

**Monitoring of Harmful Interference  
to the HF Broadcasting Service:  
Summary of Monitoring Programs  
Held Between 1984 and 1989**

**Mary W. Sowers  
Gregory R. Hand**



**U.S. DEPARTMENT OF COMMERCE  
Robert A. Mosbacher, Secretary**

Janice Obuchowski, Assistant Secretary  
for Communications and Information

May 1990



TABLE OF CONTENTS

	PAGE
LIST OF FIGURES . . . . .	iv
LIST OF TABLES . . . . .	v
ABSTRACT . . . . .	1
1. INTRODUCTION . . . . .	1
2. IFRB MONITORING CAMPAIGNS. . . . .	4
3. DISCUSSION . . . . .	14
4. REFERENCES . . . . .	16
APPENDIX . . . . .	19

Locations of Jammers From the October 1984, March/April  
1985, January 86, June 1986 and July 1989, Monitoring  
Programs

## LIST OF FIGURES

	PAGE
Figure 1. Locations of emitters of harmful interference indicated by marker ID, in Eastern Europe, Iran and the Western Soviet Union during June 1986. . . . .	6
Figure 2. Locations of emitters of harmful interferences, indicated by marker ID, the Eastern Soviet Union and China during June 1986 . . . . .	7
Figure 3. Locations of emitters of harmful interference indicated by marker ID, on Eastern Europe and the Soviet Union during July 1988. . . . .	12
Figure 4. Locations of emitters of harmful interference indicated by marker ID, in the Eastern Soviet Union and China during July 1988. . . . .	13

LIST OF TABLES

	PAGE
Table 1. Summary of the Specific Broadcasters and Languages that were Observed to be Jammed During the June 1986 Monitoring Period. . . . .	8
Table 2. Summary of the Languages, Identifications and Locations of Markers used to Target Eastern Bloc Languages. . . . .	9
Table 3. Summary of the Specific Broadcasters and Languages that were Observed to be Jammed During the July 1988 Monitoring Period. . . . .	11
Table 4. Summary of the Specific Broadcasters and Languages that Were Observed to be Jammed During the August/September 1989 Monitoring Period. . . . .	15



MONITORING OF HARMFUL INTERFERENCE  
TO THE HF BROADCASTING SERVICE:  
SUMMARY OF MONITORING PROGRAMS HELD  
BETWEEN 1984 AND 1989

Mary W. Sowers and Greg R. Hand<sup>1</sup>

A summary is presented of a series of monitoring campaigns held between 1984 and 1989 to locate the sources of intentional harmful interference to the HF broadcast spectrum. The monitoring programs were organized under the auspices of the International Frequency Registration Board of the International Telecommunications Union. The locations of the sources of interference as well as the broadcast administrations and languages targeted between 1984 and 1989 are also given. Political restructuring in the Soviet Union and Eastern Bloc countries during this period are reflected in reductions in the level of jamming documented in this report.

Key Words: harmful interference; HF broadcasting; HF jamming;  
direction finding; glasnost

## 1. INTRODUCTION

The international broadcasting scene has changed considerably since the advent of Soviet restructuring and openness to the West. Harmful interference (jamming), targeted against the high frequency (HF) broadcast services, from sources in the Soviet Union and Eastern Bloc countries was discontinued in December 1989. This marked the apparent end of a forty-year era of jamming by the Soviet Union and Eastern Bloc countries.

Jamming of U.S. HF international broadcasts into the Soviet Union and certain Eastern Bloc countries had been a common occurrence since 1948. At that time, the Soviet Union started jamming to prevent the broadcasts of Radio Liberty (RL) from reaching the people of the Soviet Union. At the same time, satellite countries such as Czechoslovakia, Poland, and Bulgaria began jamming Radio Free Europe (RFE) broadcasts.

---

<sup>1</sup>The authors are with the Institute for Telecommunications Sciences, National Telecommunications and Information Administration, U.S. Department of Commerce, Boulder, CO 80303-3328

Jamming of international shortwave programs beamed into Eastern Europe and the Soviet Union was not confined to U.S. broadcasts. The British Broadcast Corporation's (BBC) Russian, Czechoslovakian, Polish, and Bulgarian services were jammed until early 1987. The German international broadcast organization, Deutsche Welle (DW) was also jammed on the same language services. Selected programs of the Israeli Broadcast Authority in Hebrew, Yiddish and Russian, were also jammed.

Jamming has historically been associated with the development of political tensions. The 1980 Soviet invasion of Afghanistan, for example, resulted in jamming of the Voice of America's (VOA) Dari and Pashto language services into Afghanistan. The declaration of martial law in Poland in 1983 was likewise accompanied by jamming of the VOA's Polish service.

In 1984, broadcast services into the Soviet Union and Eastern Bloc countries were being jammed at record levels. The First Session of the World Administrative Radio Conference (WARC) for planning the frequencies allocated to the HF broadcasting service was held in February, 1984. This conference, designated WARC-HFBC(84), decided that coordinated worldwide monitoring programs to identify and locate sources of harmful interference to the HF broadcast service be initiated under the auspices of the International Frequency Registration Board (IFRB), (see Res. COM 5/1 ITU, 1984). A second World Administrative Radio Conference held in 1987 (WARC-HFBC (87)), decided to continue the coordinated monitoring programs (see Res. 513 ITU, 1987).

Since WARC-HFBC (84), six three-week monitoring programs have been held: October 1984, March/April 1985, January 1986, June 1986, July 1988, and August/September 1989. The National Telecommunications and Information Administration's (NTIA) Institute for Telecommunication Sciences (ITS) led a highly coordinated effort using HF monitoring and radio direction finding equipment located around the world to determine the location and extent of jamming to international broadcast services.

Reports published by NTIA (Sowers et al. 1985, 86, and 87) describe the results of the monitoring during the first intersessional period (1984 to 1987)

of the HF broadcast conferences. These reports describe the location of over 100 sources of jamming as well as document the extent of jamming against certain broadcast services. Most of the jamming signals observed during the IFRB monitoring programs between 1984 and 1987, were determined to be transmitted from stations within the Soviet Union and Eastern Bloc countries.

By the second session of the WARC (WARC HFBC(87)), however, jamming from the Soviet Union and Eastern Bloc countries had diminished considerably. Jamming of the BBC's Russian language services was discontinued in January 1987 and by May 1987, nearly all of the VOA's services into the Soviet Union (except Dari and Pashto) and Poland, were no longer jammed.

The first monitoring program, organized as a result of WARC-HFBC (87) decisions, was held in July 1988. During this monitoring period, decreases were recorded in the jamming aimed at VOA and BBC services. The fourth in a series of reports describing the results of IFRB monitoring (Sowers 1989), documents the results of the July 1988 monitoring program.

By December 1988, all jamming targeted against Western broadcasts into the Soviet Union and Eastern Bloc countries had been suspended, and in March, jamming of broadcasts in the Afghani languages Dari and Pashto was also suspended. A second monitoring program was organized as a result of WARC 87 decisions and was held in August and September 1989. This monitoring program was held in an environment free of jamming from the Soviet and Eastern Bloc countries. Although jamming from signals originating in China and Iraq were recorded during this monitoring period, the amount of spectrum jammed decreased substantially from previous monitoring periods.

The next section summarizes results of the IFRB monitoring programs held during the first intersessional period, along with summaries of the monitoring observations recorded in July 1988, and August/September 1989. Section 3 provides a discussion of the use of the HF spectrum and underlines the need for flexibility in broadcast operations should jamming resume at previous intensities.

## 2. IFRB MONITORING CAMPAIGNS

During the period between 1984 and 1989, six monitoring campaigns were organized by the IFRB to determine the extent of harmful interference to HF Broadcast Service. During this period, VOA, DW, BBC, and RFE/RL were all heavily jammed on their services into the Soviet Union and Eastern Bloc countries.

In conjunction with the IFRB monitoring programs, ITS further coordinated the monitoring campaigns through the development of a series of schedules designed to monitor specific frequencies which were known to be jammed. For the first ten minutes of each half-hour interval, a specific frequency was chosen for monitoring. The remaining 20 minutes were reserved for monitoring a specific frequency band in order to record jamming on other frequencies in this range. Several administrations cooperated with the U.S. efforts and along with the Federal Communications Commission, cooperating administrations included: the United Kingdom, the Federal Republic of Germany, Italy, Korea, Japan, Sweden and Israel.

