Communications Research Centre

HF PREDICTIONS
DESCRIPTION OF SERVICES

by

E.D. DuCharme and J.L. Thomas

DEPARTMENT OF COMMUNICATIONS
MINISTÈRE DES COMMUNICATIONS

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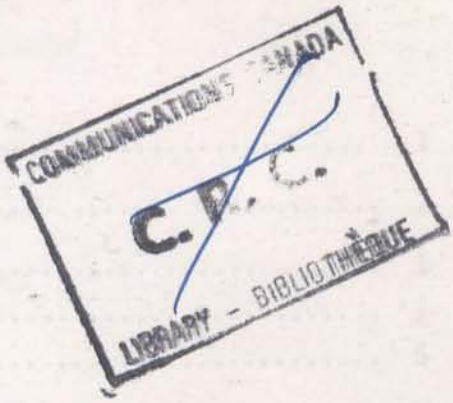
DEPARTMENT OF COMMUNICATIONS
CANADA



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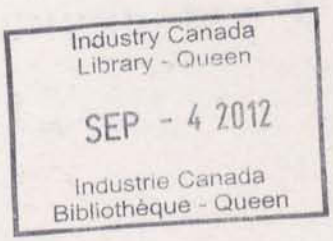

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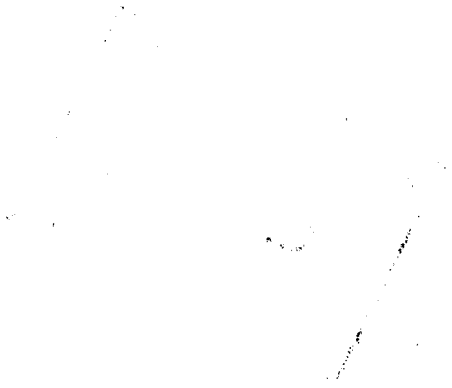

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ABSTRACT

This report describes the HF Prediction Services available from the Communications Research Centre.

1. INTRODUCTION

The Communications Research Centre (CRC) has for many years been engaged in communication research and development. As a product of this research, much data relevant to HF communications has been acquired. One of the ways in which this data has been used is the provision of predictions of ionospheric parameters to assist military and civilian organizations with communication problems, thereby achieving more efficient utilization of the HF spectrum in Canada. This report is a brief outline of the services available from CRC and describes how these services may be obtained.

2. HF PREDICTION CHARTS

2.1 Point-to-Point Circuits

The most widely used service is the provision of predicted optimum working frequencies (FOT) for an HF communication circuit. This information is presented in the form of a table and a graph similar to those shown in Figures 1(a) and 1(b). The table lists, for each hour of the day, the monthly median maximum usable frequency for each of the ionospheric layers (E and F, denoted as E EJF and F_2 EJF), and the optimum working frequency (FOT) for the circuit; the graph is a convenient presentation of the hourly FOT values. In practice, a radio operator would choose an operating frequency equal to or less than the hourly FOT. This information is prepared for specific circuits on request.

TRANSMITTER		RECEIVER		MONTH	YEAR	SSN
HALIFAX		FROBISHER BAY		11	71	67
44.9N	63.5W	63.8N	68.4W	GCD 2124 KMS	TX BEARING 353 DEG	
					RX BEARING 169 DEG	

GMT	F2EJF	E EJF	FOT	GMT	F2EJF	E EJF	FOT
0	10.1	.0	8.6	12	12.7	.0	10.8
1	9.7	.0	8.3	13	15.7	7.4	13.3
2	9.3	.0	7.9	14	17.7	11.6	15.0
3	8.6	.0	7.3	15	19.2	12.7	16.3
4	8.4	.0	7.2	16	20.2	13.4	17.2
5	8.5	.0	7.2	17	19.8	13.5	16.9
6	8.6	.0	7.3	18	19.0	13.0	16.2
7	8.9	.0	7.5	19	19.1	12.0	16.2
8	8.9	.0	7.5	20	17.5	5.3	14.9
9	8.9	.0	7.5	21	15.2	.0	12.9
10	9.2	.0	7.9	22	12.7	.0	10.8
11	10.0	.0	8.5	23	11.3	.0	9.6

