XVII A.P.
DÜSSELDORF
21.5-1.6 1990
CCIR

XVIIth PLENARY ASSEMBLY
DÜSSELDORF, 1990

INTERNATIONAL TELECOMMUNICATION UNION

REPORTS OF THE CCIR, 1990

(ALSO DECISIONS)

ANNEX TO VOLUME VII

STANDARD FREQUENCIES AND TIME SIGNALS

CCIR INTERNATIONAL RADIO CONSULTATIVE COMMITTEE

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INDEX OF TEXTS WHICH HAVE BEEN DELETED AT THE END OF THE STUDY PERIOD 1986-1990

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ANNEX TO VOLUME VII

(1) Now Recommendation 686.

ANNEX TO VOLUME VII

STANDARD FREQUENCIES AND TIME SIGNALS

(Study Group 7)

TABLE OF CONTENTS

NUMERICAL INDEX OF TEXTS

ANNEX TO VOLUME VII

Note - Decisions which already appear in numerical order in the table of contents, are not reproduced in this index.

SECTION 7A: GLOSSARY

There are no Reports in this Section.

SECTION 7B: SPECIFICATIONS FOR THE STANDARD-FREQUENCY AND TIME-SIGNAL SERVICES

There are no Reports in this Section.

SECTION 7C: SYSTEMS FOR DISSEMINATION AND COMPARISON

REPORT 267-7

STANDARD FREQUENCIES AND TIME SIGNALS

Characteristics of standard-frequency and time-signal emissions in allocated bands and characteristics of stations emitting with regular schedules with stabilized frequencies, outside of allocated bands

(Question 1/7)

(1956-1959-1963-1966-1970-1974-1978-1982-1986-1990)

The characteristics of stations appearing in the following tables are valid as of 16 September, 1989. For information concerning changes which may have occurred since that date, reference may be made to the Annual Report of the time section of the Bureau international des poids et mesures (BIPM) or directly to the respective authority for each service as listed in Annex I.

TABLE I – *Characteristics of standard-frequency and time-signal emissions in the allocated bands, valid as of* 16 September 1989

Station			Type of antenna(s)	Carrier power (kW)	Number of simultaneous transmissions	Period of operation		Standard frequencies used		Duration of emission		Uncertainty of frequency and time intervals (parts in 10^{12}) (1)	Method of DUT1 indication
Call sign	Approximate location	Latitude Longitude				Days/ week	Hours/ day	Carrier (MHz)	Modulation (Hz)	Time signal (min)	Audio-modulation (min)		
ATA	New Delhi, India	28° 34′ N 77° 19′ E	Horizontal folded dipole	8 (PEP)	3	7	24 (2)	5, 10, 15	1, 1000	continuous	4/15	± 10	
BPM (3)	Pucheng, China	35° 00′ N 109° 31′ E	Omni-directional	10-20	2	7	24 (4)	2.5, 5, 10, 15	1, 1000	20/30 (UTC) 4/30 (UT1)	nil	± 10	Direct emission of UT1 time signal
HLA	Taedok Science Town, Republic of Korea	36° 23′ N 127° 22′ E	Vertical (conical monopole)	2	1	5 (5)	7 (6)	5	1	continuous	continuous	± 10	CCIR code by double pulse
IAM (7)	Roma, Italy	41° 47′ N 12° 27′ E	Vertical λ/4	1	1	6	2	5	1	continuous	nil	± 10	CCIR code by double pulse
IBF (7)	Torino, Italy	45° 02′ N 07° 46′ E	Vertical λ/4	5	1	7	2¼	5	1	continuous	nil	± 10	CCIR code by double pulse
JJY (7)	Sanwa, Sashima, Ibaraki, Japan	36° 11′ N 139° 51′ E	(8)	2	5	7	24 (9)	2.5, 5, 8, 10, 15	1 (10) 1000 (11)	continuous	30/60	± 10	CCIR code by lengthening
LOL (7)	Buenos Aires, Argentina	34° 37′ S 58° 21′ W	Horizontal 3-wire folded dipole	2	3	7	5	5, 10, 15	1, 440, 1000	continuous	3/5	± 20	CCIR code by lengthening

