89	12.14	-0.87	-4.13	-6.05	0.23
MAY	20	45109	-0.21	-0.84	12.19	-0.75	-4.62	-6.11	0.24
MAY	30	45119	-0.11	-0.65	12.14	-0.62	-5.23	-6.22	0.17
JUN	9	45129	0.02	-0.83	12.10	-0.48	-5.36	-6.35	0.12
JUN	19	45139	0.05	-0.90	12.19	-0.32	-5.67	-6.48	0.13
JUN	29	45149	-0.24	-0.99	12.17	-0.18	-5.84	-6.61	0.08
JUL	9	45159	0.02	-1.03	12.26	0.07	-5.93	-6.73	0.08
JUL	19	45169	-0.43	-0.76	12.28	0.31	-6.00	-7.04	0.08
JUL	29	45179	-0.36	-1.06	12.45	0.46	-6.13	-7.11	0.10
AUG	8	45189	-0.57	-0.62	12.36	0.61	-6.15	-7.35	0.00
AUG	18	45199	-0.61	-0.41	12.31	0.74	-6.10	-7.56	0.02
AUG	28	45209	-0.75	-0.73	12.42	0.73	-6.20	-7.84	-0.07
SEP	7	45219	-0.90	-0.76	12.49	0.83	-6.69	-7.97	-0.05
SEP	17	45229	-0.85	-0.78	12.49	0.89	-6.72	-8.24	-0.08
SEP	27	45239	-0.81	-0.74	12.51	0.94	-5.97	-8.64	-0.09
OCT	7	45249	-0.89	-0.32	12.44	0.95	-6.21	-9.24	-0.17
OCT	17	45259	-0.97	-0.01	12.46	0.94	-6.66	-9.65	-0.21
OCT	27	45269	-0.84	0.02	12.45	0.93	-6.81	-9.57	-0.20
NOV	6	45279	-0.91	0.18	12.37	0.85	-6.87	-9.25	-0.25
NOV	16	45289	-0.72	0.26	12.32	0.87	-7.04	-8.97	-0.20
NOV	26	45299	-1.14	0.10	12.22	0.87	-7.11	-8.68	-0.20
DEC	6	45309	-0.34	0.12	12.31	0.81	-7.45	-8.28	-0.19
DEC	16	45319	-0.49	0.41	12.23	0.80	-7.78	-7.91	-0.16
DEC	26	45329	0.04	0.56	12.31	0.67	-8.10	-7.58	-0.13

TABLE 17 - (CONT.)

UNIT IS ONE MICROSECOND

DATE 1982	MJD	UTC - UTC(I) PTCH	RGO	RRL*	SO*	STA	SU (10)	TAO*
JAN 10	44979	-27.44	-9.40	-3.7	-5.1	-0.86	23.3	-5.7
JAN 20	44989	-27.94	-9.68	-4.0	-4.8	-0.63	23.4	-6.0
JAN 30	44999	-28.55	-9.91	-4.3	-5.4	-0.18	24.1	-6.3
FEB 9	45009	-29.27	-10.20	-4.2	-5.8	0.23	24.1	-6.4
FEB 19	45019	-29.89	-10.42	-4.4	-6.3	0.53	24.5	-6.6
MAR 1	45029	-30.44	-10.77	-4.7	-7.2	0.73	24.4	-7.1
MAR 11	45039	-31.01	-10.97	-5.1	-7.4	1.13	24.7	-7.5
MAR 21	45049	-31.65	-11.21	-5.5	-7.6	1.26	24.8	-7.9
MAR 31	45059	-32.33	-11.65	-5.1	-7.9	1.35	24.9	-7.7
APR 10	45069	-32.96	-11.80	-4.9	-8.7	1.10	25.1	-7.7
APR 20	45079	-33.60	-11.98	-4.9	-9.8	0.94	25.2	-7.7
APR 30	45089	-34.01	-12.29	-4.8	-9.3	0.60	25.5	-7.8
MAY 10	45099	-34.71	-12.59	-4.7	-8.6	0.35	25.0	-7.8
MAY 20	45109	-35.58	-12.87	-4.7	-9.1	0.11	26.1	-7.8
MAY 30	45119	-36.50	-13.04	-4.9	-9.7	-0.05	25.9	-7.9
JUN 9	45129	-37.48	-13.18	-5.6	-9.8	-0.20	25.6	-8.3
JUN 19	45139	-38.57	-13.44	-5.8	-9.5	-0.42	25.2	-8.4
JUN 29	45149	-39.46	-13.70	-5.7	-8.9	-0.76	25.6	-8.1
JUL 9	45159	-40.79	-13.85	-5.7	-8.5	-0.91	25.5	-7.8
JUL 19	45169	-41.94	-13.99	-5.7	-8.3	-1.01	25.3	-7.6
JUL 29	45179	-42.79	-14.13	-5.5	-8.3	-1.10	26.6	-7.2
AUG 8	45189	-43.90	-14.40	-5.6	-8.5	-1.23	25.3	-7.0
AUG 18	45199	-44.94	-14.64	-6.0	-8.9	-1.45	25.9	-7.2
AUG 28	45209	-45.93	-15.02	-6.0	-8.8	-1.74	25.6	-7.0
SEP 7	45219	-46.88	-15.13	-6.0	-9.0	-1.79	25.2	-6.8
SEP 17	45229	-47.95	-15.36	-5.9	-9.0	-1.89	25.7	-6.5
SEP 27	45239	-48.91	-15.70	-6.0	-8.6	-2.17	26.2	-6.2
OCT 7	45249	-49.76	-15.90	-6.1	-8.6	-2.50	25.6	-6.1
OCT 17	45259	-50.46	-15.91	-6.0	-8.2	-2.92	24.7	-5.8
OCT 27	45269	-51.21	-15.85	-4.7	-6.4	-3.27	25.7	-4.2
NOV 6	45279	-51.88	-15.85	-4.7	-6.3	-3.69	25.6	-3.9
NOV 16	45289	-52.43	-15.81	-4.8	-6.3	-4.03	25.7	-3.8
NOV 26	45299	-52.89	-15.76	-4.7	-7.1	-4.41	25.7	-3.5
DEC 6	45309	-53.40	-15.66	-4.7	-7.4	-4.92	26.6	-3.2
DEC 16	45319	-53.94	-15.59	-4.8	-7.6	-5.40	26.4	-3.0
DEC 26	45329	-54.49	-15.54	-4.9	-8.4	-5.75	27.1	-2.9

TABLE 17 - (CONT.)

UNIT IS ONE MICROSECOND

DATE 1982	MJD	UTC - UTC(I) TL*	TP	TUG (11)	USNO	VSL	ZIPE
JAN 10	44979	37.9	-0.43	3.43	2.08	2.25	-0.23
JAN 20	44989	36.5	-0.31	2.90	2.11	2.27	0.94
JAN 30	44999	35.2	-0.44	2.27	2.04	2.41	0.96
FEB 9	45009	34.3	-0.56	1.63	2.05	2.48	2.18
FEB 19	45019	33.0	-0.25	1.19	1.91	2.52	2.16
MAR 1	45029	31.5	-0.06	0.45	1.85	2.53	1.15
MAR 11	45039	30.1	-0.20	-0.22	1.81	2.61	1.68
MAR 21	45049	30.3	-0.24	-0.79	1.77	2.71	0.89
MAR 31	45059	30.6	-0.22	-1.43	1.77	2.83	0.18
APR 10	45069	30.2	-0.05	-1.98	1.76	2.95	-0.76
APR 20	45079	31.1	0.16	-2.56	1.65	3.11	0.40
APR 30	45089	31.2	0.20	-3.15	1.65	3.24	0.21
MAY 10	45099	31.5	0.15	-3.75	1.57	3.39	0.21
MAY 20	45109	31.9	0.25	-4.37	1.53	3.49	0.10
MAY 30	45119	32.0	0.42	-4.94	1.49	3.66	-0.17
JUN 9	45129	31.3	0.64	4.50	1.49	3.78	-0.15
JUN 19	45139	32.0	0.60	3.92	1.48	3.88	-0.25
JUN 29	45149	30.6	0.38	3.38	1.52	4.01	-0.33
JUL 9	45159	31.5	0.31	2.95	1.54	4.15	-0.43
JUL 19	45169	30.7	0.02	2.35	1.52	4.32	-0.48
JUL 29	45179	30.6	0.19	2.06	1.51	4.56	-0.50
AUG 8	45189	30.9	0.01	1.54	1.53	4.76	0.04
AUG 18	45199	29.4	0.18	1.05	1.53	4.97	-0.08
AUG 28	45209	28.6	-0.04	0.54	1.61	5.17	-0.18
SEP 7	45219	28.2	-0.37	0.11	1.60	5.54	-0.36
SEP 17	45229	27.5	-0.51	-0.31	1.69	5.84	-0.56
SEP 27	45239	27.2	-0.24	-0.66	1.70	6.10	-0.74
OCT 7	45249	26.9	-0.20	-1.11	1.75	6.30	-0.84
OCT 17	45259	26.0	-0.36	-1.50	1.75	6.48	-0.80
OCT 27	45269	26.9	-0.81	-1.95	1.80	6.51	-0.77
NOV 6	45279	26.3	-0.75	-2.39	1.88	6.52	-0.79
NOV 16	45289	25.9	-0.36	-2.76	1.90	6.60	-0.79
NOV 26	45299	25.6	-0.39	-3.11	1.94	6.73	-0.80
DEC 6	45309	25.1	-0.37	-3.42	1.90	6.86	-0.84
DEC 16	45319	25.1	-0.49	-3.79	1.94	6.83	-0.72
DEC 26	45329	26.3	-0.62	-4.14	1.89	6.94	-0.58

TABLE 17 - (CONT.)

NOTES

In general, the uncertainties are about ten times larger than the unit of the last reported digit. See Table 18.

(1) AOS. Time steps of UTC (AOS) of + 20 us and 11 us were made by AOS respectively on 1982 April 25 and 1982 December 15.

(2) AUS. The UTC-UTC (AUS) are directly computed from the predicted values UTC (USNO MC) - UTC (AUS) of Bulletin E of DNM. Time steps in the UTC-UTC (AUS) values reflect that clock transportation results were taken into account by DNM.