The observations of harmful interference from each monitoring program were analyzed independently at ITS. Each observation included the date, time, frequency, strength of the interfering signal, and, if possible, a bearing from the monitoring station to the station causing the interference. Many of the jamming signals originating in the Soviet Union and Eastern Bloc countries, were accompanied by a two character, either letter-letter or letter-number, Morse code identifier. This identifier (or marker) was also recorded by the monitors.

Utilizing the recorded bearing and the Morse identifier, we were able to determine the locations of over 100 sources of harmful interference between 1984 and 1986. The computer algorithm used to geolocate the jammers as well as the procedures implemented to combine individual observations, are described in detail in the report by Sowers et al. (1985). The markers and locations documented during the first intersessional period remained unchanged among the monitoring periods. However, a completely distinct set of Morse identifiers was recorded during the July 1988 monitoring.

Jammers were identified and located by their specific markers. Figure 1 shows the jammers which were geolocated during the June 1986 monitoring program. The markers shown in this figure typify the locations of jammers which were geolocated during the first intersessional period. During this period, specific markers tended to group in or near major populations within the Soviet Union. Jammers with Morse identifiers TU, BG, GI, WI, and KD were located in Moscow. Markers RB and DR were located in the Baltic States of Latvia, Lithuania, and Estonia. Markers located in Leningrad include IG, DU, VG and VR.

Transmitters with the markers MU, 4F, 7K, and TK were more difficult to locate because of the distance from the monitoring stations. These markers were geolocated between 55 to 70 east longitude at lower latitudes (below 45 degrees) in the Turkic speaking regions of the USSR. These jammers may have been used to jam more populous regions of the Soviet Union such as Moscow, Leningrad, or the Ukraine, via sky-wave reflection paths.

Many of the jammers recorded during the IFRB monitoring periods were used to jam populated regions located thousands of kilometers from the transmitter. Several jammers were located in the Soviet Far East near Khabarovsk (KB, IG, GM, and GR) and are shown in Figure 2. Since few Western broadcasts reach the Soviet Far East, it was assumed that these jammers targeted broadcasts into the central and western regions of the Soviet Union, via a 2 or 3 hop ionospheric reflection path.

In addition to locating the sources of harmful interference, statistics detailing which broadcast administrations and languages were jammed were compiled for each monitoring program. A summary of the statistics representing typical pre-glasnost jamming conditions, is given in Table 1 for the June 1986 period. The data in this table gives the number of jams recorded, out of the number of times each language was monitored, during the first 15 minutes of each half hour for each administration (column 0-15). Also given in this table are the number of time blocks in which each language was jammed during the second 15 minutes of each time block (column 16-29). The total number of jams recorded is given in the third column. In June 1986, RFE, VOA, BBC, and DW were jammed on most of their services in Polish, Czech, and Bulgarian as well as all Russian dialects.

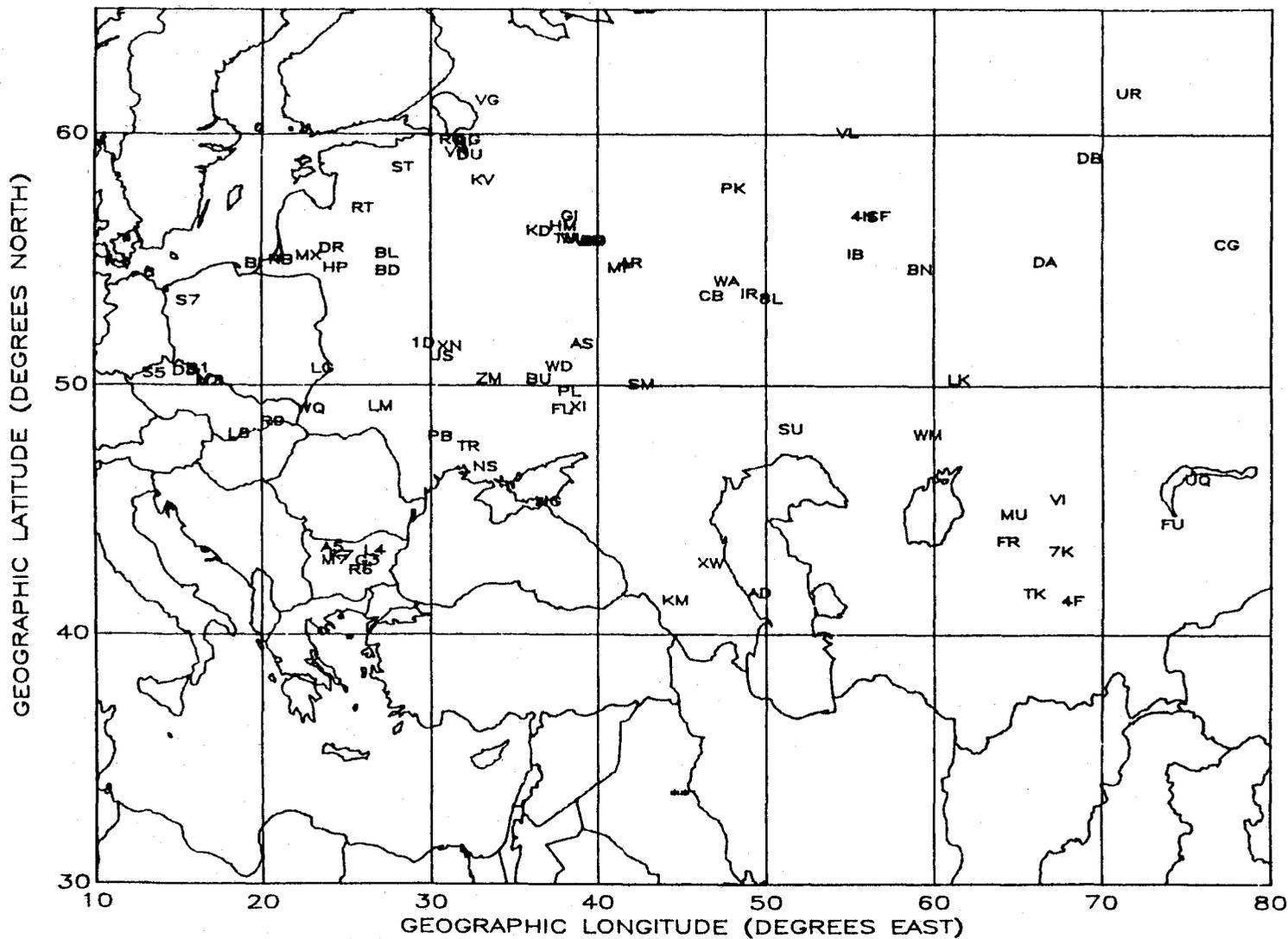


Figure 1. Locations of emitters of harmful interference, indicated by marker ID, in Eastern Europe, Iran, and the Western Soviet Union during June 1986. Note: All locations of Markers are contained in the Appendix.