Fig. 1.(a)

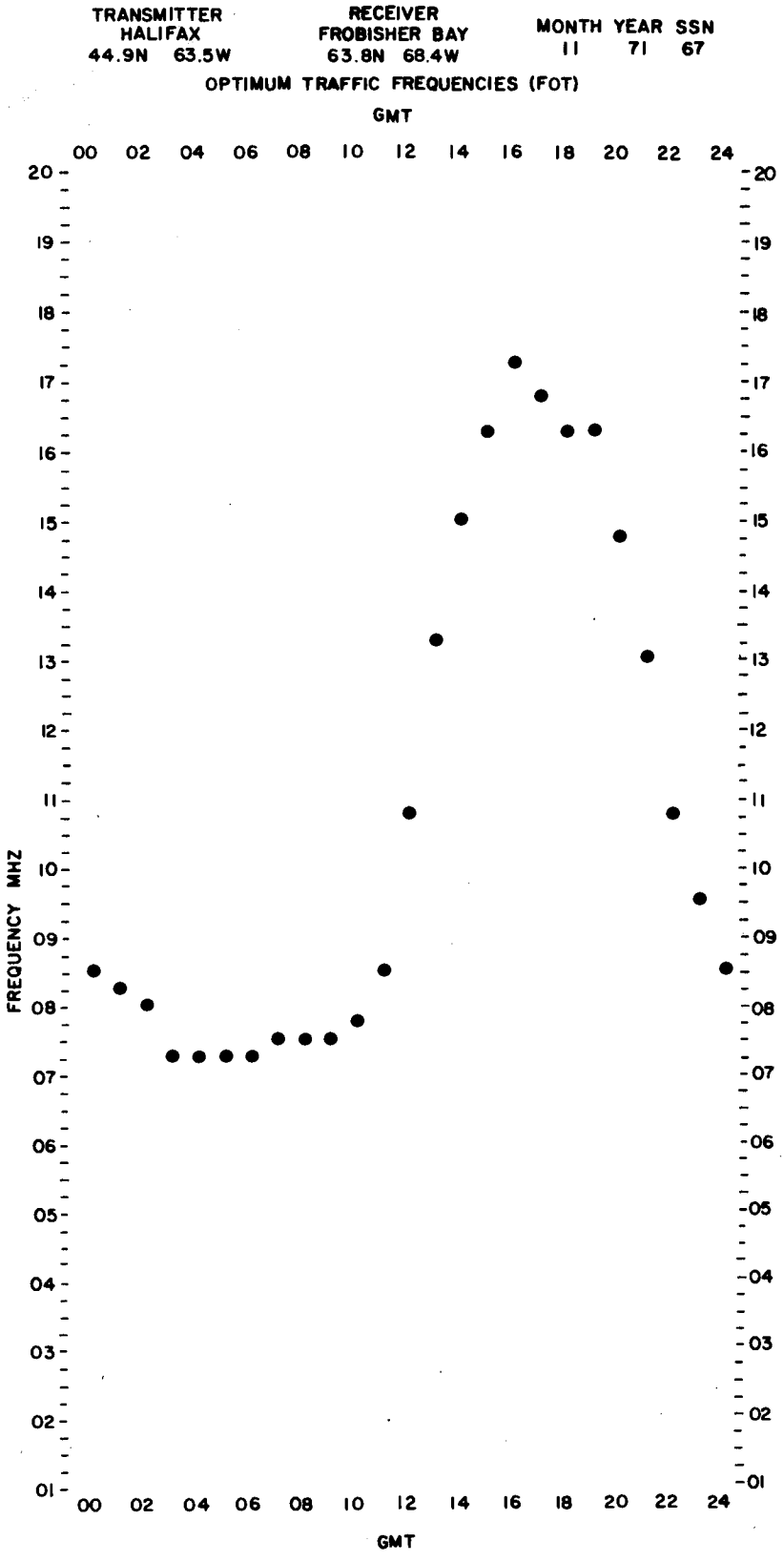