TABLE I *(continued)*

Station			Type of antenna(s)	Carrier power (kW)	Number of simultaneous transmissions	Period of operation		Standard frequencies used		Duration of emission		Uncertainty of frequency and time intervals (parts in 10^{12}) (1)	Method of DUT1 indication
Call sign	Approximate location	Latitude Longitude				Days/ week	Hours/ day	Carrier (MHz)	Modulation (Hz)	Time signal (min)	Audio-modulation (min)		
OMA (7)	Praha, Czechoslovak S.R.	50° 07′ N 14° 35′ E	T	1	1	7	24	2.5	1, 1000 (12)	15/30	4/15	± 1000	
RCH (7)	Tachkent, USSR	41° 19′ N 69° 15′ E	Horizontal dipole	1	2	7	21	2.5, 5, 10	1, 10	40/60	nil	± 50	CCIR code by double pulse, additional information dUT1 (13)
RID (7)	Irkutsk, USSR	52° 26′ N 104° 02′ E	Horizontal dipole	1 1 1	3	7	24	5.004 10.004 15.004	1, 10	40/60	nil	± 50	CCIR code by double pulse, additional information dUT1 (13)
RIM (7)	Tachkent, USSR	41° 19′ N 69° 15′ E	Horizontal dipole	1	1	7	20½	5, 10	1, 10	39/60	nil	± 50	CCIR code by double pulse, additional information dUT1
RTA (7)	Novosibirsk, USSR	55° 04′ N 82° 58′ E	Horizontal dipole	5	1	7	20½	10, 15	1, 10	40/60	nil	± 50	CCIR code by double pulse, additional information dUT1 (13)
RWM (7)	Moskva, USSR	55° 48′ N 38° 18′ E	Horizontal dipole	5 5 8	3	7	24	4.996 9.996 14.996	1, 10	40/60	nil	± 50	CCIR code by double pulse, additional information dUT1 (13)

TABLE I *(continued)*

Station			Type of antenna(s)	Carrier power (kW)	Number of simul-taneous trans-missions	Period of operation		Standard frequencies used		Duration of emission		Uncertainty of frequency and time intervals (parts in 10^{12}) (1)	Method of DUT1 indication
Call sign	Approximate location	Latitude Longitude				Days/ week	Hours/ day	Carrier (MHz)	Modulation (Hz)	Time signal (min)	Audio-modulation (min)		
WWV (7)	Fort Collins, Colorado, USA	40° 41′ N 105° 02′ W	Vertical λ/2 dipoles	2.5-10	5	7	24	2.5, 5, 10, 15, 20 (14)	1, 440, 500, 600	continuous (15)	continuous (16)	± 10	CCIR code by double pulse, additional information on UT1 corrections
WWVH (7)	Kekaha, Kauai, Hawaii, USA	21° 59′ N 159° 46′ W	Vertical λ/2 dipole arrays	2.5-10	4	7	24	2.5, 5, 10, 15 (14)	1, 440, 500, 600	continuous (15)	continuous (16)	± 10	CCIR code by double pulse, additional information on UT1 corrections
ZLFS	Lower Hutt, New Zealand	41° 14′ S 174° 55′ E		0.3	1	1	3	2.5	nil	nil	nil	± 100	

Notes to Table I:

The daily transmission schedule and hourly modulation schedule is given, where appropriate, in the form of Figs. 1 and 2 supplemented by the following notes:

(1) This value applies at the transmitter; to realize the quoted uncertainty at the point of reception it could be necessary to observe the received phase time frequency over a sufficiently long period in order to eliminate noise and random effects.

(2) 5 MHz: 1800-0900 h UTC; 10 MHz: 24 hours; 15 MHz: 0900-1800 h UTC.

(3) Call sign in Morse and language.

(4) 2.5 MHz: 0730-0100 h UTC; 15 MHz: 0100-0900 h UTC; 5 MHz and 10 MHz: continuous.

(5) Monday to Friday (except national holidays in Korea).

(6) 0100 to 0800 h — UTC. Pulses of 9 cycles of 1 800 Hz modulation. 59th and 29th second pulses omitted. Hour identified by 0.8 s —— long 1 500 Hz tone. Beginning of each minute, identified by a 0.8 s long 1 800 Hz tone, voice announcement of hours and minutes each minute following 52nd second pulse. BCD time code given on 100 Hz sub-carrier.