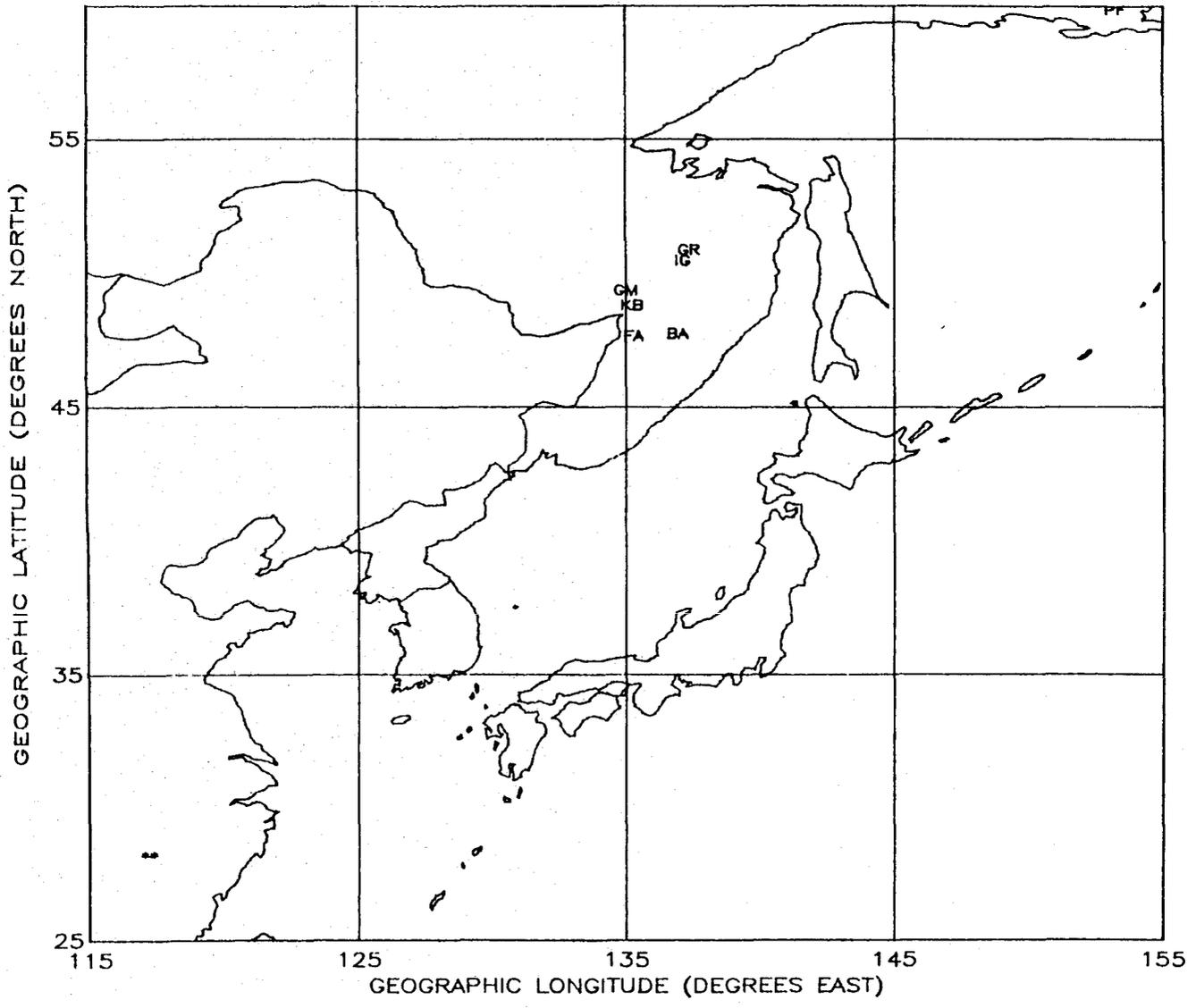


Figure 2. Locations of emitters of harmful interference, indicated by marker ID, in the Eastern Soviet Union and China during June 1986.  
Note: All locations of markers are contained in the Appendix.

Table 1. Summary of the Specific Broadcasters and Languages that were Observed to be Jammed During the June 1986 Monitoring Period

VOA	Voice of America			BBC	British Broadcasting Corp			????	Miscellaneous		
	0-15	16-29	Jams		0-15	16-29	Jams		0-15	16-29	Jams
RUSS	114/114	302	3027	RUSS	49/ 51	122	1172	????	3/ 3	744	3206
POLI	26/ 26	58	502	POLI	20/ 22	38	317	ARAB	8/ 15	19	99
UKR	12/ 12	48	313	ARAB	3/ 7	8	25	TUR	0/ 0	28	75
ARM	8/ 9	11	128	BULG	4/ 6	2	21	I	0/ 0	31	58
UZBE	11/ 17	18	127	PERS	2/ 3	0	13	F	0/ 0	16	54
PASH	12/ 13	10	75	ROMA	1/ 1	2	10	TUN	0/ 0	16	25
DARI	3/ 3	18	61	CZEC	2/ 4	3	7	YUG	0/ 0	11	22
LAT	6/ 7	8	60	HUNG	2/ 7	1	4	LUX	0/ 0	8	9
LITH	5/ 5	8	60	SERB	0/ 0	3	4	MCO	0/ 0	4	9
EST	4/ 4	8	44	URDO	3/ 5	0	3	ALG	0/ 0	3	8
AZ	0/ 0	4	10	SLVN	1/ 4	0	2	BEL	0/ 0	3	8
GEOR	1/ 1	2	5	PASH	1/ 3	0	1	BFRE	2/ 2	0	8
				SLVK	0/ 1	1	1	UAE	0/ 0	2	5
				TURK	0/ 0	1	1	CVA	0/ 0	3	4
								EQA	0/ 0	4	4
								FNL	0/ 0	3	4
								EGY	0/ 0	2	3
								ARG	0/ 0	1	2
								IND	0/ 0	1	2
								B	0/ 0	1	1
								NETH	0/ 1	1	1
								NOR	0/ 0	1	1
RFE	Radio Free Europe			DW	Deutsche Welle						
	0-15	16-29	Jams		0-15	16-29	Jams				
POLI	103/105	300	2499	RUSS	34/ 34	80	991				
CZEC	72/ 72	194	1364	BULG	11/ 12	36	285				
BULG	17/ 17	39	271	CZEC	13/ 13	23	226				
LITH	7/ 7	30	238	DARI	10/ 10	11	122				
HUNG	12/ 13	71	213	PASH	4/ 6	11	48				
LAT	4/ 4	25	144								
EST	2/ 2	21	122								
ROMA	1/ 2	13	30								
PORT	0/ 0	1	1								
RL	Radio Liberty			IBA	KOL Israel						
	0-15	16-29	Jams		0-15	16-29	Jams				
RUSS	255/256	684	8382	RUSS	18/ 19	45	425				
UKR	23/ 23	136	927	HEBR	9/ 9	8	120				
TI	13/ 13	82	517	YIDD	3/ 3	3	33				
AZ	12/ 12	31	280								
TB	8/ 8	38	278								
BR	11/ 11	30	239								
ARM	6/ 6	26	189								
GEOR	3/ 3	26	149								

KEY TO LANGUAGES

ARAB - Arabic	GEOR - Georgian	PORT - Portugese	TURK - Turkman
ARM - Armenian	HEBR - Hebrew	ROMA - Romanian	UKR - Ukrainian
AZ - Azerbaijanian	HUNG - Hungarian	RUSS - Russian	URDO - Urdo
BR - Byelorussian	LAT - Latvian	SERB - Serbian	UZBE - Uzbek
BULG - Bulgarian	LITH - Lithuanian	SLVK - Slovak	YIDD - Yiddish
CZEC - Czechoslovakian	PASH - Pashto	SLVN - Slovene	YUG - Uzbek
DARI - Dari	PERS - Persian	TI - Turkestani	
EST - Estonian	POLI - Polish	TB - Tatar Bashkir	

Radio Liberty was also heavily jammed on their Russian dialect services. The Israeli Broadcast Administration's (IBA) services into the Soviet Union in Russian, Hebrew and Yiddish were also jammed heavily at this time.

Several jammers located throughout the Soviet Bloc countries, were targeted against Polish, Czech, and Bulgarian language broadcasts. The markers used to jam these languages are shown in Table 2. Jammers found in Czechoslovakia (B1, D3, R9, S5, and U7) and Bulgaria (G3, K7, L4, and M7) were typified by a letter number Morse code combination and generally targeted broadcasts in their national language. Jammers located inside the Soviet Union (MF and NS), were also used to target Czech language services. All of the jammers targeting Polish language broadcasts were located in the Soviet Union, and were typified by a number-letter Morse code combination (4F, 7K, 1D, 1G and 8L). Other emitters targeting both Polish and Russian dialect broadcasts, were marked by letter-letter combinations of Morse identifiers (BG, GI, MF, RB, and WG).