(3) CAO. The origin of UTC-UTC (CAO) was fixed by the clock transportation result between IEN and CAO on 1982 May 28. The values UTC-UTC (CAO) published in the BIH Annual Report for 1981 have to be corrected by + 17.45 us.

(4) FTZ. The origin of UTC-UTC (FTZ) was fixed by the clock transportation result between PTB and FTZ on 1982 March 24. The values UTC-UTC (FTZ) published in the BIH Annual Report for 1981 have to be corrected by + 6.31 us.

(5) IGMA. Results obtained by VLF. The clock transportation results between IGMA and ONBA, USNO and ONBA end November 1979 fixed the origin from MJD = 44109.

(6) ILOM. No LORAN-C reception on MJD = 44989 and 44999. After the change of master clock on 1982 April 1, the origin of UTC-UTC (ILOM) was fixed by the clock transportation result between TAO and ILOM on 1982 May 25.

(7) NPRL. Results obtained by VLF. A new origin of UTC-UTC (NPRL) was fixed by the clock transportation result between USNO and NPRL on 1982 Jan. 15. The previous origin resulted from a clock transportation on 1974 April 9.

(8) OAB. Change of master clock on 1982 December 19.

(9) OFM. The origin of UTC-UTC (OFM) was fixed by the clock transportation result between OFM and ON on 1982 June 8.

(10) SU. UTC-UTC (SU) was computed using the TV link between TP and SU.

(11) TUG. A time step of UTC (TUG) of -10.0 us was made by TUG on 1982 June 3.

* CSAO, ILOM, NIM, NRLM, RRL, SO, TAO, TL. The apparent time discontinuities of the UTC-UTC(i) do not result from the time scales but from LORAN-C links changes. In 1982, the Asiatic laboratories received the Northwest LORAN-C signals which were transmitted either by Iwo - Jima, or Marcus, or Hokkaido. Furthermore, from MJD = 45269, the UTC - UTC (i) values have been computed by taking into account the clock transportation results between USNO and the Asiatic laboratories (see Table 14).

TABLE 18 - COMPARISONS BETWEEN THE CLOCK TRANSPORTATIONS AND THE BIH RESULTS

THE TABLE GIVES THE DIFFERENCES BETWEEN THE CLOCK TRANSPORTATION RESULTS AND THOSE DERIVED FROM THE DATA OF TABLE 17 (BEFORE ROUNDING-OFF)

DATE 1982	MJD	TIME COMPARISONS	DIFFERENCE CLOCK TR. - BIH (UNIT : 1 MICROSECOND)
JAN 7	44976.5	UTC(USNO) - UTC(OMSF)	0.68
JAN 12	44981.5	UTC(USNO) - UTC(IEN)	0.4
JAN 15	44984.2	UTC(USNO) - UTC(NPRL)	0.0*
JAN 20	44989.5	UTC(NPL) - UTC(VSL)	-0.13
JAN 20	44989.6	UTC(PTB) - UTC(VSL)	-0.004
JAN 20	44989.6	UTC(IEN) - UTC(VSL)	0.1
JAN 21	44990.3	UTC(USNO) - UTC(VSL)	0.48
JAN 24	44993.5	UTC(USNO) - UTC(NPL)	0.61
FEB 8	45008.5	UTC(USNO) - UTC(NRC)	0.2
FEB 26	45026.5	UTC(NBS) - UTC(USNO)	0.00
MAR 12	45040.6	UTC(USNO) - UTC(NBS)	0.00
MAR 24	45052.4	UTC(PTB) - UTC(FTZ)	0.0*
MAR 30	45058.4	UTC(USNO) - UTC(NPL)	0.21
MAY 18	45107.8	UTC(PTB) - UTC(VSL)	-0.302
MAY 18	45107.8	UTC(IEN) - UTC(VSL)	-0.627
MAY 18	45107.8	UTC(NPL) - UTC(VSL)	-0.05
MAY 25	45114.0	UTC(TAO) - UTC(ILOM)	0.0*
MAY 28	45117.5	UTC(IEN) - UTC(CAO)	0.0*
JUN 1	45121.1	UTC(NBS) - UTC(USNO)	-0.015
JUN 2	45122.0	UTC(TAO) - UTC(RRL)	-0.05
JUN 4	45124.0	UTC(TAO) - UTC(NRLM)	-0.04
JUN 7	45127.5	UTC(USNO) - UTC(ON)	0.65
JUN 9	45129.3	UTC(USNO) - UTC(BEV)	0.44
JUN 10	45130.3	UTC(USNO) - UTC(TUG)	0.61
JUN 16	45136.3	UTC(USNO) - UTC(DHI)	0.74
JUN 17	45137.3	UTC(USNO) - UTC(VSL)	-0.09
JUN 18	45138.4	UTC(USNO) - UTC(NPL)	-0.01
JUL 29	45179.3	UTC(ILOM) - UTC(RRL)	0.1
AUG 17	45198.3	UTC(ASMW) - UTC(ZIPE)	-0.059
AUG 26	45207.0	UTC(USNO) - UTC(NBS)	-0.03
SEP 9	45221.5	UTC(USNO) - UTC(NRC)	0.01
SEP 9	45221.5	UTC(USNO) - UTC(RGO)	0.1
SEP 10	45222.3	UTC(USNO) - UTC(NPL)	0.0
SEP 13	45225.3	UTC(USNO) - UTC(OP)	0.3
SEP 14	45226.3	UTC(USNO) - UTC(ORB)	0.6
SEP 16	45228.6	UTC(USNO) - UTC(VSL)	0.0
SEP 16	45228.6	UTC(PTB) - UTC(VSL)	-0.436
SEP 27	45239.6	UTC(ASMW) - UTC(TP)	-0.319
OCT 2	45244.0	UTC(OMH) - UTC(SU)	-0.25
OCT 7	45249.0	UTC(USNO) - UTC(OP)	0.335
OCT 18	45260.2	UTC(TAO) - UTC(RRL)	0.581
OCT 26	45268.0	UTC(TAO) - UTC(NRLM)	-0.153
NOV 9	45282.0	UTC(TAO) - UTC(ILOM)	0.151
NOV 23	45296.5	UTC(PKNM) - UTC(TP)	-0.33
DEC 16	45319.8	UTC(PTB) - UTC(VSL)	-0.293
DEC 16	45319.8	UTC(NPL) - UTC(VSL)	-0.143

COMPLEMENTARY RESULTS FOR THE PREVIOUS YEAR

1981			
SEP 21	44868	UTC(SU) - UTC(ASMW)	-0.2
OCT 13	44890	UTC(SU) - UTC(TP)	-0.2
DEC 7	44945	UTC(PKNM) - UTC(SU)	0.1

* NEW ORIGIN _ SEE TABLE 17

TABLE 19 - INTERNATIONAL ATOMIC TIME , BI-MONTHLY RATES OF TAI-CLOCK FOR 1982

THE RATES ARE AVERAGED OVER INTERVALS OF TWO MONTHS ENDING AT THE GIVEN DATES

UNIT IS NS/DAY , 0.0 DENOTES THAT THE CLOCK WAS NOT USED

LAB.	CLOCK	45019	45089	45149	45209	45269	45329
AOS	19 7	86.75	63.95	47.28	41.26	62.38	73.01
APL	14 121	-93.46	-101.05	-117.23	-112.94	-149.55	-167.41
APL	14 793	197.60	195.00	190.14	194.06	174.09	165.45
ASMW	13 29	0.0	0.0	0.0	0.0	-75.17	-72.82
ASMW	16 76	0.20	-8.82	-25.66	-31.22	-31.64	-8.97
ASMW	16 165	-31.34	-31.60	-28.59	-25.19	-26.97	-13.58
ASUA(1)	16 69	-48.56	-53.59				
ASUA	16 77	-113.61	-111.68				
ASUA	17 206	0.42	4.86				
ASUA	17 208	-228.95	-232.67				
ASUA	99 1	94.28	99.75				
ASUA	99 2	116.18	120.62				
ASUA	99 4	-9.09	7.20				
ASUA	99 5	-170.32	-160.26				
BEV	16 71	17.00	23.34	-2.01	2.74	0.40	-1.76
CAO	16 52	0.0	0.0	0.0	-28.54	-30.38	-8.54
CAO	16 183	0.0	0.0	0.0	-2.20	-8.21	-4.09
F	12 158	-68.07	-49.71	-23.87	-22.30	-23.82	-38.49
F	12 195	0.0	0.0	283.76	277.77	289.98	273.07
F	12 206	15.68	0.0	0.0	0.0	0.0	0.0
F	12 231	0.0	0.0	-173.30	0.0	0.0	0.0
F	12 347	-46.49	-66.21	0.0	0.0	-69.66	-81.69
F	12 439	-51.04	-50.65	-55.95	-62.68	-64.64	-43.10
F	14 51	-361.50	-365.09	0.0	0.0	-219.94	-227.15
F	14 134	0.0	-14.10	-13.42	-15.43	-14.12	-10.75
F	14 500	-53.68	-51.16	-38.58	-36.31	-34.55	-35.78
F	14 594	-250.80	-247.74	0.0	-227.37	-224.44	-231.00
F	14 753	-50.02	-39.08	-34.39	-39.03	-43.21	-24.43
F	22 120	-5.73	-7.68	-10.56	-2.80	-1.63	-6.42
F	24 407	-145.60	-144.06	-139.57	-144.52	-138.05	0.0
F	24 645	-45.18	-17.33	-24.72	-36.39	0.0	0.0
F	24 712	-49.32	-44.61	0.0	0.0	0.0	0.0
FTZ	14 312	-8.00	-12.73	-22.42	-28.93	9.57	14.59
FTZ	14 895	90.49	82.39	91.78	82.01	34.36	20.68
FTZ	16 130	0.0	0.0	0.0	0.0	16.48	26.41
FTZ	24 217	10.05	7.67	6.82	6.27	6.12	11.75
FTZ	24 482	4.64	2.75	3.61	1.89	8.96	17.60
FTZ	24 656	-3.91	-7.22	0.0	0.0	0.0	0.0
FTZ	24 674	0.0	0.0	43.88	35.15	29.85	35.88
IEN	12 303	-52.59	0.0	-44.27	-42.57	0.0	0.0
IEN	12 469	0.0	-11.24	23.92	45.44	42.44	2.28
IEN	12 609	-106.03	-117.39	-100.43	-94.21	-92.98	-109.43
IEN	14 893	33.54	26.95	48.11	47.24	45.82	37.39
IEN	16 84	154.00	143.55	137.07	123.74	140.71	148.64
IFAG	16 131	88.75	67.21	53.56	69.51	84.09	0.0

TABLE 19 - (CONT.)