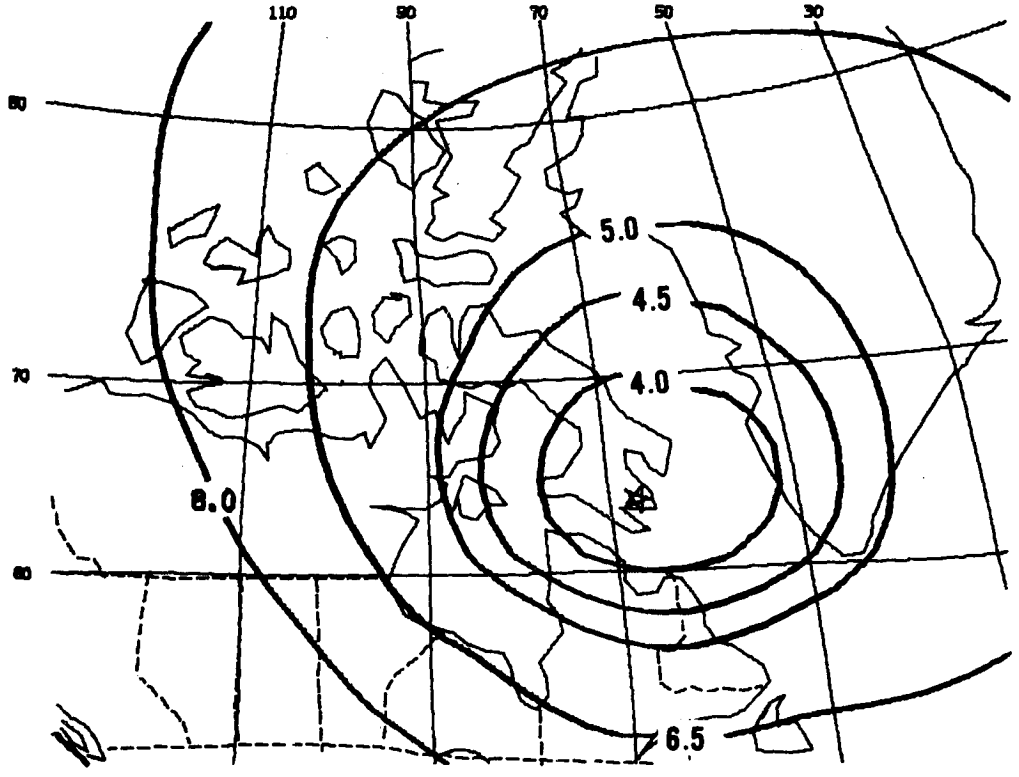