Table 2. Summary of the Languages, Identifications and Locations of Markers Used to Target Eastern Bloc Languages

Polish	Czech	Bulgarian
1D / URS	AG / ??	A5 / BUL
1G / URS (Leningrad)	B1 / TCH	*AG / ??
4F / URS	D3 / TCH	*K7 / BUL
4N / URS	G7 / ??	L4 / BUL
7K / URS	L8 / TCH	M7 / BUL
8L / URS	**MF / URS	G3 / BUL
*BG / URS (Moscow)	*NS / URS	KEY:
*GI / URS (Moscow)	*R9 / TCH	Marker / ITU Country Code
**MF / URS	*U7 / TCH	URS - Soviet Union
RB / URS	Z3 / ??	TCH - Czechoslovakia
WG / URS		BUL - Bulgaria

\* Jams 50 - 80% of the time the indicated language, and 20 - 50% Russian dialect

\*\* Jams 50% Polish and 50% Czechoslovakian languages

A study of the number of unique markers recorded targeting a specific frequency in a given time period was conducted in November 1985. Although this study was conducted outside the official IFRB monitoring periods, most of the monitors cooperating in the IFRB study also contributed to this effort. From these monitoring observations, it was shown that several (as many as eleven) unique markers were used to jam a program in a typical half-hour period. It is not possible to determine whether each Morse identifier represents a unique transmitter. However, as many as four distinct transmit locations have been identified targeting a single broadcast in a given half-hour interval.

A list of the languages and broadcast administrations affected by jamming after the Soviet instigation of glasnost policies is given in Table 3. In July 1988, jamming against Polish language broadcasts had mainly been discontinued. Eastern Bloc jammers which had previously targeted DW, VOA, or BBC broadcasts, were concentrated on RFE services. VOA and DW services in Turkic languages continued to be jammed from sources within the Soviet Union. DW as well as BBC broadcasts were jammed occasionally on their Russian dialect services. The level jamming recorded against these services however, was greatly diminished from previous levels. Radio Liberty's Russian language services, however, continued to be heavily jammed.

The jammer markers recorded during the July 1988 monitoring do not correlate with those described above for the period between 1984 and 1987. Figures 3 and 4 illustrate the locations of jammers from July 1988. The Eastern Bloc jammer markers located in Czechoslovakia (B1, R9, S5, U7, and Z3) and Bulgaria (A5, G3, and L4) are the same as recorded during earlier monitoring periods. The jammer markers located in the Soviet Union are entirely different from those recorded earlier. The jamming centers, however, did not change and markers again clustered around Moscow (IL, NI, UR, WV, and XD), Leningrad (WU, SF, and LR) the Baltic States (UA and MB), and the Turkic speaking regions (PK, NK, KM, MB, and KV).

In the Soviet Far East, jammers near Khabarovsk include WA, TK, BF, NU and RA. Jammers were also located on the Kamchatka Peninsula (DW) and near Magadan (GD and HD). A summary of the locations of all jammers located during the 1984,

Table 3. Summary of the Specific Broadcasters and Languages That Were Observed to be Jammed during the July 1988 Monitoring Period

BBC British Broadcasting Corporation				DW Deutsche Welle			
	0-10	11-29	Jams		0-10	11-29	Jams
RUSS	5/ 10	15	44	RUSS	41/ 44	139	1089
POLI	1/ 3	2	4	DARI	6/ 9	16	77
				PASH	3/ 3	19	65
VOA Voice of America				IBA KOL Israel			
	0-10	11-29	Jams		0-10	11-29	Jams
PASH	10/ 13	17	53	RUS	43/ 59	78	275
ARAB	18/ 40	13	40	EUR	11/ 22	14	53
DARI	3/ 3	12	19	ARAB	1/ 4	2	3
AMHA	4/ 5	3	18	EEUR	0/ 1	1	1
URDU	4/ 10	3	12				
HIND	4/ 7	1	6				
RFE Radio Free Europe				IRN Iran			
	0-10	11-29	Jams		0-10	11-29	Jams
CZEC	92/ 96	277	1366	IRAN	27/ 49	47	180
BULG	27/ 28	142	680				
HUNG	9/ 10	167	317				
LITH	11/ 11	51	217				
EST	7/ 7	47	194				
LAT	6/ 6	50	185				
PASH	4/ 4	20	87				
ROMA	2/ 3	35	76				
DARI	4/ 4	14	74				
POLI	2/ 4	17	44				
RL Radio Liberty				IRQ Iraq			
	0-10	11-29	Jams		0-10	11-29	Jams
RUSS	430/430	935	9660	IRAQ	2/ 5	0	5
UKR	42/ 42	278	1235				
KAZA	12/ 12	48	244				
AZ	11/ 11	65	207				
ARM	9/ 9	48	161				
BR	8/ 8	45	158				
GEOR	7/ 7	43	144				
TB	6/ 6	48	142				
UZBE	7/ 7	41	142				
TAJI	9/ 9	28	126				
TURK	3/ 3	18	62				
KIRG	4/ 4	10	29				
				???? Unknown			
	0-10	11-29	Jams		0-10	11-29	Jams
				????	0/ 0	387	1167
				ALB	0/ 0	3	6

\* All IBA languages refer to service area, actual languages used are unknown.

\*\* Key to languages:

ALB - ALBANIAN	KIRG - KIRGIZ
AMHA - AMHARIC	LAT - LATVIAN
ARAB - ARABIC	LITH - LITHUANIAN
ARM - ARMENIAN	PASH - PASHTO
AZ - AZERBAIJANIAN	POLI - POLISH
BR - BYELORUSSIAN	ROMA - ROMANIAN
BULG - BULGARIAN	RUSS - RUSSIAN
CZEC - CZECHOSLOVAKIAN	TAJI - TAJIK
DARI - DARI	TB - TATAR BASHKIR
EST - ESTONIAN	TURK - TURKMEN
GEOR - GEORGIAN	UKR - UKRAINIAN
HIND - HINDI	URDU - URDU
HUNG - HUNGARIAN	UZBE - UZBEK
KAZA - KAZAKH	