(7) These stations have indicated that they follow the UTC system as specified in Recommendation 460. Since 1 January 1972 the frequency offset has been eliminated and the time signals remain within about 0.8 s of UT1 by means of occasional 1 s steps as directed by the Bureau international de l'heure.

(8) Vertical $\lambda/4$ for 2.5 MHz, horizontal $\lambda/2$ dipole for 5 and 8 MHz, and vertical $\lambda/2$ dipoles for 10 and 15 MHz.

(9) Interrupted from 35 to 39 minutes of each hour.

(10) Pulse consists of 8 cycles of 1600 Hz tone. First pulse of each minute preceded by 655 ms of 600 Hz tone.

(11) 1000 Hz tone modulation between the minutes of 0-5, 10-15, 20-25, 30-35, 40-45, 50-55 except 40 ms before and after each second's pulse.

(12) In the period from 1800-0600 h UTC, audio-frequency modulation is replaced by time signals.

(13) The additional information about the value of the difference UT1 – UTC is transmitted by code dUT1. It provides more precisely the difference UT1 – UTC down to multipes of 0.02 s. The total value of the correction is DUT1 + dUT1. Possible values of dUT1 are transmitted by marking of p second pulses between the 21st and 24th seconds of the minute, so that dUT1 = + 0.02 s × p. Negative values of dUT1 are transmitted by marking of q second pulses between the 31st and 34th second of the minute, so that dUT1 = – 0.02 s × q.

(14) As of Feb. 1, 1977 transmissions on 25 MHz from WWV and 20 MHz from WWVH were discontinued, but may be resumed at a later date.

(15) In addition to other timing signals and time announcements, a modified IRIG-H time code is produced at a 1-pps rate and radiated continuously on a 100 Hz sub-carrier on all frequencies. A complete code frame is 1 minute. The 100 Hz sub-carrier is synchronous with the code pulses, so that 10 ms resolution is obtained. The code contains DUT1 values and UTC time-of-year information in minutes, hours and days of the year.

(16) Except for voice announcement periods and the 5-minute semi-silent period each hour.