TRANSMITTER
HALIFAX
44.9N 63.5W
RECEIVER
FROBISHER BAY
63.8N 68.4W
MONTH YEAR SSN
11 71 67
OPTIMUM TRAFFIC FREQUENCIES (FOT)
GMT
00 02 04 06 08 10 12 14 16 18 20 22 24
FREQUENCY MHZ
01 02 03 04 05 06 07 08 09 10 11 12 13 14 15 16 17 18 19 20
GMT

Fig. 1.(b)



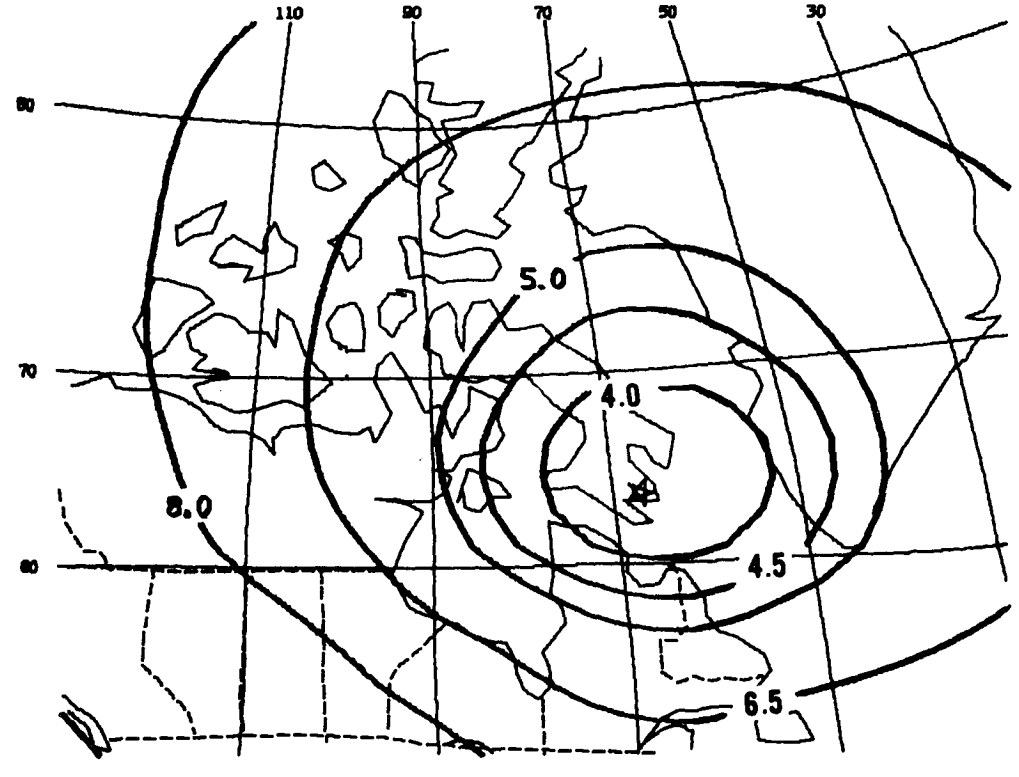


Fig. 2. Predicted optimum working frequencies.

2.2 Area Coverage from a Base Station

Where HF is serving users over an area, the optimum frequency information is presented on a map as contour lines of constant FOT for communication between a remote (possibly mobile) station and a given base station. An example is shown in Figure 2, where ~~Inuvik~~ Frobisher Bay is the base station.

The maps are used as follows:

(a) the person using the map establishes his position on the map;

(b) the FOT for the circuit from that location to the base station is determined by interpolating between the frequencies associated with the nearby contour lines.

Usually 12 maps, one for every second hour of the day, are prepared for a base station for each month. Map booklets of this type are available monthly for the following base stations in Canada:

1)	Vancouver	7)	Prince Albert
2)	Prince George	8)	Frobisher Bay
3)	Inuvik	9)	Alma, Quebec
4)	Edmonton	10)	Trenton, Ontario
5)	Resolute Bay	11)	Halifax
6)	Winnipeg	12)	Saint John.

Special arrangements can be made to supply maps for other base stations in Canada.

3. HF SYSTEM DESIGN

Recently numerical techniques have been developed to predict the statistical performance of an HF communication system. These techniques can be used to evaluate various equipment configurations that are being considered during the design of an HF communication system. For example, the influence on system performance of the choice of antennas can be estimated. The most common use of these techniques is to determine the optimum complement of operating frequencies that should be used by an HF communication system to attain the highest reliability.

A computer program of this type is operating at CRC and arrangements can be made to provide design assistance to engineers and system designers.

4. HF COMMUNICATIONS SEMINARS

The Communications Research Centre has presented HF Communications Seminars in several centres in Canada. These seminars consist of 10 hours of lectures over a period of two days; the fundamentals of ionospheric propagation are covered along with related information of interest to an HF communicator. Similar seminars can be repeated when there is a large enough group (probably greater than 10) and lecture room facilities are provided.

5. METHOD OF REQUESTING ASSISTANCE AND SERVICES

The assistance and services described are available by writing to:

Director-General
Communications Research Centre
Shirley Bay, P.O. Box 490, Station 'A'
Ottawa, Ontario.

K1N 8T5

613 . 996 - 7051