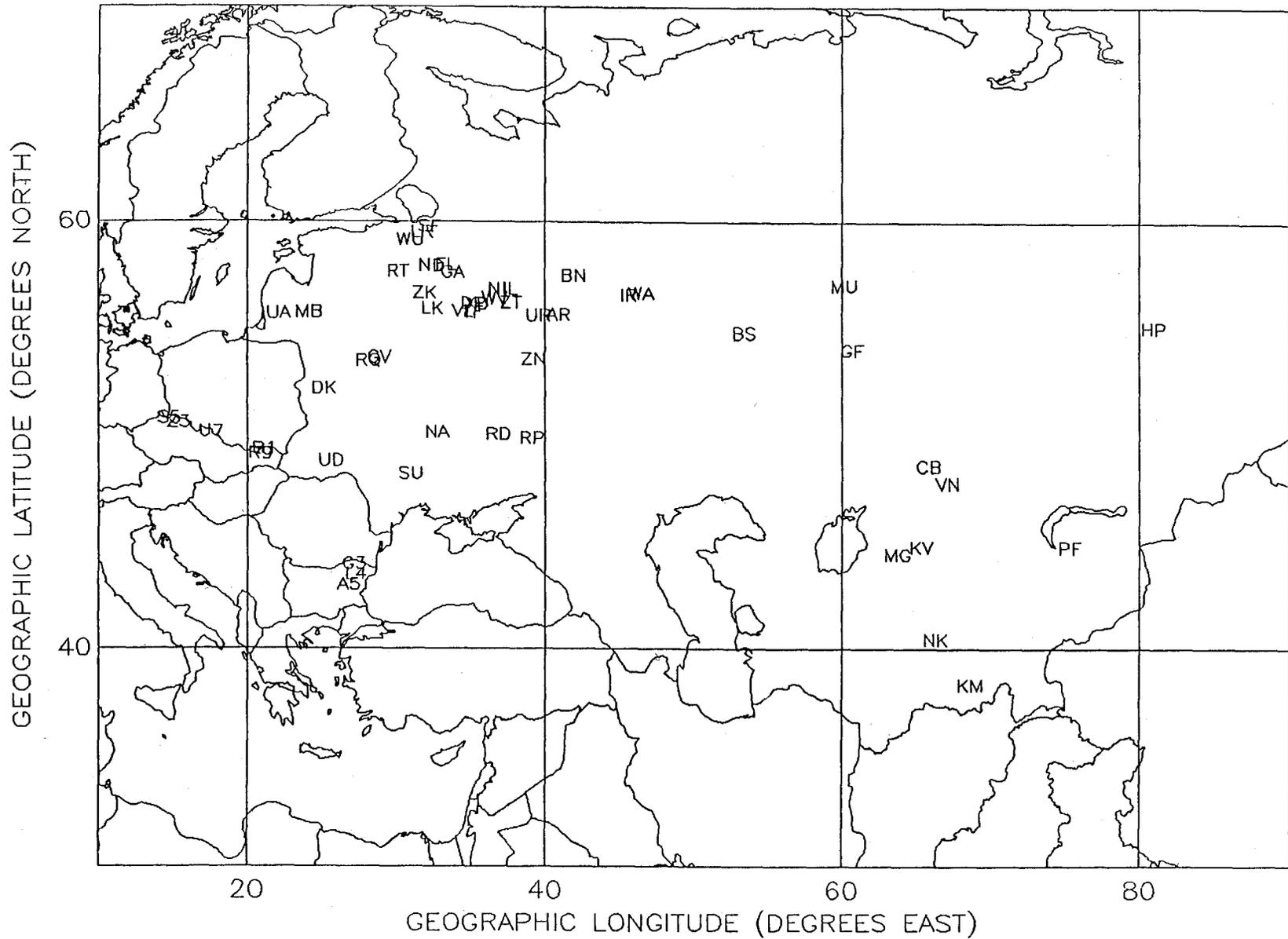


Figure 3. Locations of emitters of harmful interference indicated by Marker ID, in Eastern Europe and the Soviet Union during July 1988.  
 Note: All locations of markers are contained in the Appendix.

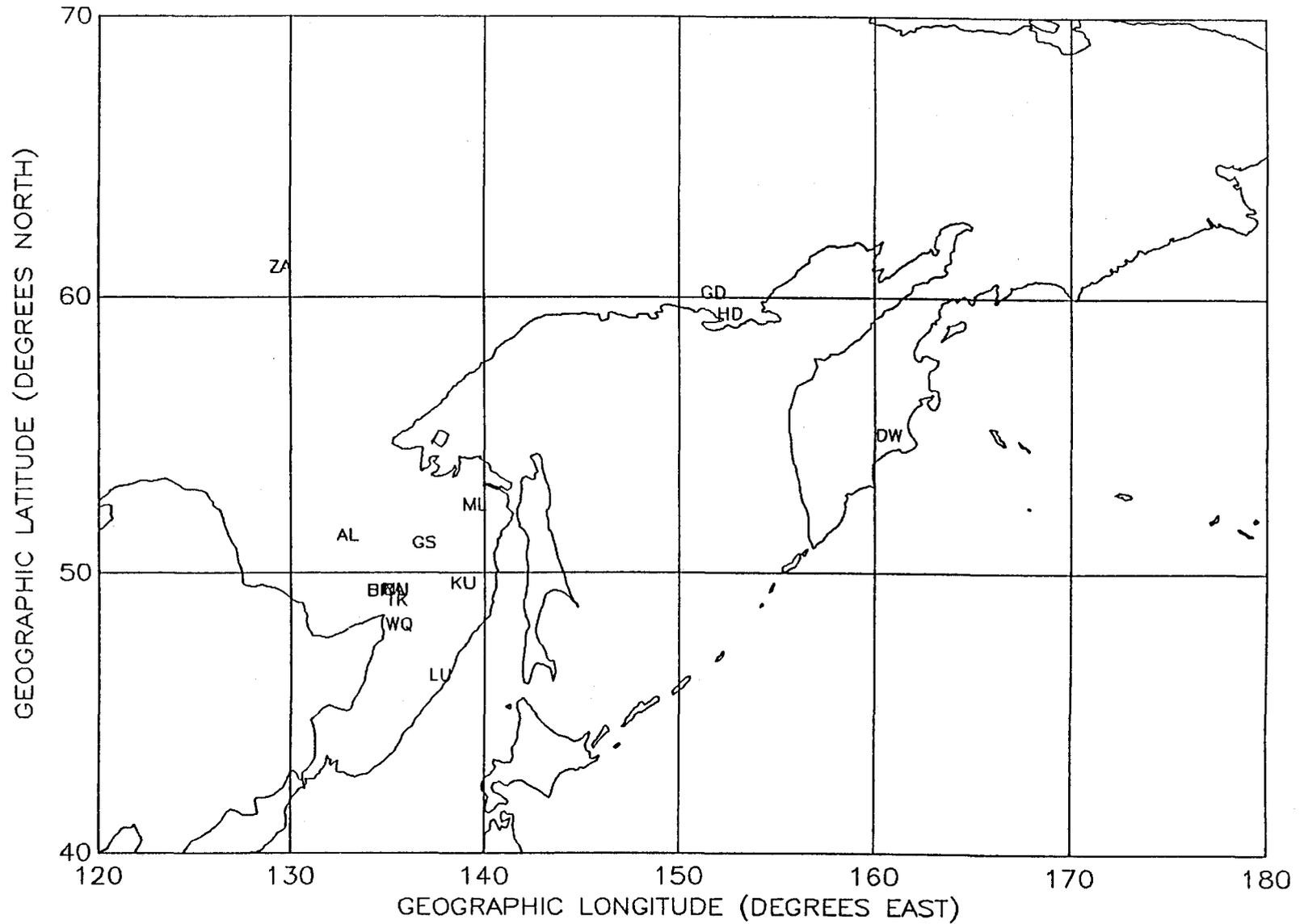


Figure 4. Locations of emitters of harmful interference indicated by Marker ID, in the Eastern Soviet Union and China during July 1988.  
Note: All locations of markers are contained in the Appendix.

85, 86, and 88 monitoring periods is given in the Appendix.

During the August/September 1989 monitoring program, languages which were previously jammed were again scheduled for monitoring. During this period, however, all broadcasts of the DW, VOA, BBC, RFE, and RL into the Soviet Union and Eastern Bloc countries were observed to be relatively clear of jamming as shown in Table 4. The column under each administration labeled 0-15 indicates the number of jams recorded of those scheduled for monitoring. The second column indicates the number of jammings recorded during the second half of a time block, compared to the number of times that the particular language was monitored. Table 4 shows that VOA Chinese and BBC Mandarin services were jammed during this period. Also shown in Table 4 is heavy jamming of Chinese language services from unknown broadcast sources. Two distinct jammers were also located in China - one from an unidentified source near Shanghai, and another located near Canton identified with marker AG. Jamming against various Arabic language broadcasts was also recorded during August/September 1989, from a jammer located near Baghdad Iraq.

### 3. DISCUSSION

The HF spectrum provides an important means of communications for developing as well as industrial countries. High frequency services can be sent to regions located thousands of kilometers from the transmit source, via ionospheric reflection paths, without the use of costly physical networks or satellites. Developing countries use the HF spectrum for national services to reach remote or rural areas where no AM or FM services are available. In addition to national services, HF communications also provide a means of communicating between different countries. Because of this ability to transcend national boundaries, broadcasting in the HF spectrum has been used for political purposes by both developing and industrialized nations.

The HF spectrum is allocated and used according to international agreements reached at world radio conferences held under the auspices of the ITU. Conferences held in 1984 and 1987 were tasked with developing the principles (WARC HFBC 84) and testing the computer based planning system (WARC HFBC 87)

Table 4. Summary of the Specific Broadcasters and Languages that were Observed to be Jammed during the August/September 1989 Monitoring Period.