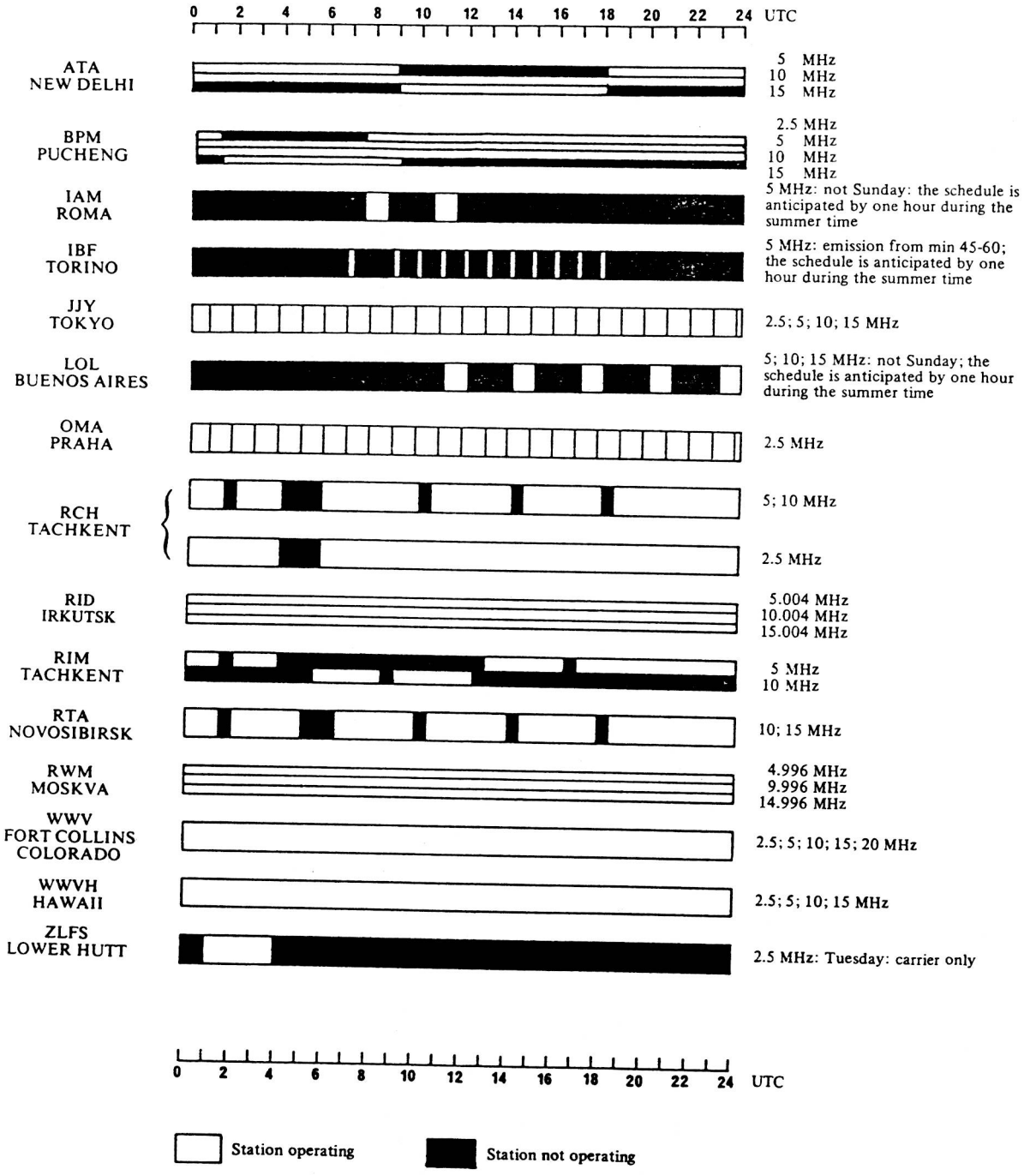
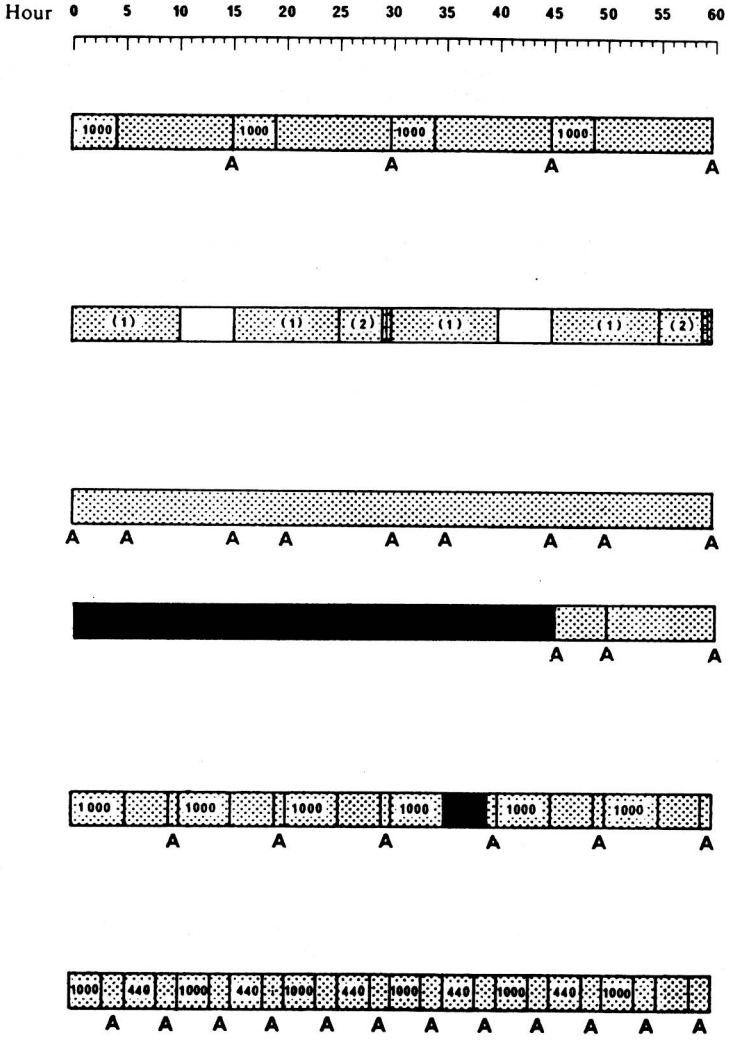


FIGURE 1 – *Daily emission schedule*



Form of second and minute signals: Morse and voice announcements (A).