LAB.	CLOCK		45019	45089	45149	45209	45269	45329
IFAG	16	138	-79.14	-114.85	-201.11	0.0	0.0	0.0
IFAG	16	173	0.0	0.0	0.0	0.0	58.72	73.08
NBS	11	137	-54.67	-66.04	-64.71	-82.35	-87.19	-87.61
NBS	11	167	-557.41	-561.97	-557.70	-559.19	-546.36	-549.16
NBS	12	352	-572.67	-573.31	0.0	0.0	-577.12	-563.61
NBS	13	61	0.0	0.0	0.0	0.0	-158.32	-117.69
NBS	14	316	-17.53	-17.09	-16.38	0.64	9.17	7.75
NBS	14	323	0.0	-101.58	-97.33	-96.71	-100.80	-97.42
NBS	14	601	-48.10	-51.00	-48.74	-48.34	-50.03	-59.72
NBS	18	8	953.03	955.58	948.28	952.37	969.65	0.0
NBS	18	113	0.0	0.0	0.0	0.0	-1063.69	-1017.89
NBS	22	375	78.44	88.24	104.25	0.0	0.0	0.0
NBS	40	4	-672.30	-670.34	0.0	0.0	-744.49	0.0
NBS (2)	91	4	0.0	0.0	0.0	0.0	7.95	0.0
NPL	11	134	-85.79	40.50	30.17	23.86	0.0	0.0
NPL	12	316	-136.83	-142.68	-158.14	-120.75	-97.42	-139.29
NPL	12	418	-68.94	-69.41	-55.19	-55.50	-55.71	-62.72
NPL	12	832	246.26	248.23	223.86	220.73	233.51	271.68
NRC	14	267	-22.13	-21.41	-24.64	-23.50	-23.21	-27.17
NRC	90	5	2.94	3.15	-5.79	-5.75	-0.71	3.33
NRC	90	61	-1.15	-6.46	-20.60	-6.13	-7.69	-6.67
NRC	90	62	0.0	0.0	2.33	-3.72	-6.33	-1.03
NRC	90	63	-1.40	1.06	-4.72	2.49	1.83	-9.28
OAD	16	144	-48.53	-39.68	-60.54	-68.11	0.0	0.0
OFM(1)	16	69				-98.02	-93.03	-84.32
OFM	16	77				-101.73	-100.37	-95.98
OFM	17	206				16.38	16.36	23.49
OFM	17	208				-179.02	-172.43	-170.98
OFM	99	1				69.00	71.76	93.25
OFM	99	2				124.87	115.79	125.94
OFM	99	4				100.81	106.85	116.27
OFM	99	5				-139.01	-146.11	-146.37
OMH	22	67	3.61	2.05	3.15	-10.49	-1.52	13.77
OMSF	14	896	4.69	2.65	0.28	10.02	18.67	9.01
OMSF	16	113	20.06	13.38	9.75	32.18	24.85	12.01
OMSF	16	121	-58.35	-64.58	-62.94	-52.58	-49.73	-65.45
OMSF	16	177	20.21	22.76	17.92	24.67	33.66	18.80
OMSF	22	223	209.30	212.40	219.31	215.00	225.33	227.69
OMSF	24	569	0.0	-21.15	-26.67	-26.40	-16.23	-14.44
ON	12	285	-16.11	-19.54	-25.05	-27.72	-20.28	-22.83
ON	12	863	0.41	-8.93	11.60	15.39	11.44	-4.47
ON	13	14	27.96	-4.73	-7.97	1.89	10.49	-18.18
ON	16	114	-8.03	-22.08	4.74	4.79	-9.05	1.30
ON	24	796	16.07	2.98	9.96	18.59	17.04	12.50
ORB	12	205	-70.83	-90.61	-102.00	-102.38	-99.96	-109.10
ORB	12	804	10.19	13.65	16.08	44.61	45.75	28.23
PKNM	16	124	20.25	14.77	-0.16	-19.55	0.0	0.0
PKNM	16	154	0.0	0.0	0.0	0.0	-61.03	-10.63
PKNM	24	144	-36.58	-26.52	-19.84	-10.51	-16.04	-2.06
PTB	12	320	0.0	0.0	-10.38	-27.70	-28.45	-22.34

TABLE 19 - (CONT.)

LAB.	CLOCK	45019	45089	45149	45209	45269	45329
PTB	12 389	-161.47	-168.46	0.0	0.0	0.0	0.0
PTB	12 462	5.39	-20.63	0.0	0.0	0.0	-10.08
PTB	14 394	-53.39	-48.47	-41.03	-41.13	-41.83	-42.64
PTB	14 395	-43.91	-47.41	-47.61	-47.70	-47.86	-43.67
PTB	14 867	-208.58	-209.28	-206.27	-204.53	-203.42	-204.42
PTB	16 119	108.45	0.0	0.0	0.0	0.0	-97.04
PTB	24 103	-31.16	-31.59	-20.64	-23.05	-19.63	-20.49
PTB(3)	92 1	0.21	-0.64	-2.66	-2.23	-2.89	1.56
PTCH	16 64	-60.93	-60.93	-92.73	-105.97	-88.57	-53.29
PTCH	16 140	77.32	75.24	17.77	-46.07	-18.21	63.60
RGO	11 123	-194.00	-190.26	-191.69	-188.90	-189.33	-178.23
RGO	11 199	-83.65	-91.90	-87.94	-85.75	-113.54	-95.61
RGO	12 348	192.28	222.79	180.41	191.12	180.62	175.25
RGO	12 484	0.0	0.0	-146.45	-134.72	-146.05	-118.31
RGO	14 202	-298.03	-304.40	-308.16	-317.19	-331.06	-343.68
RGO	14 560	-84.31	0.0	0.0	0.0	-98.94	-98.80
RGO	14 868	-124.82	-130.11	-127.74	-129.33	-131.65	-132.44
RGO	20 133	0.0	0.0	0.0	0.0	-206.09	-212.07
STA	14 900	0.0	0.0	-255.28	-239.69	-249.23	-239.42
STA	16 137	7.56	-5.71	-19.08	-24.87	-11.35	-10.42
STA	24 376	0.0	-8.64	-10.75	-4.75	-16.09	-31.64
TP	12 335	-317.39	-334.68	-330.59	-349.44	-376.21	-425.16
TUG	12 524	167.19	162.41	164.25	166.70	165.82	153.15
TUG	24 654	-56.28	-61.11	-57.86	-46.90	-40.94	-35.94
USNO	12 57	-396.51	-387.58	-334.99	-331.46	0.0	0.0
USNO	12 120	176.91	0.0	0.0	0.0	0.0	0.0
USNO	12 147	-291.16	-288.12	-267.00	-251.39	-231.46	-211.90
USNO	12 150	-22.68	-16.05	6.37	-0.03	24.74	18.05
USNO	12 532	11.45	19.36	24.49	20.04	21.83	34.89
USNO	12 549	-118.96	0.0	0.0	0.0	0.0	0.0
USNO	12 573	-91.21	-78.56	-43.50	-32.62	-44.27	-55.09
USNO	12 752	-139.80	-136.46	-136.26	-130.36	-127.38	-130.82
USNO	12 778	220.99	224.63	232.18	0.0	0.0	0.0
USNO	12 873	0.0	-17.27	-12.91	-9.54	-14.47	-10.17
USNO	14 345	0.0	0.0	140.10	129.62	138.68	147.82
USNO	14 571	-107.52	-105.04	-100.47	-92.71	-77.54	0.0
USNO	14 761	0.0	0.0	0.0	0.0	9.42	0.0
USNO	14 783	12.82	21.29	14.62	12.31	36.92	19.22
USNO	14 834	-104.41	-100.15	-87.04	-78.26	-63.17	0.0
USNO	14 871	0.0	0.0	87.56	92.21	103.66	92.15
USNO	18 107	832.27	823.21	838.50	818.85	813.50	818.48
USNO	18 108	0.0	457.02	0.0	0.0	0.0	0.0
USNO	18 133	0.0	1654.35	1655.45	1679.42	1699.02	1008.18
USNO	18 142	0.0	-224.22	0.0	-719.38	0.0	0.0
USNO	18 159	0.0	0.0	-6.89	17.42	26.81	25.32
USNO	22 114	57.59	0.0	0.0	82.23	83.67	75.00
USNO	22 264	0.0	-4.16	0.0	0.0	0.0	0.0
USNO	22 362	-50.38	-50.68	-52.14	0.0	0.0	0.0
USNO	22 535	0.0	0.0	0.0	0.0	0.0	-56.07
USNO	22 585	0.0	-35.14	-10.42	0.0	0.0	0.0

TABLE 19 - (CONT.)

LAB.	CLOCK	45019	45089	45149	45209	45269	45329
USNO	22 653	29.78	35.64	42.36	0.0	0.0	0.0
USNO	22 710	-100.65	-90.60	-39.62	0.0	0.0	0.0
USNO	24 26	-90.05	-95.58	-79.41	-58.07	0.0	0.0
USNO	24 28	-118.07	-121.23	-105.06	-103.23	-109.74	-121.83
USNO	24 33	91.56	78.34	80.99	84.91	83.12	75.52
USNO	24 35	-86.30	-89.77	-96.15	-98.66	-112.20	-115.65
USNO	24 94	0.0	0.0	-35.36	-38.51	-51.40	-54.11
USNO	24 117	-69.29	-70.95	-68.77	-67.51	0.0	0.0
USNO	24 118	0.0	0.0	0.0	-182.67	-183.70	-182.29
USNO	24 300	0.0	0.0	0.0	0.0	-229.84	-232.28
USNO	24 305	0.0	0.0	26.92	9.38	3.10	6.14
USNO	24 343	0.0	-71.39	-86.22	0.0	-51.69	-48.39
USNO	24 377	-138.02	-128.49	-124.76	-128.74	-125.04	-120.92
USNO	24 423	-25.10	-26.70	-25.52	-25.25	-21.16	0.0
USNO	24 586	0.0	0.0	0.0	0.0	0.0	-71.44
USNO	24 605	23.92	25.09	27.21	28.02	31.03	29.34
USNO	24 653	0.0	0.0	0.0	0.0	0.0	53.08
USNO	24 688	-46.94	-47.45	-50.02	-44.29	-40.06	-40.42
USNO	24 846	-53.42	-50.08	-40.93	-30.00	-37.18	-37.83
USNO	24 947	0.0	0.0	0.0	29.01	48.61	12.18
VSL	14 503	-245.80	-239.59	-237.73	-230.68	-223.68	-221.14
VSL	22 34	74.67	75.92	96.82	94.79	94.33	0.0
VSL	22 489	46.20	57.98	44.30	59.56	67.19	61.42
VSL	24 190	0.0	79.21	81.55	0.0	0.0	89.59
ZIPE	12 979	620.81	0.0	0.0	0.0	69.54	53.78

(1) From June 1982, the time facilities of ASUA were transferred to OFM.

(2) To obtain the right rate, add+433 888 ns/d.

(3) The first bi-monthly rate of TAI-92 001 (PTB CS1) was computed using two interpolated values - see Note Table 16 -

THE CLOCKS ARE DESIGNATED BY THEIR MODEL (2 DIGITS) AND SERIAL NO.
THE CODES FOR THE MODELS ARE

11	HEWLETT-PACKARD 5060A	
12 AND 22	HEWLETT-PACKARD 5061A	(22 001 EQUIVALENT TO 12 1001)
13	EBAUCHES OSCILLATOM. B 5000	
14 AND 24	HEWLETT-PACKARD 5061A OPT.4	(24 001 EQUIVALENT TO 14 1001)
16 AND 26	OSCILLOQUARTZ 3200	(26 001 EQUIVALENT TO 16 1001)
17 AND 27	OSCILLOQUARTZ 3000	(27 001 EQUIVALENT TO 17 1001)
18 AND 28	FREQ. AND TIME SYSTEMS INC. 4000	
19	ROHDE AND SCHWARZ XSC	
20	FREQ. AND TIME SYSTEMS INC. 5000	
25	HEWLETT-PACKARD 5062C	
40	HYDROGEN MASERS (NBS TYPE)	
90	LABORATORY CESIUM STANDARD NRC	
91	LABORATORY CESIUM STANDARD NBS 4	
92	LABORATORY CESIUM STANDARD PTB CS 1	
99	PROTOTYPE CS	

TABLE 20 - INTERNATIONAL ATOMIC TIME , WEIGHTS OF THE CLOCKS FOR 1982

THE WEIGHTS ARE GIVEN FOR INTERVALS OF TWO MONTHS ENDING AT THE GIVEN DATES

*** DENOTES THAT THE CLOCK WAS NOT USED

LAB.	CLOCK		45019	45089	45149	45209	45269	45329
AOS	19	7	2	4	20	27	28	33
APL	14	121	120	137	92	73	18	10
APL	14	793	196	200	198	200	67	43
ASMW	13	29	***	***	***	***	0	200
ASMW	16	76	25	25	25	35	46	44
ASMW	16	165	200	200	200	200	200	165
ASUA(1)	16	69	200	200				
ASUA	16	77	198	200				
ASUA	17	206	200	200				
ASUA	17	208	200	200				
ASUA	99	1	200	200				
ASUA	99	2	200	200				
ASUA	99	4	200	138				
ASUA	99	5	200	182				
BEV	16	71	15	31	19	22	25	60
CAO	16	52	***	***	***	0	200	52
CAO	16	183	***	***	***	0	194	200
F	12	158	139	94	27	19	20	35
F	12	195	***	***	0	193	179	140
F	12	206	179	***	***	***	***	***
F	12	231	***	***	0	***	***	***
F	12	347	200	60	***	***	0	89
F	12	439	120	200	196	184	117	123
F	14	51	0	200	***	***	0	197
F	14	134	***	0	200	200	200	200
F	14	500	200	200	179	200	186	200
F	14	594	200	200	***	0	200	200
F	14	753	106	53	51	75	185	139
F	22	120	200	200	200	200	200	200
F	24	407	200	200	200	198	200	***
F	24	645	200	80	73	75	***	***
F	24	712	200	200	***	***	***	***
FTZ	14	312	82	77	54	56	50	38
FTZ	14	895	176	192	194	174	0	9
FTZ	16	130	***	***	***	***	0	125
FTZ	24	217	200	200	200	200	200	200
FTZ	24	482	200	200	200	200	200	189
FTZ	24	656	200	200	***	***	***	***
FTZ	24	674	***	***	0	113	94	154
IEN	12	303	188	***	0	200	***	***
IEN	12	469	***	0	11	10	14	16
IEN	12	609	194	103	103	125	187	143
IEN	14	893	200	199	137	169	164	176
IEN	16	84	58	62	66	58	73	77
IFAG	16	131	200	43	24	33	44	***

TABLE 20 - (CONT.)

LAB.	CLOCK	45019	45089	45149	45209	45269	45329
IFAG	16 138	33	14	0	***	***	***
IFAG	16 173	***	***	***	***	0	60
NBS	11 137	102	150	200	87	50	38
NBS	11 167	175	200	200	193	176	200
NBS	12 352	29	24	***	***	0	68
NBS	13 61	***	***	***	***	0	8
NBS	14 316	196	200	200	157	117	88
NBS	14 323	***	0	200	200	200	200
NBS	14 601	200	200	200	200	200	185
NBS	18 8	92	61	128	200	130	***
NBS	18 113	***	***	***	***	0	5
NBS	22 375	13	12	15	***	***	***
NBS	40 4	0	0	***	***	0	***
NBS	91 4	***	***	***	***	0	***
NPL	11 134	0	0	1	2	***	***
NPL	12 316	13	63	34	32	26	26
NPL	12 418	200	200	171	200	200	198
NPL	12 832	19	13	15	22	62	28
NRC	14 267	200	200	200	200	200	200
NRC	90 5	199	200	178	200	200	200
NRC	90 61	200	200	153	170	176	197
NRC	90 62	***	***	0	193	195	200
NRC	90 63	200	200	194	200	200	178
OAB	16 144	200	188	120	55	***	***
OFM(1)	16 69				0	200	184
OFM	16 77				0	200	200
OFM	17 206				0	200	196
OFM	17 208				0	200	200
OFM	99 1				0	200	44
OFM	99 2				0	111	181
OFM	99 4				0	200	144
OFM	99 5				0	167	200
OMH	22 67	26	37	50	107	192	150
OMSF	14 896	200	200	200	193	197	185
OMSF	16 113	159	156	200	106	188	144
OMSF	16 121	39	42	48	152	200	155
OMSF	16 177	177	200	198	200	195	159
OMSF	22 223	91	96	83	141	189	200
OMSF	24 569	***	0	195	200	190	200
ON	12 285	200	200	195	200	200	200
ON	12 863	200	186	139	162	165	114
ON	13 14	100	71	57	56	57	34
ON	16 114	0	64	46	62	81	108
ON	24 796	131	72	93	128	200	200
ORB	12 205	12	8	10	12	18	41
ORB	12 804	37	30	39	35	53	54
PKNM	16 124	18	16	18	23	***	***
PKNM	16 154	***	***	***	***	0	0
PKNM	24 144	164	182	200	182	176	96
PTB	12 320	***	***	0	34	52	87

TABLE 20 - (CONT.)

LAB.	CLOCK	45019	45089	45149	45209	45269	45329
PTB	12 389	19	15	***	***	***	***
PTB	12 462	14	38	***	***	***	0
PTB	14 394	200	200	200	200	200	200
PTB	14 395	188	178	200	200	200	200
PTB	14 867	200	200	200	200	200	200
PTB	16 119	42	***	***	***	***	0
PTB	24 103	200	200	187	200	200	200
PTB	92 1	200	200	200	200	200	200
PTCH	16 64	33	35	27	21	19	20
PTCH	16 140	8	6	0	0	4	0
RGO	11 123	200	200	200	200	200	177
RGO	11 199	127	79	72	89	43	62
RGO	12 348	190	52	14	41	34	28
RGO	12 484	***	***	0	129	157	51
RGO	14 202	179	129	140	76	38	26
RGO	14 560	106	***	***	***	0	200
RGO	14 868	200	200	200	200	200	200
RGO	20 133	***	***	***	***	0	200
STA	14 900	***	***	0	67	134	167
STA	16 137	45	41	42	50	63	63
STA	24 376	***	0	200	200	168	63
TP	12 335	15	11	11	9	10	0
TUG	12 524	200	200	200	200	200	170
TUG	24 654	200	200	200	187	200	157
USNO	12 57	0	14	0	10	***	***
USNO	12 120	1	***	***	***	***	***
USNO	12 147	49	39	50	46	21	12
USNO	12 150	143	199	111	105	44	37
USNO	12 532	200	193	200	200	200	167
USNO	12 549	1	***	***	***	***	***
USNO	12 573	21	20	19	18	19	22
USNO	12 752	188	122	175	200	200	200
USNO	12 778	200	200	200	***	***	***
USNO	12 873	***	0	200	200	200	200
USNO	14 345	***	***	0	83	190	160
USNO	14 571	190	200	200	200	125	***
USNO	14 761	***	***	***	***	0	***
USNO	14 783	42	59	60	49	101	144
USNO	14 834	147	145	167	131	57	***
USNO	14 871	***	***	0	200	160	176
USNO	18 107	70	103	106	126	78	79
USNO	18 108	***	0	***	***	***	***
USNO	18 133	***	0	200	45	22	0
USNO	18 142	***	0	***	0	***	***
USNO	18 159	***	***	0	25	29	41
USNO	22 114	61	***	***	0	200	190
USNO	22 264	***	0	***	***	***	***
USNO	22 362	200	200	200	***	***	***
USNO	22 535	***	***	***	***	***	0
USNO	22 585	***	0	24	***	***	***

TABLE 20 - (CONT.)

LAB.	CLOCK	45019	45089	45149	45209	45269	45329
USNO	22 653	0	200	200	***	***	***
USNO	22 710	146	178	0	***	***	***
USNO	24 26	19	22	81	58	***	***
USNO	24 28	23	29	43	59	192	153
USNO	24 33	15	30	83	78	103	195
USNO	24 35	200	200	191	200	75	50
USNO	24 94	***	***	0	200	71	69
USNO	24 117	200	196	179	200	***	***
USNO	24 118	***	***	***	0	200	200
USNO	24 300	***	***	***	***	0	200
USNO	24 305	***	***	0	34	37	54
USNO	24 343	***	0	45	***	0	200
USNO	24 377	62	185	200	200	200	200
USNO	24 423	200	200	200	200	200	***
USNO	24 586	***	***	***	***	***	0
USNO	24 605	157	197	200	200	200	200
USNO	24 653	***	***	***	***	***	0
USNO	24 688	58	47	47	61	200	200
USNO	24 846	200	200	196	136	176	200
USNO	24 947	***	***	***	0	39	22
VSL	14 503	195	200	200	186	133	183
VSL	22 34	200	200	73	56	85	***
VSL	22 489	0	91	109	145	132	177
VSL	24 190	***	0	200	***	***	0
ZIPE	12 979	0	***	***	***	0	52

(1) From June 1982, the time facilities of ASUA were transferred to OFM.

THE CLOCKS ARE DESIGNATED BY THEIR MODEL (2 DIGITS) AND SERIAL NO.
THE CODES FOR THE MODELS ARE

11	HEWLETT-PACKARD 5060A	
12 AND 22	HEWLETT-PACKARD 5061A	(22 001 EQUIVALENT TO 12 1001)
13	EBAUCHES OSCILLATOM. B 5000	
14 AND 24	HEWLETT-PACKARD 5061A OPT.4	(24 001 EQUIVALENT TO 14 1001)
16 AND 26	OSCILLOQUARTZ 3200	(26 001 EQUIVALENT TO 16 1001)
17 AND 27	OSCILLOQUARTZ 3000	(27 001 EQUIVALENT TO 17 1001)
18 AND 28	FREQ. AND TIME SYSTEMS INC. 4000	
19	ROHDE AND SCHWARZ XSC	
20	FREQ. AND TIME SYSTEMS INC. 5000	
25	HEWLETT-PACKARD 5062C	
40	HYDROGEN MASERS (NBS TYPE)	
90	LABORATORY CESIUM STANDARD NRC	
91	LABORATORY CESIUM STANDARD NBS 4	
92	LABORATORY CESIUM STANDARD PTB CS 1	
99	PROTOTYPE CS	

TABLE 21 - MEASUREMENTS OF THE EAL AND TAI FREQUENCY

GRAVITATIONAL FREQUENCY CORRECTIONS ARE APPLIED . THE FREQUENCIES ARE EXPRESSED AT SEA LEVEL .

INTERVAL MJD	CENTRAL DATE	F(EAL)-F(NBS6) IN 10**-13	F(EAL)-F(NRC CSV) IN 10**-13	F(EAL)-F(PTB CS1) IN 10**-13
44229_44309	1980 JAN31		8.84	9.31
44249_44329	1980 FEB20	8.60		
44309_44389	1980 APR20		9.57	8.99
44389_44469	1980 JUL 9		8.98	8.45
44469_44549	1980 SEP27		8.35(1)	8.04
44549-44629	1980 DEC16		8.52	8.67
44629-44709	1981 MAR 6		9.16	9.12
44709-44789	1981 MAY25		8.63	8.42
44789-44869	1981 AUG13		7.92	7.86
44889-44969	1981 NOV21		7.99(1)	7.98
44969-45049	1982 FEB 9		8.93	8.39(2)
45029-45109	1982 APR10	7.35		
45049-45129	1982 APR30		8.15	8.28
45149-45229	1982 AUG 8		7.47(1)	7.71
45229-45309	1982 OCT27		8.18	7.62

INTERVAL MJD	CENTRAL DATE	F(TAI)-F(NBS6) IN 10**-13	F(TAI)-F(NRC CSV) IN 10**-13	F(TAI)-F(PTB CS1) IN 10**-13
44229_44309	1980 JAN31		0.44	0.91
44249_44329	1980 FEB20	0.20		
44309_44389	1980 APR20		1.17	0.59
44389_44469	1980 JUL 9		0.58	0.05
44469_44549	1980 SEP27		-0.05(1)	-0.36
44549-44629	1980 DEC16		0.12	0.27
44629-44709	1981 MAR 6		0.76	0.72
44709-44789	1981 MAY25		0.23	0.02
44789-44869	1981 AUG13		-0.48	-0.54
44889-44969	1981 NOV21		-0.41(1)	-0.42
44969-45049	1982 FEB 9		0.53	-0.01(2)
45029-45109	1982 APR10	-1.00		
45049-45129	1982 APR30		-0.15	-0.02
45149-45229	1982 AUG 8		-0.48(1)	-0.24
45229-45309	1982 OCT27		0.38	-0.18

(1) COMPUTED JUST AFTER A FULL EVALUATION OF NRC-CSV

(2) THIS FREQUENCY WAS COMPUTED USING TWO INTERPOLATED VALUES (SEE NOTE OF TABLE 16)

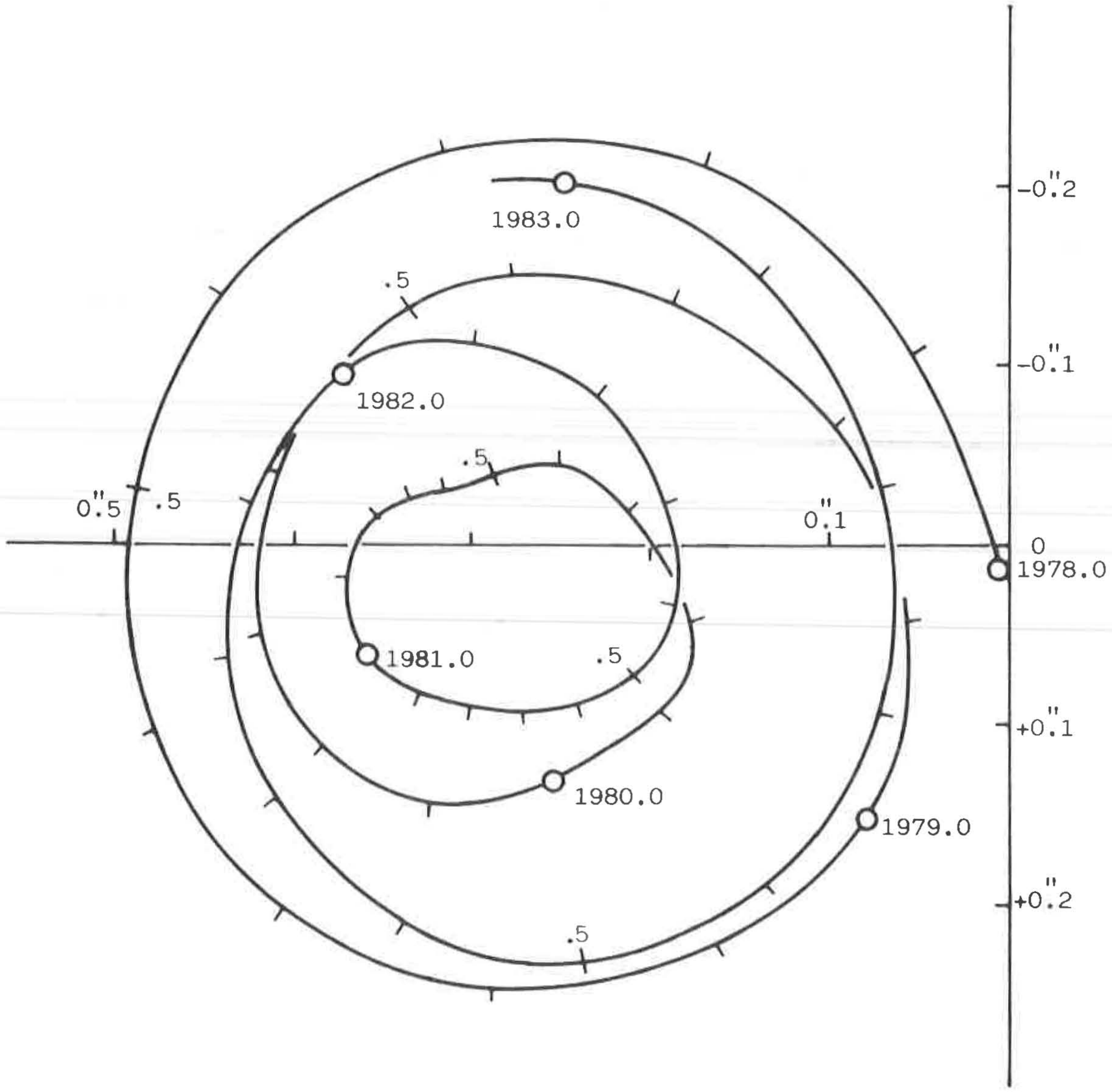

Figure 1. Path of the pole from 1978.0 to 1983.0
Smoothed values of Table 6C, obtained by the Vondrak's method, with the coefficient of smoothing which equalizes the internal and external standard deviations in x and y.

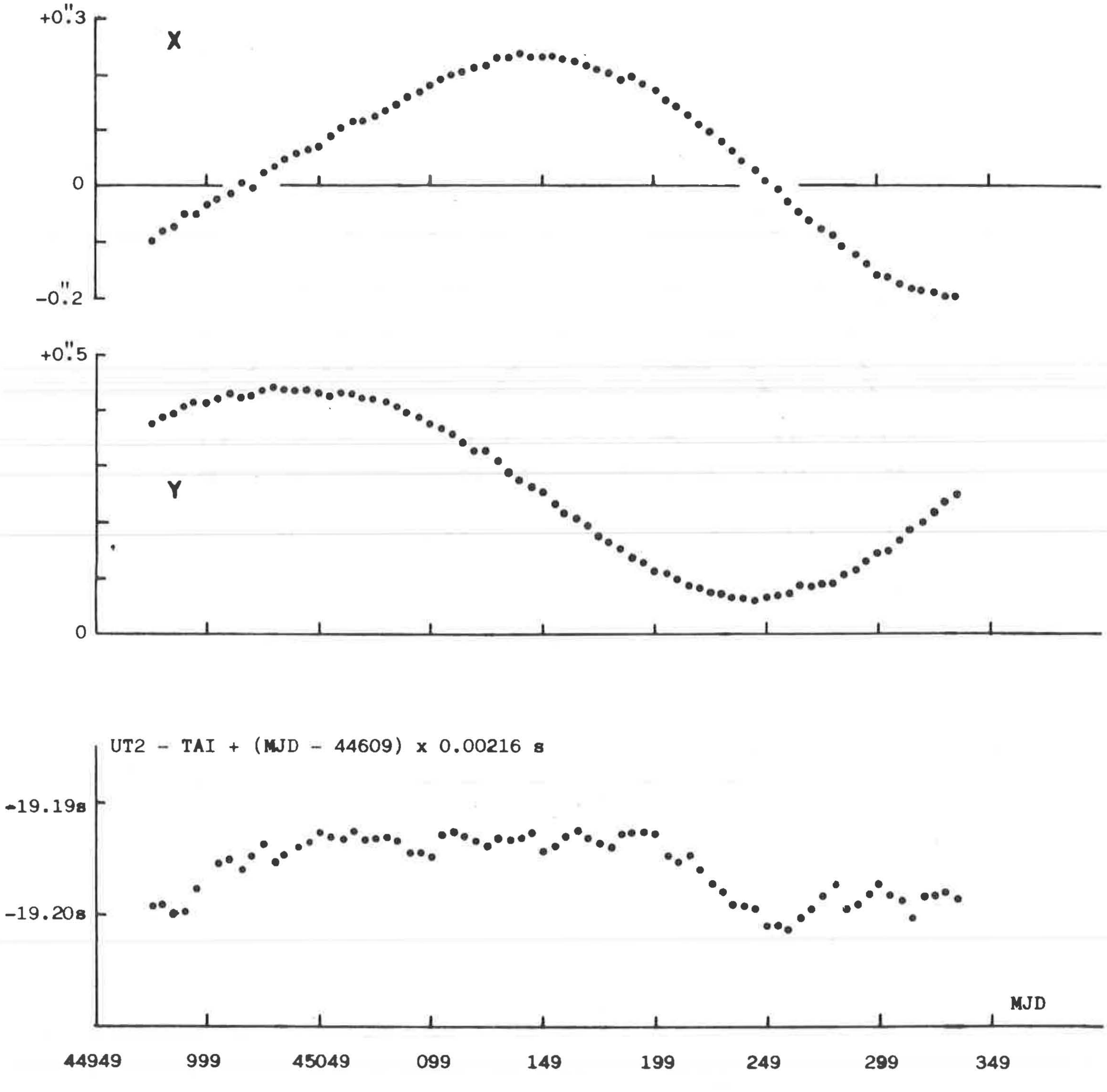

Figure 2. Raw values of x, y, UT2-TAI (Table 6 for 1982), 5-days means.

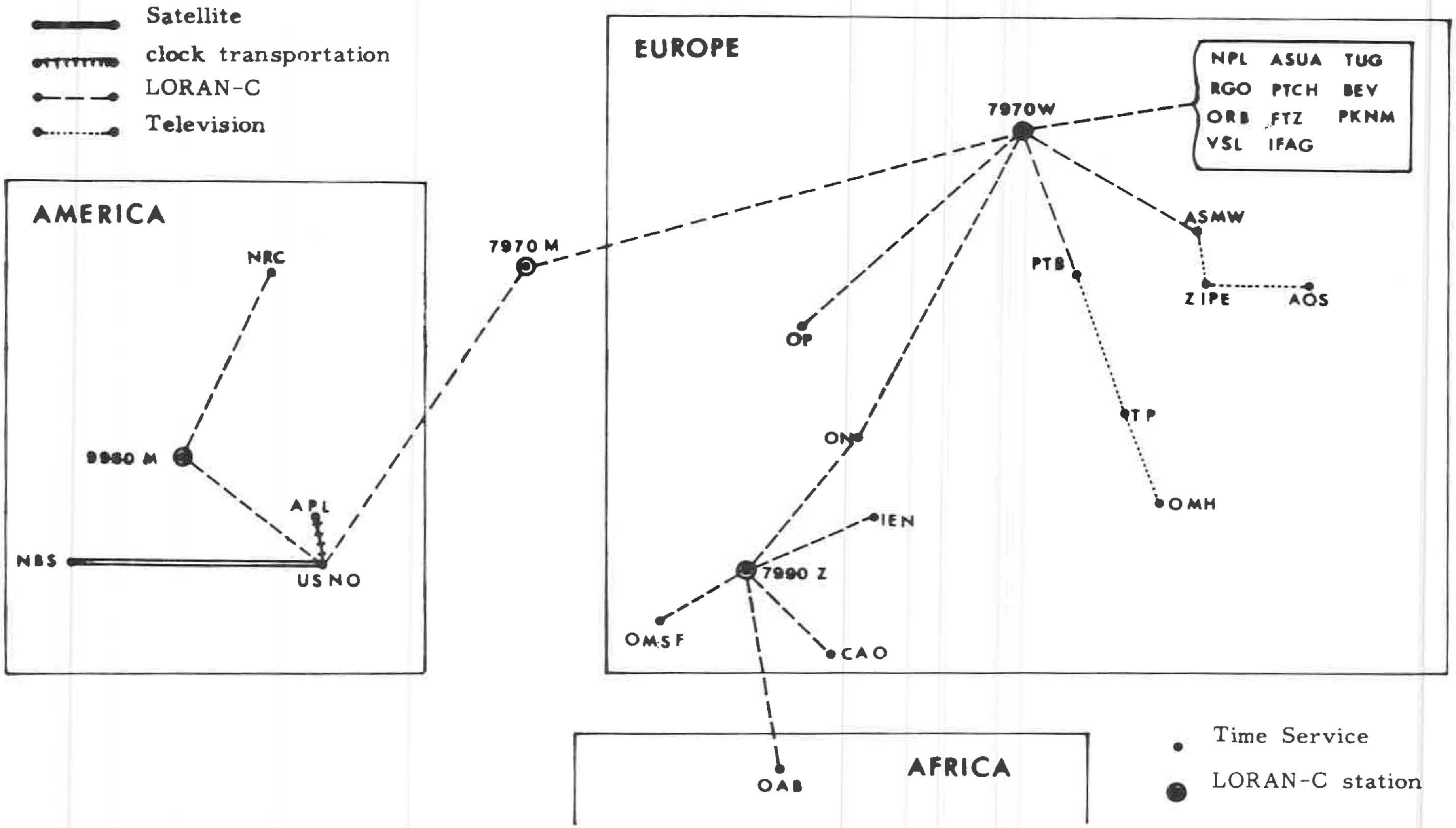

Fig. 3. Time links used by the BIH for establishing TAI end 1982

PART C

TIME SIGNALS (1983)

The time signal emissions reported thereafter follow the UTC system, in accordance with the Recommandation 460-3 of the International Radio Consultative Committee (CCIR), unless otherwise stated.

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

AUTHORITIES RESPONSIBLE FOR THE TIME SIGNAL EMISSIONS

Signal	Authority
ATA	National Physical Laboratory Hillside Road New Dehli – 110012, India
BPM	Shaanxi Astronomical Observatory Academia Sinica P. O. Box 18 – Lintong Shaanxi, China
BSF	Telecommunication Laboratories Directorate General of Telecommunications Ministry of Communications P. O. Box 71 – Ching-Li 320 Taiwan, China
CHU	National Research Council, Time and Frequency Section Physics Division (M-36) Ottawa K1A OS1, Ontario, Canada Attn : Dr. C. C. Costain
DAM, DAN, DAO	Deutsches Hydrographisches Institut Postfach 220 2000 Hamburg 4, Federal Republic of Germany
DCF77	Physikalisch-Technische Bundesanstalt, Laboratorium 1-21 Federal Republic of Germany Bundesallee 100 D33 Braunschweig
DGI, Y3S	Amt für Standardisierung: Messwesen und Warenprüfung Fachabteilung Elektrizität und Magnetismus Fachgebiet Zeit und Frequenz Fürstenwalder Damm 388 DDR 1162 Berlin
EBC	Instituto y Observatorio de Marina San Fernando Cadiz, Spain

Signal	Authority
FTH42, FTK77, FTN87	Laboratoire Primaire du Temps et des Fréquences Observatoire de Paris 61, avenue de l'Observatoire 75014 Paris, France
GBR	1/ Time information : Royal Greenwich Observatory Herstmonceux Castle Hailsham, East Sussex BN27 1 RP, United Kingdom 2/ Standard Frequency information : National Physical Laboratory Electrical Science Division Teddington, Middlesex TW11 OLW, United Kingdom
HBG	Service horaire HBG Observatoire Cantonal CH – 2000 Neuchâtel, Suisse
IAM	Istituto Superiore delle Poste e delle Telecomunicazioni Ufficio 8°, Rep. 3° - Viale Europa 00100 – Roma, Italy
IBF	Istituto Elettrotecnico Nazionale Galileo Ferraris Strada delle Cacce, 91 10135 – Torino, Italy
JJY, JG2AS	Frequency Standard Division The Radio Research Laboratories Ministry of Posts and Telecommunications Koganei, Tokyo 184, Japan
LOL	Director Observatorio Naval Av. España 2099 1107 – Buenos-Aires, Republica Argentina
LQB9, LQC20	Instituto Geografico Militar (IGMA) Servicio internacional de la Hora Seccion Conservacion de la Hora Calle 38 Gral Savio 865 1650 Villa Maipu, San Martin Pcia de Buenos-Aires Republica Argentina

Signal	Authority
MSF	National Physical Laboratory Electrical Science Division Teddington, Middlesex TW11 OLW United Kingdom
OLB5, OMA	1/ Time information : Astronomický Ústav ČSAV, Budečská 6, 120 23 Praha 2, Vinohrady, Czechoslovakia. TELEX : 122 486 2/ Standard frequency information : Ústav radiotechniky a elektroniky ČSAV, Lumumbova 1, 182 51 Praha 8, Kobylisy, Czechoslovakia. TELEX : 122 646
PPE, PPR	Serviço da Hora Observatório Nacional (CNPq) Rua General Bruce, 586 20921 Rio de Janeiro – RJ, Brasil
RBU, RCH, RID, RTA,RTZ,RWM, UNW3, UPD8, UQC3, USB2, UTR3	Comité d'État des Normes Conseil des Ministre de l'URSS Moscou 117049, URSS, Leninski prosp., 9
VNG	Telecom Australia Research Laboratories Reference Measurements Section Box 249 Clayton, Victoria 3168, Australia
WWV, WWVH WWVB	Time and Frequency Services Group Time and Frequency Division, 524.00 325 Broadway National Bureau of Standards Boulder, Colorado 80303, U.S.A.
YVTO	Direccion de Hidrografia y Navegacion Observatori Cagigal Apartado Postal N°6745 Caracas, Venezuela
Y3S	See DGI
ZUO	National Physical Research Laboratory P. O. Box 395 Pretoria South Africa

TIME - SIGNALS EMITTED IN THE UTC SYSTEM

Station	Location Latitude Longitude	Frequency (kHz)	Schedule (UT)	Form of time signals
ATA	Greater Kailash Delhi India 28° 34'N 77° 19'E	5 000 10 000 15 000	3h 30 m to 14h 30 m on Monday to Saturday no transmission on Sundays and Govt Holidays, continuous operation projected.	Second pulses of 5 cycles of a 1 kHz modulation. Minute pulses of 100 ms duration.
BPM	Pucheng China 35° 0'N 139° 31'E	5 000 10 000 15 000	from 14h to 24h continuous from 0h to 14h	UTC time signals (the signals are emitted in advance on UTC by 10ms). Second pulses of 5 ms of 1 kHz modulation. Minute pulses of 300ms of 1 kHz modulation. From minutes 0 to 5, 15 to 25, 30 to 35, 45 to 55. UT1 time signals are emitted from minutes 5 to 10, 25 to 29, 35 to 40, 55 to 59.
BSF	Chung-Li Taiwan China 24° 57'N 121° 9'E	5 000 15 000	continuous except interruption between minutes 35 and 40	(a) From min. 5 to 10, 15 to 20, 25 to 30, 45 to 50, 55 to 60, second pulses of 5ms duration without 1 kHz modulation. (b) From min. 0 to 5, 10 to 15, ..., 50 to 55, second pulses of 5ms duration with 1 kHz modulation. The 1 kHz modulation is interrupted 40ms before and after the pulses. (c) Minute pulses are extended to 300ms. (d) DUT1, CCIR code by lengthening.
CHU	Ottawa Canada 45° 18'N 75° 45'W	3 300 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 0.5s long. Hour pulses are 1.0s long, with the following 1st to 10th pulses omitted. A bilingual (Fr. Eng.) announcement of time is made each minute following the 50th second pulse. FSK time code after 10 cycles on the 31st to 39th seconds. Broadcast is single side band ; upper side band with carrier reinserted. DUT1 : CCIR code by split pulses.
DAM	Elmshorn Germany, F. R. 53° 46'N 9° 40'E	8 638.5 16 980.4 4 265 8 638.5 6 475.5 12 763.5	11h 55 m to 12h 06m 23h 55m to 24h 06m from 21 Oct. to 25 March 23h 55m to 24h 06m from 26 March to 20 Oct.	New international system, then second pulses from minutes 0.5 to 6.0 (minute pulses prolonged). A1 Type DUT1 : CCIR code by doubling, after minute pulses 1 to 5
DAN	Osterloog Germany, F.R. 53° 38'N 7° 12'E	2 614	11h 55m to 12h 06m 23h 55m to 24h 06m	As DAM (see above)
DAO	Kiel Germany, F. R. 54° 26'N 10° 8'E	2 775	11h 55m to 12h 06m 23h 55m to 24h 06m	As DAM (see above)
DCF77	Mainflingen Germany, F. R. 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 0.1s or 0.2s respectively. Coded transmission of year, month, day, hour, minute and day of the week in a BCD code from second marker N° 20 to N° 58 (the second marker durations of 0.1 s or 0.2s correspond to a binary 0 or a binary 1 respectively). Zonal time code by the second markers N° 16 to 18. Second marker N° 15 with a duration of 0.2s indicates that the reserve antenna is in use. No transmission of DUT1.

Notes : see p. C-11

Station	Location Latitude Longitude	Frequency (kHz)	Schedule (UT)	Form of time signals
DGI (1)	Oranienburg Germ. Dem. Rep. 52° 48'N 13° 24'E	182	5h 59m 30s to 6h 00m 11h 59m 30s to 12h 00m 17h 59m 30s to 18h 00m	A2 type second pulses of 0.1 s duration for seconds 30-40, 45-50, 55-60. The last pulse is prolonged. (one hour earlier in summer time)
EBC	San Fernando Spain 36° 28'N 6° 12'W	12 008 6 840	10h 00m to 10h 25m 10h 30m to 10h 55m	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, CCIR code, double pulse. Type A3H
FTH42 FTK77 FTN87	Ste Assise France 48° 33'N 2° 34'E	7 428 10 775 13 873	at 9h and 21h at 8h and 20h at 9h 30m, 13h, 22h 30m,	A1 type second pulses during the 5 minutes preceding the indicated times. Minute pulses are prolonged. DUT1 : in morse code.
GBR (2)	Rugby United Kingdom 52° 22'N 1° 11'W	16	2h 55m to 3h 00m 8h 55m to 9h 00m 14h 55m to 15h 00m 20h 55m to 21h 00m	A1 type second pulses lasting 100ms, lengthened to 500 ms at the minute. The reference point is the start of carrier rise. Uninterrupted carrier is transmitted for 24 s from 54m 30s and from 0m 6s. DUT1 : CCIR code by double pulses.
HBG	Prangins Switzerland 46° 24'N 6° 15'E	75	continuous	Interruption of the carrier at the beginning of each second, during 100ms. The minutes are identified by a double pulse, the hours by a triple pulse. No transmission of DUT1.
IAM (1)	Rome Italy 41° 47'N 12° 27'E	5 000	7h 30m to 8h 30m 10h 30m to 11h 30m except Sat. afternoon, Sund., and national holidays. Advanced by 1h in summer.	Second pulses of 5 cycles of 1 kHz modulation. Minute pulses of 20 cycles (Announcements 5m before the emission of time signals).
IBF	Torino Italy 45° 2'N 7° 42'E	5 000	During 15m preceding 7h, 9h, 10h, 11h, 12h, 13h, 14h, 15h, 16h, 17h, 18h. Advanced by 1 hour in summer.	Second pulses of 5 cycles of 1 kHz modulation. These pulses are repeated 7 times at the minute. Voice announcements at the beginning and end of each emission. Time announcement (C.E.T.) by Morse code every ten minutes beginning at 0h 0m. DUT1 : CCIR code by double pulse.
JG2AS	Sanwa Ibaraki Japan 36° 11'N 139° 51'E	40	continuous, except interruptions during communications.	A1 type second pulses of 0.5 s duration. Second 59 is of 0.1 s. No DUT1 code.
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 : CCIR code by lengthening.

Notes : see p. C-11

Station	Location Latitude Longitude	Frequency (kHz)	Schedule (UT)	Form of time signals
LOL1 (1)	Buenos-Aires Argentina 34° 37'S 58° 21'W	5 000 10 000 15 000	11h to 12h, 14h to 15h, 17h to 18h, 20h to 21h, 23h to 24h	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 : CCIR code by lengthening.
LOL2 LOL3 (1)	Buenos-Aires Argentina 34° 37'S 58° 21'W	4 856 8030 17 180	1h 13h, 21h,	A1 second pulses during the 5 minutes preceding the indicated times. Second 29 is omitted. Minute pulses are prolonged. DUT1 : CCIR code by double pulse.
LQB9 LQC20	Planta Gral Pacheco 34° 26'S 58° 37'W	8 167.5 17 550	22h 5m, 23h 50m 10h 5m, 11h 50m	A1 second pulses during the 5 minutes preceding the indicated times. Second 59 is omitted, second 60 is prolonged. After the emission, OK is transmitted if the emission is correct, NV if not correct. DUT1 : CCIR code by double pulse.
MSF	Rugby United Kingdom 52° 22'N 1° 11'W	60	continuous except for an interruption for maintenance from 10h 0m to 14h 0m on the first Tuesday in each month.	Interruptions of the carrier of 100ms for the second pulses, of 500ms 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 interruptions. BCD PWMcode, 1 bit/s (year, month, day of month, day of week, hour, minute) from seconds 17 to 59 in each minute. DUT1 : CCIR code by double pulse.
MSF	Rugby United Kingdom 52° 22'N 1° 11'W	2 500 5 000 10 000	between minutes 0 and 5, 10 and 15, 20 and 25, 30 and 35, 40 and 45, 50 and 55.	Second pulses of 5 cycles of 1 kHz modulation. Minute pulses are prolonged. DUT1 : CCIR code by double pulse.
OLB5	Poděbrady Czechoslovakia 50° 9'N 15° 9'E	3 170	continuous except from 6h to 12h on the first Wednesday of every month	A1 type, second pulses. No transmission of DUT1.
OMA (3)	Liblice Czechoslovakia 50° 4'N 14° 53'E	50	continuous (from 6h to 12h on the first Wednesday in each month, emitted from Poděbrady with reduced power)	Interruption of the carrier of 100ms at the beginning of every second, of 500ms at the beginning of every minute. The precise time is given by the beginning of the interruption. Phase coded announcement of date, UT and local civil time. No DUT1 code.
OMA	Liblice Czechoslovakia 50° 4'N 14° 53'E	2 500	between minutes 1 and 15 16 and 30, 31 and 45, 46 and 60 of every hour except from 6h to 12h on the first Wednesday of every month.	Pulses of 5 cycles of 1 kHz modulation (prolonged for the minutes). No transmission of DUT1.
PPE (1)	Rio-de-Janeiro Brasil 22° 54'S 43° 13'W	8 721	0h 30m, 11h 30m, 13h 30m, 19h 30m, 20h 30m, 23h 30m	Second ticks, of A1 type, during the five minutes preceding the indicated hours. The minute ticks are longer. DUT1 : CCIR code by double pulse.

Notes : see p. C-11

Station	Location Latitude Longitude	Frequency (kHz)	Schedule (UT)	Form of the time signals
PPR (1)	Rio-de-Janeiro Brasil 22° 59' S 43° 11' W	435 4 244 8 634 13 105 17 194.4 22 603	1h 30m, 14h 30m, 21h 30m	Second ticks, of A1 type, during the five minutes preceding the indicated hours. The minute ticks are longer.
RBU (4)	Moscow USSR 55° 48' N 38° 18' E	66 2/3	continuous	A1X type second pulses. The pulses at beginning of the minute are prolonged to 0.5 s.
RCH (4)	Tashkent USSR 41° 19' N 69° 15' E		between minutes 0 and 10, 30 and 40	Second pulses. The pulses at the beginning of the minute are prolonged to 0.5 s.
		2 500	0h to 3h 40m 5h 30m to 23h 40m	
		5 000	0h to 1h 10m 2h to 3h 40m 14h to 17h 10m 18h to 23h 40m	
		10 000	5h 30m to 9h 10m 10h to 13h 10m	
RID (4)	Irkutsk USSR 52° 26' N 104° 2' E	5 004 10 004 15 004	The station simultaneously operates on three frequencies between minutes 20 and 30 50 and 60.	Second pulses. The pulses at the beginning of the minute are prolonged to 0.5 s.
RTA (4)	Novossibirsk USSR 55° 4' N 82° 58' E		between minutes 0 and 10, 30 and 40	Second pulses. The pulses at the beginning of the minute are prolonged.
		10 000	0h to 1h 10m 2h to 4h 40m 14h to 17h 10m 18h to 23h 40m	
		15 000	6h 30m to 9h 10m 10h to 13h 10m	
RWM (4)	Moscow USSR 55° 48' N 38° 18' E	4 996 9 996 14 996	The station simultaneously operates on three frequencies between minutes 10 and 20, 40 and 50	Second pulses. The pulses at the beginning of the minute are prolonged to 0.5s.
RTZ (4)	Irkutsk USSR 52° 26' N 104° 2' E	50	between minutes 0 and 5, from 1h to 23h 5m Advanced by 1 hour in summer	A1 type second pulses. The pulses at the beginning of the minute are prolonged to 0.5s.

Notes : see p. C-11

Station	Location Latitude Longitude	Frequency (kHz)	Schedule (UT)	Form of the time signals
UNW3	Molodechno USSR 54° 26' N 26° 48' E	25	from 7h 43m to 7h 52m from 19h 43m to 19h 52m in winter (1 Oct. to 31 March) from 7h 43m to 7h 52m from 20h 43m to 20h 52m in summer (1 April to 30 Sept.)	A1N type 0.1 second pulses of 0.025s duration. Second pulses are prolonged to 0.1 s. 10 second pulses are prolonged to 1 s and minute pulses are prolonged to 10s. No transmission of DUT1 code.
UPD8	Arkhangelsk USSR 64° 24'N 41° 32'E	25	from 8h 43m to 8h 52m from 11h 43m to 11h 52m	A1N type 0.1 second pulses of 0.025 duration. Second pulses are prolonged to 0.1s. 10 second pulses are prolonged to 1s and minute pulses are prolonged to 10s. No transmission of DUT1 code.
UQC3	Chabarovsk USSR 48° 30' N 134° 51' E	25	from 0h 43m to 0h 52m, from 6h 43m to 6h 52m from 17h 43m to 17h 52m in winter (1 Oct. to 31 March) from 2h 43m to 2h 52m from 6h 43m to 6h 52m from 18h 43m to 18h 52m in summer (1 April to 30 Sept.)	A1N type 0.1 second pulses of 0.025s duration. Second pulses are prolonged to 0.1s ; 10 second pulses are prolonged to 1s and minute pulses are prolonged to 10s. No transmission of DUT1 code.
USB2	Frunze USSR 43° 04'N 73° 39'E	25	from 4h 43m to 4h 52m from 9h 43m to 9h 52m from 21h 43m to 21h 52m in winter (1 Oct. to 31 March) from 4h 43m to 4h 52m from 10h 43m to 10h 52m from 22h 43m to 22h 52m in summer (1 April to 30 Sept.)	A1N type 0.1 second pulses of 0.025s duration. Second pulses are prolonged to 0.1s. 10 second pulses are prolonged to 1s and minute pulses are prolonged to 10s. No transmission of DUT1 code.
UTR3	Gorki USSR 56° 11' N 43° 58' E	25	from 5h 43m to 5h 52m from 13h 43m to 13h 52m from 18h 43m to 18h 52m in winter (1 Oct. to 31 March) from 7h 43m to 7h 52m from 14h 43m to 14h 52m from 19h 43m to 19h 52m in summer (1 April to 30 Sept.)	A1N type 0.1 second pulses of 0.025s duration. Second pulses are prolonged to 0.1s ; 10 second pulses are prolonged to 1s and minute pulses are prolonged to 10s. No transmission of DUT1 code.

Notes : see p. C-11

Station	Location Latitude Longitude	Frequency (kHz)	Schedule (UT)	Form of the time signals
VNG	Lyndhurst Australia 38° 3' S 145° 16' E	4 500 7 500 12 000	9h 45m to 21h 30m continuous except 22h 30m to 22h 45m 21h 45m to 9h 30m	Second markers of 50 cycles of 1 kHz modulation; 5 cycles only for second markers 55 to 58 ; second marker 59 is omitted ; 500 cycles for minute markers. During the 5th, 10th, 15th, etc... minutes, 5 cycles for second markers 50 to 58. Identification by voice announcement during 15th, 30th, 45th and 60th minutes. DUT1 : CCIR code by 45 cycles of 900 Hz modulation immediately following the normal second markers.
WWV	Fort-Collins 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. 59th and 29th 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 : CCIR code by double pulse. BCD time code given on 100 Hz subcarrier, includes DUT1 correction.
WWVB	Fort-Collins 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 and time and of the correction to obtain UT1. No CCIR code.
WWVH	Kauai 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. 59th and 29th 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 : CCIR code by double pulse. BCD time code given on 100 Hz subcarrier, includes DUT1 correction.
YVTO	Caracas Venezuela 10° 30' N 66° 56' W	6 100	continuous	Second pulses of 1 kHz modulation with 0.1s duration. The minute is identified by a 800 Hz tone and a 0.5s 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.
Y3S (1)(5)	Nauen Germ. Dem. Rep. 52° 39' N 12° 55' E	4 525	continuous except from 8h 15m to 9h 45m for maintenance if necessary	A1 type second pulses of 0.1s duration. Minute pulses prolonged to 0.5s. DUT1 : CCIR code by double pulse.
ZUO	Olifantsfontein South Africa 25° 58' S 28° 14' E	2 500 5 000	18h to 4h continuous	Pulses of 5 cycles of 1 kHz modulation. Second 0 is prolonged. DUT1 : CCIR code by lengthening.
ZUO	Johannesburg South Africa 26° 11' S 28° 4' E	100 000	continuous	Pulses of 5 cycles of 1 kHz modulation. Second 0 is prolonged. DUT1 : CCIR code by lengthening.

Notes : see p. C-11

Notes on the characteristics of time signals

(1) No recent information on these time signals.

(2) The modulation system used by GBR outside the time-signals is likely to change to a form of minimum-shift keying sometime after the end of 1983. Some standard-frequency and phase-tracking receivers may not work without modification. Details of the new system are not yet available. No changes are planned in the form of the time-signals.

(3) OMA, 50 kHz

a. The main transmitter in Liblice radiates approx. 7 kW and the stand-by transmitter in Podébrady approx. 50 W.

b. The details of the time code were published in Nomenclature des stations de radiorepérage et des stations effectuant des services spéciaux - Liste VI, Volume I, édition 7 de U.I.T. in Geneva in July 1980.

(4) The radiostations of the USSR emit UT1 information in accordance with the CCIR code. Furthermore they give an additional information dUT1 specifying more precisely the difference UT1 - UTC down to multiples of 0.02s, 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 21 th and 24th second so that dUT1 = + 0.02 s x p. Negative values of dUT1 are transmitted by the marking of q second markers within the range between the 31 th and the 34 th second, so that dUT1 = -0.02s x p.

(5) Y3S

DUT1 information in CCIR code.
dUT1 information. This additional information specifies more precisely the difference UT1 - UTC down to multiples of 0.02s, the total value of the correction being DUT1 + dUT1.

A positive value of dUT1 is indicated by doubling a number (p) of consecutive seconds markers from seconds marker 21 to seconds marker (20 + p) inclusive ; (p) being an integer from 1 to 5 inclusive.

$$dUT1 = p.\,0.02s.$$

A negative value of dUT1 is indicated by doubling a number (q) of consecutive seconds markers following the minute marker from seconds marker 31 to seconds marker (30 + q) inclusive ; (q) being an integer from 1 to 5 inclusive.

$$dUT1 = -(q.\,0.02)s.$$

The seconds marker 28 following the minute marker is doubled as parity bit, if the value of (p) or (q) is an even number or if dUT1 = 0.

Time-information. During the last 20 seconds of each minute in a BCD-Code an information about the value "minute" and "hour" in the UTC time scale of the following minute marker is given.

UNCERTAINTY OF THE CARRIER FREQUENCY

The carriers of the following time signals are standard frequencies.

Station	Relative uncertainty of the carrier frequency in 10^{-10}
ATA	0.1
BPM	1
BSF	0.2
CHU	0.05
DCF77	0.005
GBR	0.02
HBG	0.005
IAM	0.5
IBF	0.5
JJY, JG2 AS	0.1
LOL1	0.1
MSF (60 kHz)	0.02
MSF (h. f.)	0.02
OMA (all frequencies)	0.5
RBU, RTZ	0.05
RCH, RID, RTA, RWM	0.5
UNW3, UPD8, UQC3, USB2, UTR3	0.1 - 0.2
VNG	0.1
WWV	0.1
WWVB	0.1
WWVH	0.1
ZUO	0.1

TIME OF EMISSION OF THE TIME SIGNALS IN THE UTC SYSTEM, IN 1982

The following deviations of the time of emission of time signals, from UTC, have been reported to the BIH, or observed.

BPM	UTC - BPM = -0.0100
OLB5	UTC - OLB5 = 0.0008s