(BBC) British Broadcasting Corporation

	0-15	16-29
ARAB	0/ 32	10/ 427
RUSS	2/ 23	23/ 337
MAND	10/ 29	27/ 264
POLI	1/ 20	2/ 223

(RFE) Radio Free Europe

	0-15	16-29
POLI	2/ 52	47/ 750
CZEC	1/ 45	11/ 648
HUNG	0/ 8	20/ 155
ROMA	1/ 6	9/ 153
BULG	1/ 10	6/ 128
EST	1/ 5	4/ 61
PASH	0/ 2	0/ 49
LAT	0/ 1	5/ 42
LITH	0/ 2	0/ 26
DARI	0/ 0	0/ 10
PORT	0/ 0	1/ 3

(DW) Deutsche Welle

	0-15	16-29
RUSS	1/ 22	13/ 311
CHIN	2/ 18	4/ 213
CZEC	2/ 12	14/ 149
BULG	5/ 11	29/ 143
DARI	0/ 14	0/ 119
PASH	0/ 8	0/ 100
ROMA	0/ 6	0/ 67
POLI	0/ 5	0/ 65
PERS	0/ 4	0/ 55

(IRAN) Iran Broadcast

	0-15	16-29
PERS	6/ 18	17/ 148
ARAB	12/ 15	33/ 103

(VOA) Voice of America

	0-15	16-29
CHIN	68/ 155	228/ 1521
RUSS	7/ 65	55/ 864
POLI	1/ 21	3/ 257
DUP	0/ 15	4/ 227
UKRA	1/ 9	12/ 130
PASH	1/ 3	11/ 58
UZBE	0/ 4	2/ 52
LLE	0/ 3	5/ 47
AZER	0/ 2	0/ 28
EL	1/ 1	1/ 17
SERB	0/ 1	0/ 14
DARI	1/ 1	3/ 10
GEOR	1/ 1	1/ 5

(RL) Radio Liberty

	0-15	16-29
RUSS	10/ 179	101/ 2266
UKRA	0/ 15	7/ 243
TB	0/ 7	6/ 147
UZBE	0/ 2	8/ 92
KIRG	1/ 5	2/ 90
TAJI	0/ 5	0/ 79
BR	0/ 4	5/ 74
KAZA	0/ 6	1/ 72
AZER	0/ 6	4/ 63
GEOR	1/ 3	7/ 48
TURK	0/ 2	1/ 43
ARM	0/ 3	3/ 39

(IBA) Kol Israel

	0-15	16-29
EEUR	5/ 54	14/ 436
ARAB	3/ 17	8/ 82
IRAN	0/ 2	0/ 18

(???) Miscellaneous

	0-15	16-29
CHIN	42/ 43	275/ 608
ARAB	2/ 6	5/ 53
???	0/ 0	294/ 539

KEY TO LANGUAGES

ARAB - Arabic	DUP - Dar, Urdo, Pashto	LITH - Lithuanian	SERB - Serbian
ARM - Armenian	EL/LLE - Estonian, Latvian, Lithuanian	MAND - Mandarin	TAJI - Tajik
AZER - Azerbaijanian	GEOR - Georgian	PASH - Pashto	TB - Tatar
BR - Byelorussian	HUNG - Hungarian	PERS - Persian	Bashkir
BULG - Bulgarian	KAZA - Kazakh	POLI - Polish	UKRA - Ukrainian
CHIN - Chinese	KIRG - Kirgiz	ROMA - Romanian	UZBE - Uzbek
CZEC - Czechoslovakian	LAT - Latvian	RUSS - Russian	
DARI - Dari			

to automate a planning system to equitably parcel, among the various administrations, the HF broadcast frequencies. Because the demand for the use of this spectrum far exceeded that which was available, this was a difficult task if the quality of the broadcast services was to be preserved. Even with jamming not taken into account, the planning system yielded results that were not acceptable to the world broadcast community (ITU 1987).

Although jamming has been suspended in certain parts of the world, the potential for political misuse of the spectrum still exists. The cessation of jamming against information and programming into the Soviet Union and Eastern Europe marks the end of a 40-year era in jamming by these administrations. While the Soviets have discontinued their efforts to halt the free flow of information, broadcasts into China have been heavily jammed since the Tienamen Square incident in June 1989. The jamming of these services, two months following this incident, points up quite vividly how jamming is a political expedient employed by nations to impede the free-flow of information.

Thus, while jamming of the Eastern European and Soviet languages has ceased, it is necessary to maintain a degree of flexibility in broadcast operations to assure the capability to minimize the effects of jamming if political situations lead to its resumption.

#### 4. REFERENCES

- ITU (1984), Report to the Second Session of the World Administrative Radio Conference for the Planning of the HF bands Allocated to the Broadcasting Service, International Telecommunication Union, Geneva, Switzerland.
- ITU (1987), Final Acts of the World Administrative Radio Conference for the Planning of the HF Bands Allocated to the Broadcasting Service, (HFBC-87), Geneva, Switzerland, 159 pp.
- Sowers, M.W., G.R. Hand, and C.M. Rush (1985), Monitoring of harmful interference to the HF broadcasting service: I. Results of the October 1984 and March/April 1985 coordinated monitoring periods, NTIA Report 85-187, December, 318 pp. (NTIS Order No. PB 86-163011).

Sowers, M.W., G.R. Hand, and C.M. Rush (1986), Monitoring of harmful interference to the HF broadcasting service: II. Results of the January 1986 coordinated monitoring period, NTIA Report 86-206, October, 136 pp. (NTIS Order No. PB 87-180212/AS).

Sowers, M.W., G.R. Hand, and C.M. Rush (1987), Monitoring of harmful interference to the HF broadcasting service: III. Results of the June 1987 coordinated monitoring period, NTIA Report 87-213, March, 176 pp. (NTIS Order No. PB 87-210274/AS).

Sowers, M.W., G.R. Hand, and C.M. Rush (1989), Monitoring of harmful interference to the HF broadcasting service: IV. Results of the July 1988 coordinated monitoring period, NTIA Report 87-213, June, 108 pp. (NTIS Order No. PB 89-231732/AS)



APPENDIX

Locations of Jammers From the October 1984,  
March/April 1985, January 1986, June 1986 and  
July 1989, Monitoring Programs

ID	Oct 84	ITU Country Code	March/ April 85	ITU Country Code	Jan 86	ITU Country Code	June 86	ITU Country Code
UN-BUL	43.6 N, 24.0 E	BUL						
UN-ARM	56.6 N, 32.5 E	URS						
UN-UKR	50.7 N, 20.4 E	POL						
ID			50.2 N, 31.3 E	URS	52.9 N, 29.8 E	URS	51.2 N, 28.8 E	URS
1G	55.1 N, 20.0 E	URS	58.4 N, 27.7 E	URS	59.7 N, 30.6 E	URS	59.6 N, 31.5 E	URS
4F	47.2 N, 65.4 E	URS	43.6 N, 51.0 E	URS	41.5 N, 66.8 E	URS	41.2 N, 67.5 E	URS
4N	54.4 N, 26.5 E	URS	55.9 N, 55.5 E	URS	57.1 N, 57.9 E	URS	56.6 N, 55.0 E	URS
7K	52.4 N, 27.4 E	URS	43.9 N, 67.9 E	URS	43.5 N, 66.5 E	URS	43.2 N, 66.8 E	URS
8L							53.3 N, 49.6 E	URS
A5							43.8 N, 23.5 E	BUL
AD	46.1 N, 36.5 E	URS	44.8 N, 46.8 E	URS			41.5 N, 48.9 E	URS
AG	57.2 N, 48.4 E	URS	53.4 N, 69.2 E	URS	56.2 N, 58.1 E			
AN	54.2 N, 28.1 E	URS					55.6 N, 39.0 E	URS
AR			54.9 N, 40.9 E	URS			54.7 N, 41.3 E	URS
AS			47.4 N, 54.1 E	URS			51.5 N, 38.4 E	URS
AW			64.9 N, 175.5 E	URS				

ID	Oct 84	ITU Country Code	March/ April 85	ITU Country Code	Jan 86	ITU Country Code	June 86	ITU Country Code
BI	49.3 N, 19.3 E	POL	49.7 N, 19.5 E	POL	50.5 N, 18.4 E	POL	50.5 N, 15.5 E	TCH
BA							47.6 N, 136.5 E	URS
BD	52.1 N, 17.7 E	POL	49.7 N, 24.9 E	POL	50.5 N, 28.3 E	POL	54.4 N, 26.7 E	URS
BG	54.6 N 40.4 E	URS	55.9 N, 38.5 E	URS	55.8 N, 36.4 E	URS	55.6 N 39.0 E	URS
BI							54.7 N, 19.0 E	POL
BL			54.5 N, 28.8 E	URS			55.1 N, 26.7 E	URS
BN							54.5 N 58.4 E	URS
BQ	50.4 N, 19.1 E	POL	45.3 N, 43.7 E	URS	48.2 N, 36.7 E	URS		
BR	52.3 N, 16.4 E	POL						
BU			49.8 N, 37.9 E	URS	50.9 N, 34.4 E	URS	50.1 N, 35.7 E	URS
CB	53.6 N, 35.9 E	URS	50.7 N, 51.5 E	URS	49.6 N, 54.6 E	URS	53.4 N, 46.0 E	URS
CG							55.5 N, 76.6 E	URS
D3	49.0 N, 16.2 E	TCH	49.6 N, 17.0 E	TCH	50.5 N, 15.8 E	TCH	50.4 N, 14.7 E	TCH
DA	50.6 N, 24.5 E	URS					54.8 N, 65.9 E	URS
DB					48.4 N, 78.6 E	URS	58.9 N, 68.5 E	URS
DG	55.5 N, 27.2 E	URS						
DR	54.3 N, 19.4 E	URS	54.8 N, 20.2 E	URS	54.9 N, 21.0 E	URS	55.3 N, 23.4 E	URS
DU			57.9 N, 25.9 E	URS	58.8 N, 31.4 E	URS	59.0 N, 31.6 E	URS