ATA: Pulse of 5 cycles of 1000 Hz tone, lengthened to 100 ms at the beginning of each minute. Call sign and time (UTC) in Morse.

BPM:
(1) Pulse of 10 cycles of 1000 Hz tone (UTC time signal), the first pulse of every minute is a 300 ms pulse of 1000 Hz tone. In order to avoid mutual interference the second pulses of UTC of BPM precede UTC of BIH by 20 ms.
(2) 100 ms pulse of 1000 Hz tone UT1 time signal, the first pulse of every minute is a 300 ms pulse of 1000 Hz tone.

IAM: Pulse of 5 cycles of 1000 Hz tone: minute pulse of 20 cycles of 1000 Hz tone. Call sign and time (UTC) in Morse and voice identification.

IBF: Pulse of 5 cycles of 1000 Hz tone repeated 7 times at minute. Call sign and time (UTC) in Morse, voice identification at the beginning and end of emission.

JJY: Pulse of 8 cycles of 1600 Hz tone: minute pulse is preceded by a 600 Hz tone of 655 ms duration. Call sign and time (JST) in Morse and voice. Radio propagation warnings in letter code: N (normal), U (unstable) or W (disturbed). DUT1 is indicated, by the number and position of the lengthened second's pulses of 45 ms duration, instead of the 5 ms duration of the normal second's pulse.

LOL: Pulse of 5 cycles of 1000 Hz tone, 59th pulse omitted. Call sign in Morse: identification and time (UTC – 3 h) in voice.

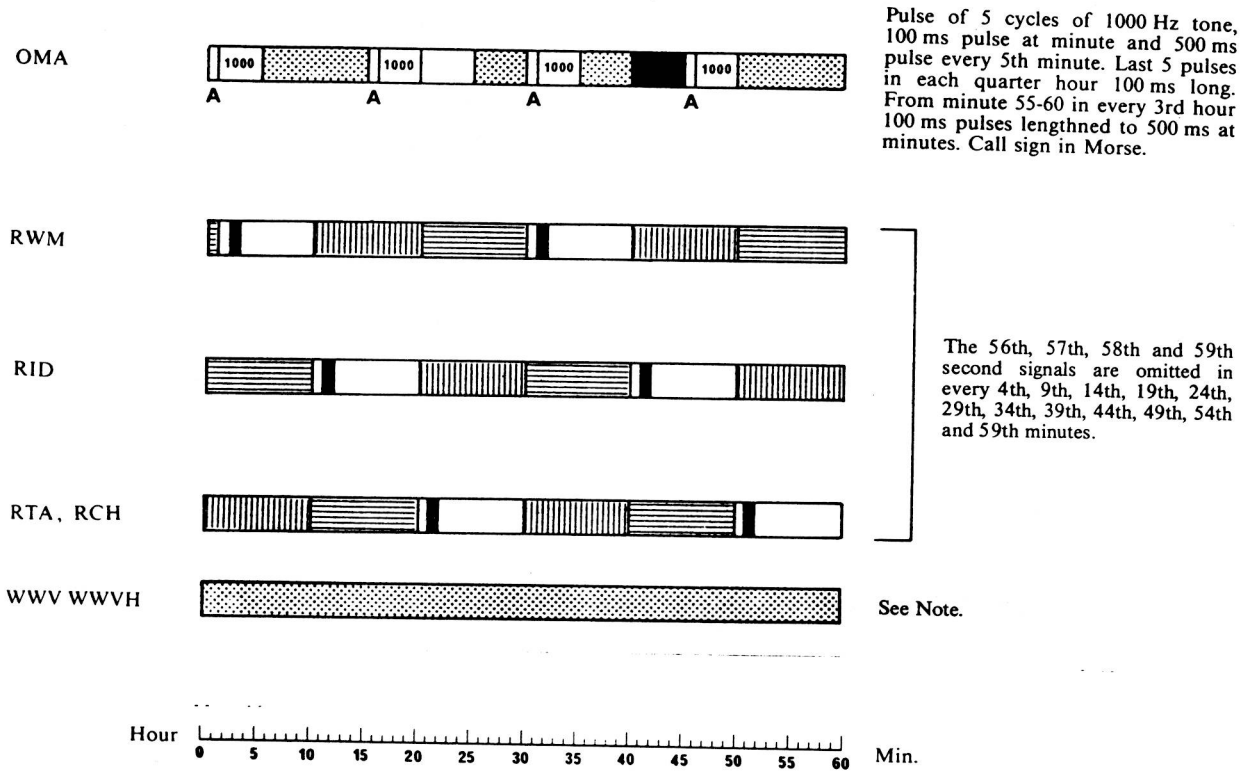


FIGURE 2 – *Hourly modulation schedule*

Note – Pulse of 5 cycles of 1000 Hz (WWV) or 6 cycles of 1200 Hz (WWVH) tone, lengthened to 0.8 s at beginning of each minute. An 0.8 s pulse of 1500 Hz begins each hour at both stations. 29th and 59th pulses each minute are omitted. Voice time announcements preceding each minute. 45-second audio tones alternating between 500 and 600 Hz each minute, except when special announcements or station identification messages are given in voice. One 45-second segment of 440 Hz is included each hour at one minute (WWVH) or two minutes (WWV) past the hour. A modified IRIG-H time code, giving day, hour, minute and UT1 information, is broadcast continuously on a 100 Hz sub-carrier. DUT1 information is provided by the number and position of doubled second pulses each minute. All modulations interrupted for 40 ms around each second's pulse.

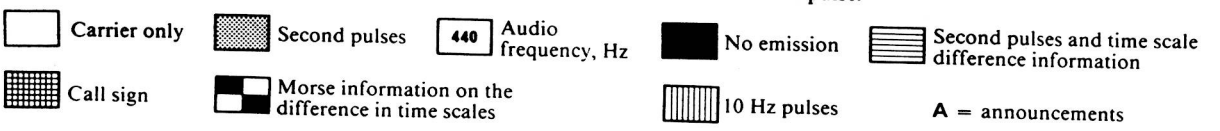


TABLE II – *Characteristics of standard-frequency and time-signal emissions in additional bands, valid as of* 16 September 1989

Station			Type of antenna(s)	Carrier power (kW)	Number of simultaneous transmissions	Period of operation		Standard frequencies used		Duration of emission		Uncertainty of frequency and time intervals (parts in 10^{12}) (1)	Method of DUT1 indication
Call sign	Approximate location	Latitude Longitude				Days/ week	Hours/ day	Carrier (kHz)	Modulation (Hz)	Time signal (min)	Audio-modulation (min)		
	Allouis, France	47° 10′ N 02° 12′ E	Omni-directional	1000 to 2000	1	7	24	162	1 (2)	continuous	A3E broadcast continuously	± 2	No DUT1 transmission
CHU(3)	Ottawa, Canada	45° 18′ N 75° 45′ W	Omni-directional	3, 10, 3	3	7	24	3330, 7335, 14 670	1 (4)	continuous	nil	± 5	CCIR code by split pulses
	Donebach, F.R. of Germany	49° 34′ N 09° 11′ E	Omni-directional	250	1	7	24	153	nil	nil	A3E broadcast continuously	± 2	
DCF77 (3)	Mainflingen, F.R. of Germany	50° 01′ N 09° 00′ E	Omni-directional	20 (5)	1	7	24	77.5	1	continuous (6)	continuous (7)	± 0.5	No DUT1 transmission
	Droitwich, United Kingdom	52° 16′ N 02° 09′ W	T	400	1	7	22	198 (8)	nil	nil	A3E broadcast continuously	± 20	
	Westerglen, United Kingdom	55° 58′ N 03° 50′ W	T	50	1	7	22	198 (8)	nil	nil	A3E broadcast continuously	± 20	
	Burghead, United Kingdom	57° 42′ N 03° 28′ W	T	50	1	7	22	198 (8)	nil	nil	A3E broadcast continuously	± 20	
GBR (3)(9) (10)	Rugby, United Kingdom	52° 22′ N 01° 11′ W	Omni-directional	750 60 (5)	1	7	22 (11)	16.0	nil	nil	nil	±10	
HBG (12)	Prangins, Switzerland	46° 24′ N 06° 15′ E	Omni-directional	20	1	7	24	75	1 (13)	continuous	nil	± 1	No DUT1 transmission