ID	Oct 84	ITU Country Code	March/ April 85	ITU Country Code	Jan 86	ITU Country Code	June 86	ITU Country Code
FA	62.2 N, 177.2 E	URS	49.6 N, 134.8 E	URS			47.5 N, 134.9 E	URS
FG	52.2 N, 17.6 E	POL	49.8 N, 36.9 E	URS	49.1 N, 33.1 E	URS		
FL	50.3 N, 29.7 E	URS	49.4 N, 37.7 E	URS	50.6 N, 35.6 E	URS	48.9 N, 37.2 E	URS
FM							53.0 N, 143.4 E	URS
FR							43.6 N, 63.7 E	URS
FU	53.0 N, 23.9 E	URS	54.0 N, 17.7 E	POL	47.3 N, 67.0 E	URS	44.3 N, 73.4 E	URS
G1	48.8 N, 23.5 E	URS						
G3			43.3 N, 22.7 E	BUL			42.8 N, 25.5 E	BUL
GI	55.3 N, 38.8 E	URS	56.4 N, 37.8 E	URS	56.5 N, 36.6 E	URS	56.6 N, 37.8 E	URS
GJ	55.5 N, 36.2 E	URS						
GM	49.9 N, 137.5 E	URS	49.8 N, 134.3 E	URS			49.2 N, 134.5 E	URS
GR	50.6 N, 133.3 E	URS	47.7 N, 134.7 E 50.0 N, 138.5 E	URS URS	50.2 N, 137.1 E	URS	50.7 N, 136.9 E	URS
GS	54.4 N, 40.4 E	URS						
HM			52.8 N, 52.2 E	URS			56.2 N, 37.1 E	URS
HP	50.1 N, 17.0 E	TCH	48.0 N, 35.5 E	URS	45.4 N, 37.2 E	URS	54.5 N, 23.6 E	URS
IB							55.1 N, 54.8 E	URS
IG	48.5 N, 135.5 E	URS	50.0 N, 136.5 E	URS	50.1 N, 136.9 E	URS	50.3 N, 136.8 E	URS

ID	Oct 84	ITU Country Code	March/ April 85	ITU Country Code	Jan 86	ITU Country Code	June 86	ITU Country Code
IN	49.3 N, 30.3 E	URS						
IR			58.0 N, 33.3 E	URS			53.5 N, 48.5 E	URS
K7			42.8 N, 25.1 E	BUL	43.5 N, 24.2 E	BUL	43.0 N, 23.9 E	BUL
KB	51.9 N, 133.5 E 47.8 N	URS	48.5 N 135.2E	URS	48.6 N 134.8 E	URS	48.7 N, 134.8 E	URS
KD	54.7 N, 24.9 E	URS	56.5 N, 35.9 E	URS	56.2 N, 34.3 E	URS	56.0 N, 35.7 E	URS
KF	50.3 N, 16.0 E	TCH						
KM	46.2 N, 39.4 E	URS					41.2 N, 43.8 E	URS
KU							53.5 N, 145.5 E	URS
KV	58.2 N, 25.8 E	URS	56.2 N, 30.9 E	URS	57.8 N, 27.9 E	URS	58.0 N, 32.4 E	URS
L4							43.2 N, 26.0 E	BUL
L8							47.9 N, 18.0 E	TCH
LG					52.6 N, 20.9 E	POL	50.5 N, 22.9 E	POL
LK	53.3 N, 19.6 E	POL	54.8 N, 31.5 E	URS	46.4 N, 67.1 E	URS	50.1 N, 60.8 E	URS
LM							49.0 N, 26.3 E	URS
M3							50.0 N, 16.1 E	URS
M7							42.8 N, 23.5 E	BUL
MA	53.2 N, 18.7 E	POL						
MF	52.6 N, 13.3 E	DDR	55.6 N, 29.3 E	URS	53.4 N, 48.5 E	URS	54.5 N, 40.6 E	URS

ID	Oct 84	ITU Country Code	March/ April 85	ITU Country Code	Jan 86	ITU Country Code	June 86	ITU Country Code
MG					46.9 N, 34.2 E	URS	45.2 N, 36.2 E	URS
MP	51.6 N, 15.5 E	POL	50.9 N, 16.8 E	POL	52.4 N, 24.9 E	URS		
MS	49.8 N, 16.0 E	TCH						
MU			47.5 N, 56.1 E	URS	45.6 N, 63.9 E	URS	44.7 N, 63.9 E	URS
MX	53.3 N, 15.5 E	POL					55.0 N, 22.0 E	URS
NI					59.9 N, 31.7 E	URS	59.5 N, 31.4 E	URS
NS	47.6 N, 27.9 E	URS	47.9 N, 27.5 E	URS			46.6 N, 32.5 E	URS
PA			54.8 N, 16.4 E	POL				
PB	48.1 N, 26.0 E	URS	49.7 N, 25.5 E	URS	49.5 N, 26.9 E	URS	47.8 N, 29.8 E	URS
PF					60.6 N, 162.5 E	URS	59.7 N, 152.8 E	URS
PK	56.8 N, 41.0 E	URS					57.7 N, 47.3 E	URS
PL	52.0 N, 18.8 E	POL	51.4 N, 35.9 E	URS			49.6 N, 37.6 E	URS
R6			43.0 N, 26.4 E	BUL	46.4 N, 22.9 E	BUL/ROU	42.4 N, 25.1 E	BUL
R9	51.1 N, 14.9 E	DDR	50.3 N, 16.7 E	POL	49.6 N, 16.9 E	TCH	48.4 N, 19.9 E	TCH
RB	55.4 N, 23.6 E	URS	54.8 N, 21.5 E	URS	54.6 N, 21.3 E	POL	54.9 N, 20.4 E	URS
RQ							59.6 N, 30.5 E	URS
RT	54.7 N, 19.0 E	URS	56.5 N, 27.7 E	URS	57.1 N, 24.4 E	URS	56.9 N, 25.3 E	URS
S5			49.4 N, 13.1 E	TCH			50.3 N, 12.9 E	TCH

ID	Oct 84	ITU Country Code	March/ April 85	ITU Country Code	Jan 86	ITU Country Code	June 86	ITU Country Code
S7							53.2 N, 14.9 E	POL
SB					68.2 N, 34.1 E	URS		
SF					55.9 N, 59.3 E	URS	56.6 N, 56.0 E	URS
SM					51.0 N, 38.9 E	URS	49.9 N, 41.8 E	URS
ST	55.6 N, 26.9 E	URS	57.3 N, 24.2 E	URS			58.5 N, 27.7 E	URS
SU	50.2 N, 38.9 E	URS					48.1 N, 50.7 E	URS
TK	62.2 N, 24.8 E	URS	40.9 N, 67.6 E	URS	41.9 N, 64.5 E	URS	41.5 N, 65.3 E	URS
TR	51.0 N, 19.2 E	POL	46.0 N, 33.4 E	URS	52.4 N, 28.7 E	URS	47.4 N, 31.6 E	URS
TU	54.9 N, 36.6 E	URS	55.7 N, 36.1 E	URS	55.6 N, 35.1 E	URS	55.7 N, 37.4 E	URS
U7	50.0 N, 15.7 E	TCH	49.5 N, 16.1 E	TCH	50.2 N, 16.2 E	TCH	50.0 N, 16.0 E	TCH
UA	49.1 N, 136.6 E	URS	47.1 N, 134.6 E	URS	49.2 N, 135.8 E	URS		
UB	47.5 N, 26.1 E	ROU	52.8 N, 27.8 E	URS				
UM					46.9 N, 42.4 E	URS		
UN	57.4 N, 33.2 E	URS						
UQ			52.2 N, 79.2 E	URS	42.2 N, 56.8 E	URS	46.1 N, 74.8 E	URS
UR							61.5 N, 70.8 E	URS
US			52.6 N, 28.7 E	URS	51.5 N, 27.4 E	URS	51.0 N, 29.9 E	URS
VF	47.3 N, 41.1 E	URS						

ID	Oct 84	ITU Country Code	March/ April 85	ITU Country Code	Jan 86	ITU Country Code	June 86	ITU Country Code
VG			59.0 N, 30.4 E	URS	59.7 N, 31.1 E	URS	61.2 N, 32.7 E	URS
VI							45.3 N, 66.9 E	URS
VL					53.8 N, 24.0 E	URS	59.9 N, 54.2 E	URS
VM					51.3 N, 50.2 E	URS		
VN	58.6 N, 43.8 E	URS						
VR	53.7 N, 15.5 E	POL	59.1 N, 26.5 E	URS	58.9 N, 31.0 E	URS	59.1 N, 30.9 E	URS
WI	48.5 N, 18.6 E	TCH						
WA			54.7 N, 43.9 E	URS	53.2 N, 51.0 E	URS	54.0 N, 46.9 E	URS
WD	55.1 N, 38.5 E	URS	52.9 N, 34.8 E	URS	52.6 N, 26.9 E	URS	50.6 N, 36.9 E	URS
WG							55.6 N 38.7 E	URS
WI	55.6 N, 30.8 E	URS	55.1 N, 24.8 E	URS	55.9 N, 36.0 E	URS	55.7 N, 37.8 E	URS
WM			49.2 N, 55.4 E	URS	43.6 N, 67.5 E	URS	47.9 N, 58.8 E	URS
WQ	46.7 N, 24.7 E	ROU	50.3 N, 20.1 E	POL	48.7 N, 22.5 E	URS	48.9 N, 22.1 E	TCH
XI							49.0 N, 38.3 E	URS
XN					51.6 N, 19.9 E	POL	51.4 N, 30.4 E	URS
XW							42.7 N, 45.9 E	URS
Z1			49.0 N, 15.4 E	TCH	48.7 N, 18.5 E	TCH		
ZD					63.5 N, 44.7 E	URS	64.9 N, 42.1 E	URS

ID	Oct 84	ITU Country Code	March/ April 85	ITU Country Code	Jan 86	ITU Country Code	June 86	ITU Country Code
ZM	53.6 N, 22.7 E	POL	51.9 N, 17.3 E	POL	51.1 N, 29.8 E	URS	50.1 N, 32.7 E	URS
ZT	47.3 N, 138.2 E	URS			49.3 N, 142.7 E	URS	51.5 N, 144.4 E	URS
**							28.0 N, 116.9 E	CHN
**							33.4 N, 44.3 E	IRQ

July 1988 LOCATIONS

Location				Marker	ITU Country Code	Location				Marker	ITU Country Code
Degrees		Minutes				Degrees		Minutes			
42	44N	26	2E	A5	BUL	56	47N	59	13E	MU	URS
51	11N	132	23E	AL	URS	69	13N	29	41E	MX	URS
55	25N	40	8E	AR	URS	50	47N	31	21E	NA	URS
49	10N	20	20E	B1	TCH	57	40N	31	28E	ND	URS
49	10N	133	55E	BF	URS	56	36N	36	10E	NI	URS
57	14N	41	01E	BN	URS	40	12N	65	24E	NK	URS
56	46N	49	52E	BS	URS	49	11N	134	45E	NU	URS
48	22N	64	59E	CB	URS	44	31N	74	30E	PF	URS
51	59N	24	14E	DK	URS	48	55N	20	03E	R9	TCH
55	55N	34	18E	DP	URS	49	12N	134	40E	RA	URS
54	53N	159	59E	DW	URS	50	17N	36	52E	RD	URS
58	41N	61	11E	FG	URS	49	38N	40	26E	RP	URS
58	14N	29	40E	FI	URS	53	17N	27	14E	RO	URS
55	04N	28	52E	FL	URS	57	24N	29	21E	RT	URS
43	44N	26	18E	G3	BUL	50	37N	13	58E	S5	TCH
57	22N	32	59E	GA	URS	59	24N	31	57E	SF	URS
59	58N	151	6E	GD	URS	47	60N	30	06E	SU	URS
53	48N	59	53E	GF	URS	55	32N	34	27E	TF	URS
58	08N	23	42E	GL	URS	48	48N	134	55E	TK	URS
50	54N	136	17E	GS	URS	56	08N	33	53E	TU	URS
46	52N	37	30E	GU	URS	49	58N	16	46E	U7	TCH
53	26N	28	3E	GV	URS	55	28N	21	17E	UA	URS
59	13N	151	56E	HD	URS	48	36N	24	42E	UD	URS
54	50N	80	2E	HP	URS	55	23N	38	40E	UR	URS
56	36N	37	9E	IL	URS	55	34N	33	46E	VL	URS
56	20N	45	01E	IR	URS	63	56N	91	47E	VN	URS
38	06N	67	41E	KM	URS	55	07N	46	42E	WA	URS
49	25N	138	13E	KU	URS	47	56N	134	53E	WQ	URS
44	32N	64	33E	KV	URS	59	00N	30	07E	WU	URS
43	15N	26	30E	L4	BUL	56	10N	35	45E	WV	URS
55	43N	31	37E	LK	URS	55	20N	34	21E	XD	URS
59	15N	30	58E	LR	URS	50	45N	14	49E	Z3	TCH
46	6N	137	7E	LU	URS	60	52N	128	53E	ZA	URS
49	16N	20	09E	M3	URS	56	25N	31	05E	ZK	URS
55	31N	23	29E	MB	URS	53	23N	38	22E	ZN	URS
44	11N	62	50E	MG	URS	55	59N	36	56E	ZT	URS
52	18N	138	52E	ML	URS						

August/September 1989 LOCATIONS

30	34N	115	10E		CHN
25	27N	114	20E	AG	CHN
32	58N	44	27E		IRQ

\* ITU Country codes: URS - Soviet Union, TCH - Czechoslovakia  
 BUL - Bulgaria.

**BIBLIOGRAPHIC DATA SHEET**

1. PUBLICATION NO.  NTIA Rpt 90-		2. Gov't Accession No.	3. Recipient's Accession No.
4. TITLE AND SUBTITLE Monitoring of Harmful Interference to the HF Broadcasting Service: Summary of Monitoring Programs Held Between 1984 and 1989		5. Publication Date June 1990	
		6. Performing Organization Code ITS.S3	
7. AUTHOR(S) Mary W. Sowers and Gregory R Hand		9. Project/Task/Work Unit No.	
8. PERFORMING ORGANIZATION NAME AND ADDRESS National Telecom & Information Administration Institute for Telecommunications Sciences 325 Broadway Boulder, CO 80303-3328		10. Contract/Grant No.	
		12. Type of Report and Period Covered	
11. Sponsoring Organization Name and Address National Telecomm & Information Administration Herbert C Hoover Building 14th & Constitution Avenue, NW Washington, DC 20230		13.	
		14. SUPPLEMENTARY NOTES	
15. ABSTRACT (A 200-word or less factual summary of most significant information. If document includes a significant bibliography or literature survey, mention it here.)  A summary is presented of a series of monitoring campaigns held between 1984 and 1989 to locate the sources of harmful interference to the HF broadcast services. The monitoring programs were organized under the auspices of the IFRB of the International Telecommunications Union. The locations of the sources of interference as well as the broadcast administrations and languages targeted between 1984 and 1989 are also given. Political restructuring in the Soviet Union and Eastern Bloc countries during this period are reflected in reductions in the level of jamming documented in this report.			
16. Key Words (Alphabetical order, separated by semicolons)  Harmful interference, HF broadcasting, HF jamming, direction finding, glasnost.			
17. AVAILABILITY STATEMENT  <input checked="" type="checkbox"/> UNLIMITED.  <input type="checkbox"/> FOR OFFICIAL DISTRIBUTION.		18. Security Class. (This report)	20. Number of pages  31
		19. Security Class. (This page)	21. Price:

