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Field Strength Calculation For TV and FM Broadcasting

(Computer Program TVFMFS)

Prepared by The Office of Chief Engineer
Research & Standards Division

Federal Communications Commission
Washington, DC, 20554

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FEDERAL COMMUNICATIONS COMMISSION
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Introduction

This program is a computer version of the TV and FM field strength curves found in figures 17, 18, 19, 20, 29 and 30 of FCC Report R-6602[1]. These curves have been adopted in Part 73 of the FCC rules and regulations, effective August 1, 1975.

Output options include (1) field strength verses distance, (2) distances to the grade A and B contours, and (3) distance to any given field strength value, based upon input of station power, antenna height above average terrain, frequency, and terrain roughness factor.

The computed values of field strength are well within ±.5 dB of the corresponding curve values. The computed distances to various contours are within ±.25 miles of the distances calculated from the curves.

The program is written in FORTRAN V for use on a UNIVAC 1106 computer.

1. "Report No. R-6602; Development of VHF and UHF Propagation Curves for TV and FM Broadcasting", Federal Communications Commission, Office of the Chief Engineer, Research Division, Washington, D.C. September 7, 1966. Available from National Technical Information Service (NTIS), Springfield, Va. 22161 for $3.75 paper copy/$2.25 microfiche. NTIS accession number is PB 174288.

TVFMFS DESCRIPTION

This program consists of a main program, an interpolation subroutine, and field strength tables based upon the curves.

Main Program

The main program does the following:

1. Reads the TV curve data tables.

2. Reads the TV or FM station data and output options.

3. Determines the input parameters for the interpolation subroutine.

4. Calls the subroutine to find the field strength values.

5. Prints the required output information.

Interpolation Subroutine ITPLBV[2]

This subroutine is a bivarate interpolation method which is used to interpolate values of field strength from the tables. The inputs to the subroutine are field strength tables as a function of distance and antenna height, and distance and height values for the desired field strengths.

Field Strength Data

This data consists of field strength values read at the antenna heights of 100', 200', 400', 600', 800', 1000', 1250', 1500', 1750', 2000', 3000', 4000', and 5000' along each indicated distance curve from figures 17, 18, 19, 20, 29, and 30 of report R-6602.

Roughness Correction

The terrain roughness correction is calculated as follows:

$$RC = C - (.03)\ (DH)\ (1. + F/300.)$$

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2. Akima, Hiroshi, "Algorithm 474, Bivariate Interpolation and Smooth Surface Fitting Based on Local Procedures"; Communications of the ACM, January 1974, Volume 17, Number 1.

where; RC = roughness correction in dB
DH = terrain roughness factor, in meters, as defined in figure 1 of R-6602
F = frequency, in MHz
C = a constant with the following values
= 1.9 for $F \leq 108$ MHz (channels 2-6 and FM)
= 2.5 for $174 \leq F \leq 216$ MHz (channels 7-13)
= 4.8 for $470 \leq F \leq 806$ MHz (channels 14-69)

An input option is available so that the calculations performed by this program can be made with or without the roughness correction.

INPUT DATA

1. TV and FM Field strength data

The tables in figures 1, 2, 3, 4, 5, and 6 represent the field strength curves from figures 17, 18, 19, 20, 29, and 30 of report R-6602.

The data from the tables are punched on cards, having the following format:

Cards 1-2;	The number of distance values (25) and the distance values in miles for the F(50,50) curves, format (I5,15F5.Ø/(16F5.Ø))
Card 3;	The number of height values (13) and the height values in feet for the F(50,50) curves, format (I5,15F5.Ø/(16F5.Ø))
Cards 4-28;	The field strength values for the F(50,50) curves for channels 2-6 and FM. There is 1 card for each of the 25 distances, arranged in ascending order. The 13 field strength values correspond to the 13 heights of card 3. The format of the card is (16F5.1).
Cards 29-30;	The number of distance values (30) and the values in miles for the F(50,10) curves, format (I5,15F5.Ø/(16F5.Ø))
Card 31;	The number of height values (13) and the values in feet for the F(50,10) curves, format (I5,15F5.Ø/(16F5.Ø))

Cards 32-61;	The field strength values for the F(50,10) curves for channels 2-6 and FM. There is 1 card for each of the 30 distances arranged in ascending order. The 13 field strength values correspond to the 13 heights of card 31. The format is (16F5.1)
Cards 62-86;	The field strength values for the F(50,50) curves for channels 7-13. There is 1 card for each of the 25 distances arranged in ascending order. The 13 field strength values correspond to the 13 heights of card 3. The format is (16F5.1)
Cards 87-116;	The field strength values for the F(50,10) curves for channels 7-13, arranged as the previous F(50,10) values.
Cards 117-141;	The field strength values for the F(50,50) curves for channels 14-69, arranged as the previous F(50,50) values.
Cards 142-171;	The field strength values for the F(50,10) curves for the channels 14-69, arranged as the previous F(50,10) values.

A listing of these data cards is in appendix C.

2. Station Input Data

The input data for a TV or FM station consists of a set of 2 cards. The station data sets follow the field strength data cards. The program will read station data sets until an EOF card is encountered.

1st card of the station set

Alphanumeric information in the first 72 columns of the card.

2nd card of the station set

Column	Description
1	The value of output option IOP1. Code values are; IOP1 = Ø, no field strength vs. distance curve is produced = 1, a F(50,50) curve is produced. = 2, a F(50,10) curve is produced.
2	The value of output option IOP2. Code values are: IOP2 = Ø, no distance to a contour is produced = 1, distance to the grade A & B contour is printed = 2, distance to a given field strength is printed

3	The value of output option IOP3. Code values are; IOP3 = 0, the roughness correction is applied. = 1, no roughness correction is applied.
4-5	Blanks
6-10	The station power in KW, format F5.1
11-15	The antenna height above average terrain in feet, format F5.0
16-20	The station frequency in MHz, format F5.2
21-25	The roughness factor in meters, format F5.0
26-30	The starting distance (DS) in miles for the field strength vs. distance curve, format F5.0
31-35	The ending distance (DE) in miles for the field strength vs. distance curve, format F5.0
36-40	The distance increment (DI) in miles for the field strength vs. distance curve, format F5.0
41-45	The field strength for which the distance to is to be calculated, format F5.1

The maximum number of distance values for the field strength vs. distance curve is 200, hence the user must be sure the following equation holds:

$$\frac{DE - DS}{DI} + 1 \leq 200$$

If the field strength at a certain distance is wanted, DE would be set equal to DS and DI would be given any non zero value.

Input and Output Examples

Example 1, WDCA-TV

The input data cards are shown in figure 7. In this example, the F(50,50) field strength is wanted every 5 miles between 5 and 200 miles from the transmitter. The distance to the grades A and B contours will be printed and the roughness correction will apply.

The output is shown in figure 8.

Example 2, WMAL-TV

The input data cards are shown in figure 9. In this example, the F(50,10) field strength is wanted every 10 miles between 10 and 300 miles from the transmitter. The roughness correction will apply.

The output is shown in figure 10.

Example 3, WRC-TV

The input data cards are shown in figure 11. In this example, the F(50,50) field strength is wanted every 5 miles between 5 and 100 miles from the transmitter. The distance to the grades A and B contours will be printed and the roughness correction will not be applied.

The output is shown in figure 12.

Example 4, WTOP-TV

The input cards are shown in figure 13. In this example, the F(50,50) field strength is wanted every 5 miles between 5 and 200 miles from the transmitter. The distance to the 50 dBU contour will be printed out and the roughness correction will apply.

The output is shown in figure 14.

Output Note

If the input value of antenna height, starting distance, or ending distance is outside the minimum or maximum value found in the field strength table, the following error messages will be printed out and no calculations will be made on the data set.

(1) ANTENNA HEIGHT OUTSIDE OF TABLE RANGE

(2) STARTING OR ENDING DISTANCE OUTSIDE OF TABLE RANGE

TABLE OF FIELD STRENGTHS DBU/1KW

F(50,50) TV CHANNELS 2-6 AND FM

	HEIGHT IN FEET												
****** MILES	100.0	200.0	400.0	600.0	800.0	1000.0	1250.0	1500.0	1750.0	2000.0	3000.0	4000.0	5000.0
1.*	92.0	98.0	100.6	101.5	101.9	102.0	102.1	102.2	102.3	102.4	102.5	102.5	102.5
2.*	79.7	85.9	91.0	93.4	94.6	95.0	95.6	95.9	96.0	96.1	96.3	96.5	96.5
3.*	72.7	79.0	84.8	87.8	89.4	90.4	91.2	91.8	92.0	92.2	92.5	92.5	92.5
4.*	67.8	73.8	80.0	83.3	85.4	86.8	87.7	88.3	88.9	89.2	89.9	90.1	90.2
5.*	64.0	70.0	76.0	79.6	82.0	83.7	85.0	85.8	86.3	86.7	87.6	88.0	88.1
10.*	52.0	58.0	64.0	67.6	70.0	72.0	73.9	75.4	76.7	77.9	80.2	81.3	81.9
20.*	39.4	45.5	51.5	55.0	57.6	59.6	61.7	63.3	64.9	66.2	70.0	72.4	74.2
30.*	31.0	37.0	43.0	46.7	49.0	51.0	53.2	55.1	57.0	58.5	62.6	65.0	66.5
40.*	25.3	29.5	35.5	39.0	41.5	43.6	45.9	47.9	50.0	51.5	55.4	57.8	59.6
50.*	20.3	23.5	28.8	32.0	34.4	36.7	39.1	41.5	43.5	45.0	48.9	51.2	53.0
60.*	16.2	18.1	22.0	25.3	27.7	29.9	32.0	34.4	36.7	38.2	42.5	44.9	46.4
70.*	12.8	14.5	17.1	19.8	22.0	23.9	26.0	28.3	30.7	32.4	36.9	39.1	40.8
80.*	9.8	11.0	13.4	15.2	17.0	18.8	21.0	23.2	25.2	27.0	31.0	33.2	35.0
90.*	6.9	8.2	10.2	11.8	13.1	14.7	16.8	18.8	20.4	22.0	25.7	28.1	30.0
100.*	4.0	5.5	7.4	8.9	10.1	11.5	13.1	14.9	16.0	17.3	21.0	23.5	25.5
110.*	1.5	2.9	4.8	6.0	7.2	8.4	9.9	11.1	12.5	13.7	17.1	19.8	21.8
120.*	-1.1	.3	2.2	3.7	4.8	5.7	7.0	8.0	9.1	10.1	13.6	16.1	18.3
130.*	-3.6	-2.2	-.3	1.0	2.0	3.0	4.1	5.2	6.2	7.1	10.3	13.0	15.0
140.*	-5.8	-4.8	-3.0	-1.4	-.3	.6	1.7	2.7	3.8	4.6	7.8	10.4	12.4
150.*	-8.1	-7.0	-5.2	-3.9	-2.7	-1.8	-.7	.2	1.1	2.0	5.1	8.0	10.0
160.*	-10.6	-9.4	-7.6	-6.1	-5.1	-4.2	-3.2	-2.2	-1.3	-.4	2.8	5.5	7.7
170.*	-13.0	-11.7	-10.0	-8.7	-7.6	-6.6	-5.6	-4.6	-3.6	-2.7	.5	3.1	5.1
180.*	-15.1	-14.0	-12.2	-11.0	-10.0	-9.0	-8.0	-7.0	-6.1	-5.1	-2.1	.6	2.8
190.*	-17.2	-16.1	-14.6	-13.2	-12.1	-11.2	-10.2	-9.2	-8.4	-7.6	-4.5	-2.0	.2
200.*	-19.2	-18.3	-16.9	-15.6	-14.6	-13.6	-12.5	-11.6	-10.6	-10.0	-6.8	-4.1	-2.0

figure 1

TABLE OF FIELD STRENGTHS DBU/1KW

F(50,10) TV CHANNELS 2-6 AND FM

HEIGHT IN FEET

****** MILES	100.0	200.0	400.0	600.0	800.0	1000.0	1250.0	1500.0	1750.0	2000.0	3000.0	4000.0	5000.0
10.*	52.2	58.4	64.3	68.0	70.5	72.3	74.2	75.9	77.0	78.2	80.8	81.8	82.2
20.*	41.4	47.0	53.0	56.5	59.0	60.9	63.0	64.8	66.2	67.6	71.2	73.8	75.5
30.*	36.4	40.9	45.9	49.0	51.7	53.7	56.0	57.9	59.6	60.9	64.5	67.0	69.0
40.*	33.0	36.0	39.9	43.0	45.4	47.5	50.0	52.0	54.0	55.2	58.9	61.4	63.3
50.*	30.0	31.9	35.0	37.7	40.0	41.9	44.4	46.7	48.5	50.0	53.9	56.3	58.4
60.*	26.7	28.0	30.5	32.8	34.9	36.8	39.2	41.6	43.5	45.0	49.0	51.7	53.5
70.*	23.5	24.9	26.9	28.8	30.4	32.0	34.9	37.1	39.2	40.7	44.2	46.9	48.8
80.*	20.4	22.0	24.0	25.6	27.0	28.4	30.8	33.0	35.0	36.2	39.8	42.0	44.0
90.*	17.4	19.0	20.9	22.5	23.9	25.0	27.0	29.0	30.8	32.0	35.4	37.8	39.7
100.*	14.5	16.1	18.2	19.8	21.0	22.0	23.9	25.5	26.9	28.0	31.3	33.8	35.7
110.*	11.5	13.1	15.3	16.9	18.2	19.2	20.8	22.0	23.2	24.1	27.6	30.0	32.1
120.*	8.5	10.1	12.4	13.9	15.1	16.2	17.8	19.0	20.0	21.0	24.4	27.0	29.1
130.*	5.9	7.7	9.8	11.0	12.3	13.4	14.8	16.0	17.1	18.0	21.6	24.1	26.1
140.*	3.0	4.9	6.9	8.2	9.7	10.7	12.0	13.2	14.2	15.3	18.9	21.5	23.5
150.*	.6	2.0	4.1	5.7	6.9	8.0	9.1	10.3	11.6	12.5	16.0	18.8	20.9
160.*	-2.0	-.4	1.6	2.9	4.1	5.3	6.7	7.9	9.0	10.0	13.6	16.1	18.0
170.*	-4.3	-3.0	-1.0	.3	1.6	2.7	3.9	5.0	6.0	7.0	10.7	13.6	15.7
180.*	-6.6	-5.1	-3.4	-2.2	-1.0	.0	1.1	2.2	3.3	4.4	8.0	10.9	13.0
190.*	-8.7	-7.4	-5.8	-4.6	-3.4	-2.5	-1.4	-.2	.9	1.8	5.2	8.1	10.2
200.*	-10.5	-9.4	-8.0	-6.9	-5.7	-4.9	-3.9	-2.8	-1.8	-.8	2.8	5.3	7.5
210.*	-12.5	-11.4	-10.1	-9.0	-8.0	-7.0	-6.0	-5.0	-4.0	-3.0	.3	3.0	5.0
220.*	-14.6	-13.4	-12.0	-11.0	-10.0	-9.0	-8.0	-7.0	-6.2	-5.3	-2.0	.4	2.6
230.*	-16.6	-15.5	-14.1	-13.0	-12.0	-11.2	-10.2	-9.2	-8.2	-7.4	-4.5	-1.9	.0
240.*	-18.6	-17.4	-16.0	-15.0	-14.0	-13.2	-12.2	-11.3	-10.5	-9.8	-7.0	-4.3	-2.4
250.*	-20.5	-19.3	-18.0	-17.0	-16.0	-15.1	-14.2	-13.3	-12.5	-11.8	-9.0	-6.7	-4.6
260.*	-22.4	-21.2	-19.9	-18.9	-17.9	-17.0	-16.2	-15.3	-14.6	-14.0	-11.1	-9.0	-6.9
270.*	-24.3	-23.2	-21.9	-20.9	-19.9	-19.0	-18.1	-17.2	-16.3	-15.8	-13.2	-11.0	-9.0
280.*	-26.2	-25.0	-23.7	-22.5	-21.7	-21.0	-20.0	-19.2	-18.4	-17.8	-15.0	-12.9	-11.0
290.*	-28.1	-27.0	-25.6	-24.6	-23.6	-23.0	-22.0	-21.1	-20.2	-19.6	-17.0	-14.9	-13.0
300.*	-30.0	-29.0	-27.4	-26.3	-25.4	-24.6	-23.7	-22.8	-22.0	-21.3	-19.0	-16.9	-15.0

figure 2

TABLE OF FIELD STRENGTHS DBU/1KW

F(50,50) TV CHANNELS 7-13

HEIGHT IN FEET

****** MILES	100.0	200.0	400.0	600.0	800.0	1000.0	1250.0	1500.0	1750.0	2000.0	3000.0	4000.0	5000.0
1.*	94.6	100.7	101.6	101.8	101.9	102.0	102.3	102.3	102.3	102.4	102.4	102.4	102.5
2.*	82.8	88.9	92.3	93.9	94.6	95.0	95.4	95.7	95.9	96.0	96.2	96.2	96.5
3.*	75.7	81.8	86.6	88.7	89.8	90.5	91.3	91.8	92.0	92.1	92.6	92.6	92.7
4.*	70.7	76.9	82.2	84.8	86.2	87.0	88.0	88.7	89.1	89.5	90.0	90.0	90.1
5.*	66.8	73.0	78.8	81.6	83.2	84.5	85.7	86.3	87.0	87.3	88.0	88.0	88.0
10.*	55.0	61.0	67.2	70.8	73.2	75.0	77.0	78.1	79.1	80.0	81.1	81.8	82.0
20.*	42.5	48.6	54.7	58.1	60.7	62.5	65.0	67.6	69.5	71.0	73.9	74.8	75.0
30.*	34.0	40.0	46.1	49.8	52.1	54.2	56.7	59.0	61.0	62.8	66.3	67.4	68.0
40.*	26.3	32.0	38.1	41.7	44.0	46.0	48.8	51.0	53.3	55.0	58.7	60.3	61.1
50.*	20.7	24.1	30.1	33.8	36.1	38.0	40.9	43.5	46.0	47.9	52.0	53.8	54.6
60.*	16.3	18.5	23.0	26.2	28.8	30.6	33.5	36.3	39.0	41.0	45.0	47.0	48.1
70.*	12.9	14.4	17.0	20.0	22.1	24.0	26.8	29.6	32.0	34.0	38.2	40.6	42.0
80.*	9.9	11.2	13.5	15.2	17.0	18.9	21.2	23.9	26.0	28.0	32.0	34.4	36.1
90.*	7.0	8.3	10.5	12.0	13.7	15.0	17.0	19.0	21.0	22.6	26.3	28.8	30.6
100.*	4.3	5.5	7.5	9.0	10.4	11.5	13.1	14.9	16.2	17.5	21.1	23.8	25.5
110.*	1.5	2.9	4.8	6.2	7.5	8.6	10.0	11.2	12.7	13.6	17.0	19.8	21.8
120.*	-1.0	.5	2.3	3.7	4.8	5.8	7.0	8.2	9.5	10.5	14.0	16.6	18.5
130.*	-3.5	-2.0	-.3	1.0	2.2	3.2	4.4	5.5	6.5	7.4	10.7	13.1	15.1
140.*	-5.7	-4.3	-2.7	-1.2	-.1	.9	2.0	3.0	4.0	4.9	8.0	10.4	12.3
150.*	-8.0	-6.9	-5.0	-3.7	-2.5	-1.5	-.5	.6	1.5	2.2	5.6	8.2	10.1
160.*	-10.4	-9.2	-7.3	-6.0	-4.9	-4.0	-3.0	-2.0	-1.0	-.2	3.0	5.5	7.5
170.*	-12.8	-11.5	-9.8	-8.4	-7.3	-6.3	-5.3	-4.3	-3.5	-2.6	.6	3.1	5.1
180.*	-15.0	-13.8	-12.0	-10.7	-9.7	-8.7	-7.6	-6.6	-5.8	-5.0	-1.8	.9	2.9
190.*	-17.2	-16.0	-14.4	-13.0	-12.0	-11.0	-10.0	-9.0	-8.2	-7.3	-4.2	-1.8	.3
200.*	-19.1	-18.2	-16.8	-15.5	-14.4	-13.4	-12.3	-11.3	-10.5	-9.8	-6.6	-4.0	-1.9

figure 3

TABLE OF FIELD STRENGTHS DBU/1KW

F(50,10) TV CHANNELS 7-13

	HEIGHT IN FEET												
****** MILES	100.0	200.0	400.0	600.0	800.0	1000.0	1250.0	1500.0	1750.0	2000.0	3000.0	4000.0	5000.0
10.*	55.4	61.6	67.7	71.0	73.5	75.3	77.1	78.6	79.6	80.4	82.0	82.4	82.5
20.*	44.4	50.0	55.8	59.1	61.7	63.7	66.5	68.9	70.8	72.0	75.0	75.9	76.2
30.*	39.2	43.5	48.6	52.0	54.6	56.5	59.0	61.5	63.6	65.2	68.6	69.8	70.2
40.*	34.0	38.0	42.7	45.6	48.0	50.0	52.5	54.9	56.9	58.8	62.5	64.0	64.9
50.*	29.9	32.5	35.9	38.8	41.0	43.0	45.8	48.2	50.8	53.0	57.0	58.9	59.8
60.*	26.6	28.2	31.0	33.4	35.4	37.4	40.0	43.0	45.4	47.6	52.0	53.8	54.8
70.*	23.5	25.0	27.0	28.9	30.7	32.3	35.0	37.4	40.0	42.0	46.8	48.9	50.0
80.*	20.3	22.0	24.0	25.5	27.0	28.3	30.4	32.9	35.0	36.8	41.5	43.7	45.0
90.*	17.4	19.0	21.0	22.4	23.8	25.0	26.9	28.8	30.4	32.0	35.8	38.2	40.1
100.*	14.3	16.0	18.1	19.6	20.8	22.0	23.5	25.0	26.4	27.7	31.0	33.6	35.5
110.*	11.3	13.0	15.1	16.7	18.0	19.1	20.5	22.0	23.0	24.0	27.6	30.0	32.0
120.*	8.6	10.0	12.2	13.7	15.0	16.3	17.6	18.8	19.9	20.7	24.0	26.8	28.9
130.*	5.8	7.2	9.4	10.8	12.0	13.3	14.7	15.9	17.0	18.0	21.4	24.0	26.0
140.*	2.9	4.7	6.8	8.1	9.5	10.6	12.0	13.0	14.1	15.2	18.8	21.2	23.4
150.*	.3	1.9	3.8	5.2	6.5	7.8	9.0	10.3	11.5	12.5	16.0	18.7	20.7
160.*	-2.1	-.7	1.2	2.7	3.9	5.0	6.4	7.5	8.8	9.8	13.1	15.9	18.0
170.*	-4.4	-3.2	-1.4	.0	1.2	2.4	3.7	4.9	6.0	7.0	10.6	13.2	15.4
180.*	-6.7	-5.4	-3.8	-2.3	-1.2	.0	1.0	2.1	3.3	4.3	7.9	10.6	12.8
190.*	-8.9	-7.8	-6.1	-4.8	-3.8	-2.6	-1.4	-.3	.8	1.7	5.0	8.0	10.0
200.*	-10.8	-9.8	-8.2	-7.0	-6.0	-5.0	-4.0	-3.0	-2.0	-1.0	2.5	5.2	7.3
210.*	-12.9	-11.8	-10.3	-9.0	-8.2	-7.1	-6.0	-5.1	-4.2	-3.3	.0	2.8	4.9
220.*	-14.8	-13.8	-12.3	-11.1	-10.2	-9.3	-8.2	-7.4	-6.5	-5.6	-2.4	.2	2.2
230.*	-16.9	-15.8	-14.3	-13.1	-12.2	-11.2	-10.2	-9.4	-8.6	-7.8	-4.7	-2.0	-.1
240.*	-18.8	-17.7	-16.3	-15.1	-14.2	-13.3	-12.3	-11.4	-10.6	-9.8	-6.9	-4.3	-2.4
250.*	-20.7	-19.7	-18.3	-17.0	-16.2	-15.3	-14.3	-13.5	-12.8	-12.0	-9.0	-6.5	-4.7
260.*	-22.7	-21.4	-20.1	-19.0	-18.0	-17.2	-16.2	-15.4	-14.8	-14.0	-11.1	-9.0	-7.0
270.*	-24.6	-23.3	-22.0	-20.9	-20.0	-19.1	-18.2	-17.4	-16.8	-16.0	-13.1	-11.0	-9.0
280.*	-26.4	-25.2	-24.0	-22.9	-21.9	-21.0	-20.0	-19.2	-18.5	-18.0	-15.1	-13.0	-11.0
290.*	-28.2	-27.1	-25.9	-24.8	-23.9	-23.0	-22.0	-21.1	-20.3	-19.6	-17.0	-15.0	-13.0
300.*	-30.1	-29.0	-27.7	-26.5	-25.5	-24.9	-23.9	-23.0	-22.1	-21.5	-19.0	-16.8	-15.0

figure 4

TABLE OF FIELD STRENGTHS DBU/1KW

F(50,50) TV CHANNELS 14-69

	HEIGHT IN FEET												
****** MILES	100.0	200.0	400.0	600.0	800.0	1000.0	1250.0	1500.0	1750.0	2000.0	3000.0	4000.0	5000.0
1.*	92.0	97.9	100.7	101.5	101.9	102.0	102.1	102.2	102.3	102.4	102.5	102.5	102.5
2.*	80.0	86.0	91.0	93.0	94.1	94.8	95.2	95.6	95.9	96.0	96.3	96.5	96.5
3.*	72.9	79.0	84.7	87.4	89.0	90.0	90.8	91.3	91.8	92.0	92.5	92.8	93.0
4.*	67.9	74.0	80.0	83.3	85.1	86.3	87.3	88.0	88.6	88.9	89.6	90.0	90.3
5.*	63.8	70.0	76.0	79.5	81.5	82.9	84.1	85.0	85.8	86.2	87.3	87.9	88.1
10.*	51.9	58.0	64.0	67.6	70.0	72.0	73.8	75.3	76.5	77.2	79.6	80.5	81.0
20.*	39.0	45.2	51.2	54.6	57.2	59.1	61.0	62.6	64.0	65.0	68.2	70.0	71.1
30.*	27.5	33.5	39.6	43.0	45.7	48.0	50.5	52.3	53.9	55.0	58.4	60.8	62.5
40.*	17.8	22.7	28.2	31.5	34.5	37.3	40.3	42.7	44.3	45.7	49.4	52.1	54.0
50.*	13.0	16.0	19.6	22.3	25.1	28.3	31.8	34.1	36.0	37.6	41.7	44.8	46.7
60.*	10.1	11.7	14.4	16.8	19.1	21.7	24.7	27.0	29.3	31.0	35.4	38.6	41.0
70.*	7.0	8.5	10.8	12.5	14.2	16.3	19.0	21.3	23.4	25.0	29.8	33.0	35.7
80.*	4.2	5.5	7.7	9.3	10.8	12.4	14.5	16.3	18.0	19.8	24.5	28.0	30.8
90.*	1.6	2.8	4.7	6.0	7.5	8.9	10.6	12.0	13.6	15.0	19.8	23.4	26.0
100.*	-1.0	.2	1.9	3.2	4.6	5.7	7.1	8.5	9.7	10.8	15.0	18.8	21.8
110.*	-3.2	-2.0	-.4	.7	1.9	3.0	4.3	5.6	6.7	7.7	11.5	14.8	17.5
120.*	-5.0	-4.2	-2.7	-1.5	-.4	.5	1.7	2.8	3.8	4.8	8.2	11.1	13.7
130.*	-7.2	-6.3	-4.9	-3.8	-2.9	-2.0	-.9	.0	1.0	1.9	5.0	7.8	10.0
140.*	-9.1	-8.4	-7.0	-5.9	-5.0	-4.2	-3.2	-2.3	-1.6	-.9	2.0	4.6	6.7
150.*	-11.0	-10.3	-8.9	-7.9	-7.0	-6.1	-5.2	-4.3	-3.6	-3.0	-.2	1.9	3.7
160.*	-13.1	-12.3	-10.9	-9.9	-9.0	-8.0	-7.1	-6.2	-5.5	-4.8	-2.2	-.1	1.7
170.*	-15.1	-14.2	-12.8	-11.7	-10.8	-10.0	-9.0	-8.2	-7.5	-6.8	-4.3	-2.2	-.4
180.*	-17.2	-16.2	-14.8	-13.8	-12.8	-11.9	-11.0	-10.2	-9.5	-8.9	-6.3	-4.2	-2.3
190.*	-19.3	-18.3	-16.8	-15.8	-14.8	-13.9	-13.0	-12.2	-11.4	-10.8	-8.3	-6.1	-4.4
200.*	-21.4	-20.1	-18.7	-17.7	-16.8	-15.9	-15.0	-14.1	-13.2	-12.5	-10.0	-8.0	-6.3

figure 5

TABLE OF FIELD STRENGTHS DBU/1KW

F(50,10) TV CHANNELS 14-69

	HEIGHT IN FEET												
****** MILES	100.0	200.0	400.0	600.0	800.0	1000.0	1250.0	1500.0	1750.0	2000.0	3000.0	4000.0	5000.0
10.*	52.2	58.3	64.7	68.0	70.5	72.3	74.1	75.4	76.4	77.4	79.5	80.7	81.3
20.*	41.6	46.7	52.4	56.0	58.5	60.3	62.3	63.9	65.2	66.2	69.3	71.2	72.6
30.*	35.0	38.0	43.0	46.3	48.8	50.8	52.9	54.9	56.3	57.6	60.9	63.0	64.5
40.*	30.3	32.1	35.3	37.6	40.0	42.4	45.1	47.1	48.7	50.0	53.6	56.1	58.0
50.*	27.0	28.3	30.8	32.6	34.7	36.7	39.0	40.8	42.4	43.7	47.7	50.2	52.4
60.*	23.8	25.2	27.6	29.1	30.4	32.0	34.5	36.4	37.9	39.0	43.1	46.0	48.0
70.*	20.8	22.2	24.5	26.0	27.2	28.4	30.4	32.2	33.9	35.1	39.2	42.1	44.3
80.*	17.8	19.3	21.3	23.0	24.2	25.4	27.0	28.8	30.2	31.7	35.8	38.7	40.7
90.*	14.8	16.5	18.5	20.0	21.2	22.4	23.9	25.2	26.6	27.8	32.0	35.0	37.3
100.*	12.0	13.4	15.6	17.1	18.3	19.7	21.0	22.1	23.4	24.6	28.3	31.3	33.8
110.*	9.2	10.7	12.7	14.0	15.2	16.5	18.0	19.3	20.3	21.3	24.9	27.8	30.3
120.*	6.6	8.0	9.9	11.2	12.6	13.8	15.3	16.4	17.3	18.3	21.7	24.3	27.0
130.*	4.0	5.1	7.1	8.8	10.0	11.0	12.5	13.8	14.8	15.7	18.8	21.2	23.7
140.*	1.2	2.5	4.4	6.0	7.3	8.3	9.7	10.9	11.9	12.8	15.9	18.2	20.5
150.*	-1.3	-.2	1.8	3.2	4.6	5.7	7.0	8.1	9.1	10.0	13.1	15.5	17.4
160.*	-3.8	-2.4	-.8	.8	1.9	3.0	4.4	5.6	6.7	7.6	10.6	12.8	14.7
170.*	-6.0	-4.9	-3.1	-1.7	-.5	.6	1.8	2.9	3.9	4.8	7.9	10.0	12.0
180.*	-8.4	-7.2	-5.5	-4.1	-3.0	-2.0	-.7	.3	1.3	2.1	5.1	7.3	9.2
190.*	-10.3	-9.3	-7.7	-6.2	-5.2	-4.3	-3.2	-2.2	-1.2	-.4	2.2	4.7	6.5
200.*	-12.5	-11.3	-9.8	-8.4	-7.4	-6.6	-5.4	-4.5	-3.6	-2.8	.0	2.1	4.0
210.*	-14.5	-13.5	-12.0	-10.4	-9.6	-8.8	-7.7	-6.7	-5.8	-5.0	-2.2	.0	1.8
220.*	-16.5	-15.5	-14.0	-12.7	-11.7	-10.8	-9.8	-8.9	-7.9	-7.1	-4.3	-2.2	-.4
230.*	-18.5	-17.4	-15.9	-14.6	-13.8	-13.0	-12.0	-11.0	-10.0	-9.2	-6.6	-4.6	-2.8
240.*	-20.5	-19.3	-17.8	-16.5	-15.6	-14.9	-14.0	-13.0	-12.2	-11.3	-8.9	-6.8	-5.0
250.*	-22.4	-21.3	-19.8	-18.6	-17.7	-17.0	-16.0	-15.0	-14.2	-13.4	-11.0	-8.8	-7.0
260.*	-24.2	-23.2	-21.6	-20.4	-19.6	-18.9	-17.9	-17.0	-16.2	-15.4	-13.0	-10.8	-9.0
270.*	-26.0	-25.0	-23.4	-22.2	-21.3	-20.8	-19.9	-19.1	-18.2	-17.5	-15.0	-12.9	-11.0
280.*	-27.8	-27.0	-25.5	-24.2	-23.3	-22.7	-21.8	-21.0	-20.2	-19.4	-17.0	-14.9	-13.0
290.*	-29.5	-28.5	-27.1	-26.0	-25.0	-24.4	-23.7	-22.8	-22.0	-21.3	-19.0	-16.9	-15.0
300.*	-31.0	-30.1	-28.9	-27.9	-27.0	-26.3	-25.6	-24.8	-24.0	-23.2	-21.0	-18.9	-16.8

figure 6

WDCA-TV	WASHINGTON	DC	CHANNEL	20							
110	40000	770	50725	50	5	200	5				

figure 7

WDCA-TV WASHINGTON DC CHANNEL 20

POWER = 4000.0 KW HEIGHT ABOVE AVERAGE TERRAIN = 770. FEET FREQ. = 507.25 MHZ
DELTA H = 50. METERS

D MILES	5.0	10.0	15.0	20.0	25.0	30.0	35.0	40.0	45.0	50.0	55.0	60.0	65.0	70.0
F5050 DBU	118.0	106.5	99.8	93.6	87.9	82.1	76.4	70.8	65.7	61.5	58.2	55.5	52.9	50.7
D MILES	75.0	80.0	85.0	90.0	95.0	100.0	105.0	110.0	115.0	120.0	125.0	130.0	135.0	140.0
F5050 DBU	49.0	47.4	45.7	44.1	42.6	41.2	39.8	38.5	37.4	36.2	35.0	33.7	32.7	31.7
D MILES	145.0	150.0	155.0	160.0	165.0	170.0	175.0	180.0	185.0	190.0	195.0	200.0		
F5050 DBU	30.7	29.6	28.6	27.6	26.8	25.9	24.8	23.8	22.8	21.8	20.8	19.8		

WDCA-TV WASHINGTON DC CHANNEL 20

POWER = 4000.0 KW HEIGHT ABOVE AVERAGE TERRAIN = 770. FEET FREQ. = 507.25 MHZ
DELTA H = 50. METERS

GRADE A CONTOUR = 74.0 DBU DIST. TO GRADE A = 37.25 MILES
GRADE B CONTOUR = 64.0 DBU DIST. TO GRADE B = 46.75 MILES

figure 8

WMAL-TV WASHINGTON DC CHANNEL 7										
2ØØ		3Ø2Ø	77Ø	17525	5Ø	1Ø	3ØØ	1Ø		

figure 9

WMAL-TV WASHINGTON DC CHANNEL 7

POWER = 302.0 KW HEIGHT ABOVE AVERAGE TERRAIN = 770. FEET FREQ. = 175.25 MHZ
DELTA H = 50. METERS

D MILES	10.0	20.0	30.0	40.0	50.0	60.0	70.0	80.0	90.0	100.0	110.0	120.0	130.0	140.0
F5010 DBU	98.1	86.3	79.2	72.6	65.6	60.0	55.4	51.7	48.5	45.5	42.8	39.7	36.7	34.2

D MILES	150.0	160.0	170.0	180.0	190.0	200.0	210.0	220.0	230.0	240.0	250.0	260.0	270.0	280.0
F5010 DBU	31.2	28.7	25.9	23.6	21.0	18.8	16.6	14.6	12.6	10.6	8.6	6.8	4.8	2.9

D MILES	290.0	300.0
F5010 DBU	.9	-.7

figure 10

WRC -TV WASHINGTON DC CHANNEL 4											
1	11		1ØØØ	57Ø	6725		5	1ØØ	5		

figure 11

WRC -TV WASHINGTON DC CHANNEL 4

POWER = 100.0 KW HEIGHT ABOVE AVERAGE TERRAIN = 570. FEET FREQ. = 67.25 MHZ
DELTA H = 0. METERS

D MILES	5.0	10.0	15.0	20.0	25.0	30.0	35.0	40.0	45.0	50.0	55.0	60.0	65.0	70.0
F5050 DBU	99.2	87.2	80.0	74.6	70.3	66.3	62.4	58.6	55.1	51.6	48.2	44.9	42.0	39.4

D MILES	75.0	80.0	85.0	90.0	95.0	100.0
F5050 DBU	37.0	34.9	33.2	31.6	30.1	28.7

WRC -TV WASHINGTON DC CHANNEL 4

POWER = 100.0 KW HEIGHT ABOVE AVERAGE TERRAIN = 570. FEET FREQ. = 67.25 MHZ
DELTA H = 0. METERS

GRADE A CONTOUR = 68.0 DBU DIST. TO GRADE A = 27.75 MILES
GRADE B CONTOUR = 47.0 DBU DIST. TO GRADE B = 56.75 MILES

figure 12

WTOP-TV WASHINGTON DC CHANNEL 9									
120	3160	770	18725	50	5	200	5	500	

figure 13

WTOP-TV WASHINGTON DC CHANNEL 9

POWER = 316.0 KW HEIGHT ABOVE AVERAGE TERRAIN = 770. FEET FREQ. = 187.25 MHZ
DELTA H = 50. METERS

D MILES	5.0	10.0	15.0	20.0	25.0	30.0	35.0	40.0	45.0	50.0	55.0	60.0	65.0	70.0
F5050 DBU	108.0	98.0	91.0	85.4	81.1	76.8	72.8	68.7	64.8	60.9	57.1	53.5	50.1	46.9
D MILES	75.0	80.0	85.0	90.0	95.0	100.0	105.0	110.0	115.0	120.0	125.0	130.0	135.0	140.0
F5050 DBU	44.0	41.8	40.2	38.5	36.9	35.3	33.8	32.4	31.0	29.7	28.4	27.1	25.9	24.8
D MILES	145.0	150.0	155.0	160.0	165.0	170.0	175.0	180.0	185.0	190.0	195.0	200.0		
F5050 DBU	23.6	22.4	21.2	20.0	18.8	17.6	16.4	15.2	14.1	12.9	11.7	10.5		

WTOP-TV WASHINGTON DC CHANNEL 9

POWER = 316.0 KW HEIGHT ABOVE AVERAGE TERRAIN = 770. FEET FREQ. = 187.25 MHZ
DELTA H = 50. METERS

DISTANCE TO THE 50.0 DBU CONTOUR IS 65.25 MILES

figure 14

APPENDIX A

FORTRAN Listing of TV Main

```
C MAIN PROGRAM FOR TVFMFS
C SOME VARIABLES AND THEIR DEFINITIONS ARE
C      D = INPUT ARRAY OF DISTANCE VALUES TO ITPLBV
C     DE = ENDING DISTANCE FOR THE E VS D OUTPUT TABLE
C   DFIN = DISTANCE TO THE GIVEN INPUT FIELD STRENGTH VALUE
C    DGA = DISTANCE TO THE GRADE A CONTOUR
C    DGB = DISTANCE TO THE GRADE B CONTOUR
C     DH = TERRAIN ROUGHNESS FACTOR
C     DI = DISTANCE INCREMENT FOR THE E VS D OUTPUT TABLE
C     DS = STARTING DISTANCE FOR THE E VS D OUTPUT TABLE
C    D10 = ARRAY OF DISTANCE VALUES FROM THE F(50,10) CURVES
C    D50 = ARRAY OF DISTANCE VALUES FROM THE F(50,50) CURVES
C      F = ARRAY OF FIELD STRENGTH VALUES RETURNED FROM ITPLBV
C    FIN = INPUT FIELD STRENGTH FOR WHICH THE DISTANCE TO IS TO BE FOUND
C   FREQ = STATION FREQUENCY IN MHZ
C  F51HV = CHANNEL 7-13, F(50,10) FIELD STRENGTH VALUES
C  F51LV = CHANNEL 2-6 AND FM, F(50,10) FIELD STRENGTH VALUES
C   F51U = CHANNEL 14-69, F(50,10) FIELD STRENGTH VALUES
C  F55HV = CHANNEL 7-13, F(50,50) FIELD STRENGTH VALUES
C  F55LV = CHANNEL 2-6 AND FM, F(50,50) FIELD STRENGTH VALUES
C   F55U = CHANNEL 14-69, F(50,50) FIELD STRENGTH VALUES
C  GRADA = THE VALUE OF THE GRADE A CONTOUR
C  GRADB = THE VALUE OF THE GRADE B CONTOUR
C      H = INPUT ARRAY OF HEIGHT VALUES FOR ITPLBV
C    HGT = STATION ANTENNA HEIGHT ABOVE AVERAGE TERRAIN IN FEET
C    H10 = ARRAY OF HEIGHT VALUES FROM THE F(50,10) CURVES
C    H50 = ARRAY OF HEIGHT VALUES FROM THE F(50,50) CURVES
C   ID10 = NUMBER OF DISTANCE VALUES IN ARRAY D10
C   ID50 = NUMBER OF DISTANCE VALUES IN ARRAY D50
C   IH10 = NUMBER OF HEIGHT VALUES IN ARRAY H10
C   IH50 = NUMBER OF HEIGHT VALUES IN ARRAY H50
C   IOP1 = FIELD VS DISTANCE OUTPUT OPTION CODE
C   IOP2 = DISTANCE TO A CONTOUR OUTPUT OPTION CODE
C   IOP3 = ROUGHNESS CORRECTION OPTION CODE
C   NAME = ARRAY OF STATION INFORMATION
```

```
C     ND = NUMBER OF DISTANCE VALUES FOR THE E VS D OUTPUT TABLE
C    PDB = STATION POWER IN DB ABOVE 1 KW
C POWER = STATION POWER IN KW
C     RC = ROUGHNESS CORRECTION IN DB
      DIMENSION D50(25),H50(13),D10(30),H10(13),F55LV(30,13),F51LV(30,I3
     1),F55HV(30,13),F51HV(30,13),F55U(30,13),F51U(30,13),D(200),H(200),
     2F(200),NAME(12)
C
C READ IN THE FIELD STRENGTH TABLES
C
      READ(5,100)ID50,(D50(I),I=1,ID50)
      READ(5,100)IH50,(H50(I),I=1,IH50)
      DO 10 I=1,ID50
      READ(5,102)(F55LV(I,J),J=1,IH50)
   10 CONTINUE
      READ(5,100)ID10,(D10(I),I=1,ID10)
      READ(5,100)IH10,(H10(I),I=1,IH10)
      DO 12 I=1,ID10
      READ(5,102)(F51LV(I,J),J=1,IH10)
   12 CONTINUE
  100 FORMAT(I5,15F5.0/(16F5.0))
  102 FORMAT(16F5.1)
      DO 14 I=1,ID50
      READ(5,102)(F55HV(I,J),J=1,IH50)
   14 CONTINUE
      DO 16 I=1,ID10
      READ(5,102)(F51HV(I,J),J=1,IH10)
   16 CONTINUE
      DO 18 I=1,ID50
      READ(5,102)(F55U(I,J),J=1,IH50)
   18 CONTINUE
      DO 20 I=1,ID10
      READ(5,102)(F51U(I,J),J=1,IH10)
   20 CONTINUE
```

```
C
C READ IN THE STATION DATA
C
  505 READ(5,200,END=500)(NAME(I),I=1,12)
  200 FORMAT(12A6)
      READ(5,202)IOP1,IOP2,IOP3,POWER,HGT,FREQ,DH,DS,DE,DI,FIN
  202 FORMAT(3I1,2X,F5.1,F5.0,F5.2,4F5.0,F5.1)
      IF(HGT.LT.100..OR.HGT.GT.5000.)GO TO 506
      IF(IOP1.EQ.1.AND.(DS.LT.1..OR.DE.GT.200.))GO TO 507
      IF(IOP1.EQ.2.AND.(DS.LT.10..OR.DE.GT.300.))GO TO 507
C
C CHANGE THE POWER TO DB, AND CALCULATE THE ROUGHNESS CORRECTION
C
      PDB=10.0*ALOG10(POWER)
      C=2.5
      IF(FREQ.LT.108.1)C=1.9
      IF(FREQ.GT.470.)C=4.8
      RC=C-.03*DH*(1.+FREQ/300.)
      IF(IOP3.EQ.1)RC=0.0
      IF(IOP1.EQ.0) GO TO 30
C
C DETERMINE THE INPUTS TO ITPLBV,AND CALL ITPLBV TO RETURN THE NEEDED
C FIELD STRENGTH VALUES
C
      ND=1+IFIX((DE-DS)/DI)
      DO 31 I=1,ND
      H(I)=HGT
      D(I)=DS+DI*FLOAT(I-1)
   31 CONTINUE
      IF(IOP1.EQ.1.AND.FREQ.LT.108.1)CALL ITPLBV(6,25,13,D50,H50,F55LV,
     1ND,D,H,F)
      IF(IOP1.EQ.1.AND.FREQ.GT.174..AND.FREQ.LT.216.)CALL ITPLBV(6,25,13
     1,D50,H50,F55HV,ND,D,H,F)
      IF(IOP1.EQ.1.AND.FREQ.GT.470.)CALL ITPLBV(6,25,13,D50,H50,F55U,ND,
     1D,H,F)
```

```
      IF(IOP1.EQ.2.AND.FREQ.LT.108.1)CALL ITPLBV(6,30,13,D10,H10,F51LV,
     1ND,D,H,F)
      IF(IOP1.EQ.2.AND.FREQ.GT.174..AND.FREQ.LT.216.)CALL ITPLBV(6,30,13
     1,D10,H10,F51HV,ND,D,H,F)
      IF(IOP1.EQ.2.AND.FREQ.GT.470.)CALL ITPLBV(6,30,13,D10,H10,F51U,ND,
     1D,H,F)
      DO 32 I=1,ND
      F(I)=F(I)+PDB+RC
   32 CONTINUE
C
C PRINT THE FIELD VS DISTANCE TABLE
C
      WRITE(6,300)(NAME(I),I=1,12)
  300 FORMAT(1H0,//1X,12A6)
      WRITE(6,302)POWER,HGT,FREQ,DH
  302 FORMAT(1H0,8HPOWER = ,F6.1,3H KW,5X,31HHEIGHT ABOVE AVERAGE TERRAI
     1N = ,F5.0,5H FEET,5X,8HFREQ. = ,F6.2,4H MHZ,5X,10HDELTA H = ,F5.0,
     27H METERS)
      NS=-19
      NF=0
   33 NS=NS+20
      NF=NF+20
      IF(NF.GT.ND)NF=ND
      WRITE(6,304)(D(I),I=NS,NF)
  304 FORMAT(1H0,7HD MILES,2X,20F6.1)
      IF(IOP1.EQ.1)WRITE(6,306)(F(I),I=NS,NF)
      IF(IOP1.EQ.2)WRITE(6,308)(F(I),I=NS,NF)
  306 FORMAT(1X,9HF5050 DBU,20F6.1)
  308 FORMAT(1X,9HF5010 DBU,20F6.1)
      IF(NF.LT.ND) GO TO 33
   30 IF(IOP2.EQ.0) GO TO 505
C
C DETERMINE THE CORRECT VALUES FOR THE GRADES A AND B CONTOURS, CALL
C ITPLBV TO RETURN THE NEEDED FIELD STRENGTHS
C
```

```
140*            DFIN=1000.
141*            DGA=1000.
142*            DGB=1000.
143*            DS=1.0
144*         41 DO 37 I=1,200
145*            D(I)=DS+.5*FLOAT(I-1)
146*            H(I)=HGT
147*         37 CONTINUE
148*            IF(FREQ.LT.108.) GO TO 34
149*            IF(FREQ.GT.470.) GO TO 35
150*            GRADA=71.0
151*            GRADB=56.0
152*            CALL ITPLBV(6,25,13,D50,H50,F55HV,200,D,H,F)
153*            GO TO 36
154*         34 IF(FREQ.GT.88.) GO TO 45
155*            GRADA=68.0
156*            GRADB=47.0
157*            CALL ITPLBV(6,25,13,D50,H50,F55LV,200,D,H,F)
158*            GO TO 36
159*         45 GRADA=70.0
160*            GRADB=60.0
161*            CALL ITPLBV(6,25,13,D50,H50,F55LV,200,D,H,F)
162*            GO TO 36
163*         35 GRADA=74.0
164*            GRADB=64.0
165*            CALL ITPLBV(6,25,13,D50,H50,F55U,200,D,H,F)
166*         36 DO 42 I=1,200
167*            F(I)=F(I)+PDB+RC
168*         42 CONTINUE
169*            IF(IOP2.EQ.2)GO TO 43
170*      C
171*      C DETERMINE THE DISTANCE TO THE GRADES A AND B CONTOURS
172*      C
```

```
      DO 38 I=2,200
      IF(GRADA.LT.F(I-1).AND.GRADA.GT.F(I))DGA=(D(I-1)+D(I))/2.0
      IF(GRADB.LT.F(I-1).AND.GRADB.GT.F(I))DGB=(D(I-1)+D(I))/2.0
   38 CONTINUE
      IF(DGA.GT.999.) GO TO 39
      IF(DGB.GT.999.) GO TO 39
      GO TO 40
   39 DS=100.5
      GO TO 41
   43 DO 44 I=2,200
      IF(FIN.LT.F(I-1).AND.FIN.GT.F(I))DFIN=(D(I-1)+D(I))/2.0
   44 CONTINUE
      IF(DFIN.GT.999.) GO TO 39
C
C PRINT THE DISTANCE TO THE CONTOURS
C
   40 WRITE(6,300)(NAME(I),I=1,12)
      WRITE(6,302)POWER,HGT,FREQ,DH
      IF(IOP2.EQ.1)WRITE(6,310)GRADA,DGA,GRADB,DGB
      IF(IOP2.EQ.2)WRITE(6,312)FIN,DFIN
  310 FORMAT(1H0,18HGRADE A CONTOUR = ,F4.1,4H DBU,5X,19HDIST. TO GRADE
     1A = ,F6.2,6H MILES/1X,18HGRADE B CONTOUR = ,F4.1,4H DBU,5X,19HDIST
     2. TO GRADE B = ,F6.2,6H MILES)
  312 FORMAT(1H0,16HDISTANCE TO THE ,F4.1,16H DBU CONTOUR IS ,F6.2,6H MI
     1LES)
      GO TO 505
  506 WRITE(6,400)(NAME(I),I=1,12)
      GO TO 505
  507 WRITE(6,405)(NAME(I),I=1,12)
      GO TO 505
  400 FORMAT(1H0//1X,12A6/1X,37HANTENNA HEIGHT OUTSIDE OF TABLE RANGE)
  405 FORMAT(1H0//1X,12A6/1X,50HSTARTING OR ENDING DISTANCE OUTSIDE OF T
     1ABLE RANGE)
  500 STOP
      END
```

APPENDIX B

FORTRAN Listing of Subroutine ITPLBV

```
      SUBROUTINE ITPLBV(IU,LX,LY,X,Y,Z,N,U,V,W)
      DIMENSION X(30),Y(13),Z(30,13),U(200),V(200),W(200)
      DIMENSION ZA(5,2),ZB(2,5),ZAB(3,3),ZX(4,4),ZY(4,4),ZXY(4,4)
      EQUIVALENCE (Z3A1,ZA(1)),(Z3A2,ZA(2)),(Z3A3,ZA(3)),(Z3A4,ZA(4)),
     1(Z3A5,ZA(5)),(Z4A1,ZA(6)),(Z4A2,ZA(7)),(Z4A3,ZA(8)),(Z4A4,ZA(9)),
     2(Z4A5,ZA(10)),(Z3B1,ZB(1)),(Z3B2,ZB(3)),(Z3B3,ZB(5)),(Z3B4,ZB(7)),
     3(Z3B5,ZB(9)),(Z4B1,ZB(2)),(Z4B2,ZB(4)),(Z4B3,ZB(6)),(Z4B4,ZB(8)),
     4(Z4B5,ZB(10)),(ZA2B2,ZAB(1)),(ZA3B2,ZAB(2)),(ZA4B2,ZAB(3)),(ZA2B3,
     5ZAB(4)),(ZA3B3,ZAB(5)),(ZA4B3,ZAB(6)),(ZA2B4,ZAB(7)),(ZA3B4,ZAB(8)
     6),(ZA4B4,ZAB(9)),(ZX33,ZX(6)),(ZX43,ZX(7)),(ZX34,ZX(10)),(ZX44,ZX(
     711)),(ZY33,ZY(6)),(ZY43,ZY(7)),(ZY34,ZY(10)),(ZY44,ZY(11)),(ZXY33,
     8ZXY(6)),(ZXY43,ZXY(7)),(ZXY34,ZXY(10)),(ZXY44,ZXY(11)),(P00,Z33),
     9(P01,ZY33),(P10,ZX33),(P11,ZXY33)
      EQUIVALENCE (LX0,ZX(1)),(LXM1,ZX(4)),(LXM2,ZX(13)),(LXP1,ZX(16)),
     1(LY0,ZY(1)),(LYM1,ZY(4)),(LYM2,ZY(13)),(LYP1,ZY(16)),(IX,ZXY(1)),
     2(IY,ZXY(4)),(IXPV,ZXY(13)),(IYPV,ZXY(16)),(IMN,JX),(IMX,JY),(JXM2,
     3JX1),(JYM2,JY1),(UK,DX),(VK,DY),(A1,A5,B1,B5,ZX(2),A,Q0),(A2,ZX(5)
     4,B,Q1),(A4,ZX(8),C,Q2),(B2,ZY(2),D,Q3),(B4,ZY(14),E),(X2,ZX(3),A3S
     5Q),(X4,ZX(9)),(X5,ZX(12)),(Y2,ZX(14)),(Y4,ZY(3),B3SQ1),(Y5,ZX(15),
     6P02),(Z23,ZY(5),P03),(Z24,ZY(8),P12),(Z32,ZY(9),P13),(Z34,ZY(12),
     7P20),(Z35,ZY(15),P21),(Z42,ZXY(2),P22),(Z43,ZXY(5),P23),(Z44,ZXY(3
     8),P30),(Z45,ZXY(8),P31),(Z53,ZXY(9),P32),(Z54,ZXY(12),P33),(W2,WY2
     9,W4),(W3,WY3,W1,W5),(WX2,ZXY(14)),(WX3,ZXY(15))
      IU0=IU
      LX0=LX
      LXM1=LX0-1
      LXM2=LXM1-1
      LXP1=LX0+1
      LY0=LY
      LYM1=LY0-1
      LYM2=LYM1-1
      LYP1=LY0+1
      N0=N
      IF(LXM2.LT.0)GO TO 710
      IF(LYM2.LT.0)GO TO 720
```

```
      IF(NO.LT.1)GO TO 730
      DO 10 IX=2,LXO
      IF(X(IX-1)-X(IX))10,740,750
   10 CONTINUE
      DO 20 IY=2,LYO
      IF(Y(IY-1)-Y(IY))20,770,780
   20 CONTINUE
      IXPV=0
      IYPV=0
      DO 700 K=1,NO
      UK=U(K)
      VK=V(K)
      IF(LXM2.EQ.0)GO TO 80
      IF(UK.GE.X(LXO))GO TO 70
      IF(UK.LT.X(1))GO TO 60
      IMN=2
      IMX=LXO
   30 IX=(IMN+IMX)/2
      IF(UK.GE.X(IX))GO TO 40
      IMX=IX
      GO TO 50
   40 IMN=IX+1
   50 IF(IMX.GT.IMN)GO TO 30
      IX=IMX
      GO TO 90
   60 IX=1
      GO TO 90
   70 IX=LXP1
      GO TO 90
   80 IX=2
   90 IF(LYM2.EQ.0) GO TO 150
      IF(VK.GE.Y(LYO)) GO TO 140
      IF(VK.LT.Y(1)) GO TO 130
      IMN=2
      IMX=LYO
  100 IY=(IMN+IMX)/2
```

```
      IF(VK.GE.Y(IY)) GO TO 110
      IMX=IY
      GO TO 120
  110 IMN=IY+1
  120 IF(IMX.GT.IMN)GO TO 100
      IY=IMX
      GO TO 160
  130 IY=1
      GO TO 160
  140 IY=LYP1
      GO TO 160
  150 IY=2
  160 IF(IX.EQ.IXPV.AND.IY.EQ.IYPV)GO TO 690
      IXPV=IX
      IYPV=IY
      JX=IX
      IF(JX.EQ.1)JX=2
      IF(JX.EQ.LXP1)JX=LXO
      JY=IY
      IF(JY.EQ.1)JY=2
      IF(JY.EQ.LYP1)JY=LYO
      JXM2=JX-2
      JXML=JX-LXO
      JYM2=JY-2
      JYML=JY-LYO
      X3=X(JX-1)
      X4=X(JX)
      A3=1.0/(X4-X3)
      Y3=Y(JY-1)
      Y4=Y(JY)
      B3=1.0/(Y4-Y3)
      Z33=Z(JX-1,JY-1)
      Z43=Z(JX,JY-1)
      Z34=Z(JX-1,JY)
      Z44=Z(JX,JY)
      Z3A3=(Z43-Z33)*A3
```

```
      Z4A3=(Z44-Z34)*A3
      Z3B3=(Z34-Z33)*B3
      Z4B3=(Z44-Z43)*B3
      ZA3B3=(Z4B3-Z3B3)*A3
      IF(LXM2.EQ.0)GO TO 230
      IF(JXM2.EQ.0)GO TO 170
      X2=X(JX-2)
      A2=1.0/(X3-X2)
      Z23=Z(JX-2,JY-1)
      Z24=Z(JX-2,JY)
      Z3A2=(Z33-Z23)*A2
      Z4A2=(Z34-Z24)*A2
      IF(JXML.EQ.0) GO TO 180
  170 X5=X(JX+1)
      A4=1.0/(X5-X4)
      Z53=Z(JX+1,JY-1)
      Z54=Z(JX+1,JY)
      Z3A4=(Z53-Z43)*A4
      Z4A4=(Z54-Z44)*A4
      IF(JXM2.NE.0)GO TO 190
      Z3A2=Z3A3+Z3A3-Z3A4
      Z4A2=Z4A3+Z4A3-Z4A4
      GO TO 190
  180 Z3A4=Z3A3+Z3A3-Z3A2
      Z4A4=Z4A3+Z4A3-Z4A2
  190 ZA2B3=(Z4A2-Z3A2)*B3
      ZA4B3=(Z4A4-Z3A4)*B3
      IF(JX.LE.3)GO TO 200
      A1=1.0/(X2-X(JX-3))
      Z3A1=(Z23-Z(JX-3,JY-1))*A1
      Z4A1=(Z24-Z(JX-3,JY))*A1
      GO TO 210
  200 Z3A1=Z3A2+Z3A2-Z3A3
      Z4A1=Z4A2+Z4A2-Z4A3
  210 IF(JX.GE.LXM1)GO TO 220
      A5=1.0/(X(JX+2)-X5)
```

```
      Z3A5=(Z(JX+2,JY-1)-Z53)*A5
      Z4A5=(Z(JX+2,JY)-Z54)*A5
      GO TO 240
  220 Z3A5=Z3A4+Z3A4-Z3A3
      Z4A5=Z4A4+Z4A4-Z4A3
      GO TO 240
  230 Z3A2=Z3A3
      Z4A2=Z4A3
      GO TO 180
  240 IF(LYM2.EQ.0) GO TO 310
      IF(JYM2.EQ.0) GO TO 250
      Y2=Y(JY-2)
      B2=1.0/(Y3-Y2)
      Z32=Z(JX-1,JY-2)
      Z42=Z(JX,JY-2)
      Z3B2=(Z33-Z32)*B2
      Z4B2=(Z43-Z42)*B2
      IF(JYML.EQ.0) GO TO 260
  250 Y5=Y(JY+1)
      B4=1.0/(Y5-Y4)
      Z35=Z(JX-1,JY+I)
      Z45=Z(JX,JY+1)
      Z3B4=(Z35-Z34)*B4
      Z4B4=(Z45-Z44)*B4
      IF(JYM2.NE.0) GO TO 270
      Z3B2=Z3B3+Z3B3-Z3B4
      Z4B2=Z4B3+Z4B3-Z4B4
      GO TO 270
  260 Z3B4=Z3B3+Z3B3-Z3B2
      Z4B4=Z4B3+Z4B3-Z4B2
  270 ZA3B2=(Z4B2-Z3B2)*A3
      ZA3B4=(Z4B4-Z3B4)*A3
      IF(JY.LE.3)GO TO 280
      B1=1.0/(Y2-Y(JY-3))
      Z3B1=(Z32-Z(JX-1,JY-3))*B1
      Z4B1=(Z42-Z(JX,JY-3))*B1
```

```
      GO TO 290
  280 Z3B1=Z3B2+Z3B2-Z3B3
      Z4B1=Z4B2+Z4B2-Z4B3
  290 IF(JY.GE.LYM1)GO TO 300
      B5=1.0/(Y(JY+2)-Y5)
      Z3B5=(Z(JX-1,JY+2)-Z35)*B5
      Z4B5=(Z(JX,JY+2)-Z45)*B5
      GO TO 320
  300 Z3B5=Z3B4+Z3B4-Z3B3
      Z4B5=Z4B4+Z4B4-Z4B3
      GO TO 320
  310 Z3B2=Z3B3
      Z4B2=Z4B3
      GO TO 260
  320 IF(LXM2.EQ.0) GO TO 400
      IF(LYM2.EQ.0) GO TO 410
      IF(JXML.EQ.0) GO TO 350
      IF(JYM2.EQ.0) GO TO 330
      ZA4B2=((Z53-Z(JX+1,JY-2))*B2-Z4B2)*A4
      IF(JYML.EQ.0)GO TO 340
  330 ZA4B4=((Z(JX+1,JY+1)-Z54)*B4-Z4B4)*A4
      IF(JYM2.NE.0)GO TO 380
      ZA4B2=ZA4B3+ZA4B3-ZA4B4
      GO TO 380
  340 ZA4B4=ZA4B3+ZA4B3-ZA4B2
      GO TO 380
  350 IF(JYM2.EQ.0) GO TO 360
      ZA2B2=(Z3B2-(Z23-Z(JX-2,JY-2))*B2)*A2
      IF(JYML.EQ.0) GO TO 370
  360 ZA2B4=(Z3B4-(Z(JX-2,JY+1)-Z24)*B4)*A2
      IF(JYM2.NE.0) GO TO 390
      ZA2B2=ZA2B3+ZA2B3-ZA2B4
      GO TO 390
  370 ZA2B4=ZA2B3+ZA2B3-ZA2B2
      GOTO 390
  380 IF(JXM2.NE.0)GO TO 350
```

```
      ZA2B2=ZA3B2+ZA3B2-ZA4B2
      ZA2B4=ZA3B4+ZA3B4-ZA4B4
      GO TO 420
  390 IF(JXML.NE.0)GO TO 420
      ZA4B2=ZA3B2+ZA3B2-ZA2B2
      ZA4B4=ZA3B4+ZA3B4-ZA2B4
      GO TO 420
  400 ZA2B2=ZA3B2
      ZA4B2=ZA3B2
      ZA2B4=ZA3B4
      ZA4B4=ZA3B4
      GO TO 420
  410 ZA2B2=ZA2B3
      ZA2B4=ZA2B3
      ZA4B2=ZA4B3
      ZA4B4=ZA4B3
  420 DO 480 JY=2,3
      DO 470 JX=2,3
      W2=ABS(ZA(JX+2,JY-1)-ZA(JX+1,JY-1))
      W3=ABS(ZA(JX,JY-1)-ZA(JX-1,JY-1))
      SW=W2+W3
      IF(SW.LT..0000001) GO TO 430
      WX2=W2/SW
      WX3=W3/SW
      GO TO 440
  430 WX2=0.5
      WX3=0.5
  440 ZX(JX,JY)=WX2*ZA(JX,JY-1)+WX3*ZA(JX+1,JY-1)
      W2=ABS(ZB(JX-1,JY+2)-ZB(JX-1,JY+1))
      W3=ABS(ZB(JX-1,JY)-ZB(JX-1,JY-1))
      SW=W2+W3
      IF(SW.LT..0000001) GO TO 450
      WY2=W2/SW
      WY3=W3/SW
      GO TO 460
  450 WY2=0.5
```

```
      WY3=0.5
  460 ZY(JX,JY)=WY2*ZB(JX-1,JY)+WY3*ZB(JX-1,JY+1)
      ZXY(JX,JY)=WY2*(WX2*ZAB(JX-1,JY-1)+WX3*ZAB(JX,JY-1))+WY3*(WX2*ZAB(
     1JX-1,JY)+WX3*ZAB(JX,JY))
  470 CONTINUE
  480 CONTINUE
      IF(IX.EQ.LXP1) GO TO 530
      IF(IX.NE.1) GO TO 590
      W2=A4*(3.0*A3+A4)
      W1=2.0*A3*(A3-A4)+W2
      DO 500 JY=2,3
      ZX(1,JY)=(W1*ZA(1,JY-1)+W2*ZA(2,JY-1))/(W1+W2)
      ZY(1,JY)=ZY(2,JY)+ZY(2,JY)-ZY(3,JY)
      ZXY(1,JY)=ZXY(2,JY)+ZXY(2,JY)-ZXY(3,JY)
      DO 490 JX1=2,3
      JX=5-JX1
      ZX(JX,JY)=ZX(JX-1,JY)
      ZY(JX,JY)=ZY(JX-1,JY)
      ZXY(JX,JY)=ZXY(JX-1,JY)
  490 CONTINUE
  500 CONTINUE
      X3=X3-1.0/A4
      Z33=Z33-Z3A2/A4
      DO 510 JY=1,5
      ZB(2,JY)=ZB(1,JY)
  510 CONTINUE
      DO 520 JY=2,4
      ZB(1,JY)=ZB(1,JY)-ZAB(1,JY-1)/A4
  520 CONTINUE
      A3=A4
      JX=1
      GO TO 570
  530 W4=A2*(3.0*A3+A2)
      W5=2.0*A3*(A3-A2)+W4
      DO 550 JY=2,3
      ZX(4,JY)=(W4*ZA(4,JY-1)+W5*ZA(5,JY-1))/(W4+W5)
```

```
288*          ZY(4,JY)=ZY(3,JY)+ZY(3,JY)-ZY(2,JY)
289*          ZXY(4,JY)=ZXY(3,JY)+ZXY(3,JY)-ZXY(2,JY)
290*          DO 540 JX=2,3
291*          ZX(JX,JY)=ZX(JX+1,JY)
292*          ZY(JX,JY)=ZY(JX+1,JY)
293*          ZXY(JX,JY)=ZXY(JX+1,JY)
294*      540 CONTINUE
295*      550 CONTINUE
296*          X3=X4
297*          Z33=Z43
298*          DO 560 JY=1,5
299*          ZB(1,JY)=ZB(2,JY)
300*      560 CONTINUE
301*          A3=A2
302*          JX=3
303*      570 ZA(3,1)=ZA(JX+1,1)
304*          DO 580 JY=1,3
305*          ZAB(2,JY)=ZAB(JX,JY)
306*      580 CONTINUE
307*      590 IF(IY.EQ.LYPI) GO TO 630
308*          IF(IY.NE.1) GO TO 680
309*          W2=B4*(3.0*B3+B4)
310*          W1=2.0*B3*(B3-B4)+W2
311*          DO 620 JX=2,3
312*          IF(JX.EQ.3.AND.IX.EQ.LXPI)GO TO 600
313*          IF(JX.EQ.2.AND.IX.EQ.1)GO TO 600
314*          ZY(JX,1)=(W1*ZB(JX-1,1)+W2*ZB(JX-1,2))/(W1+W2)
315*          ZX(JX,1)=ZX(JX,2)+ZX(JX,2)-ZX(JX,3)
316*          ZXY(JX,1)=ZXY(JX,2)+ZXY(JX,2)-ZXY(JX,3)
317*      600 DO 610 JY1=2,3
318*          JY=5-JY1
319*          ZY(JX,JY)=ZY(JX,JY-1)
320*          ZX(JX,JY)=ZX(JX,JY-1)
321*          ZXY(JX,JY)=ZXY(JX,JY-1)
322*      610 CONTINUE
323*      620 CONTINUE
```

```
      Y3=Y3-1.0/B4
      Z33=Z33-Z3B2/B4
      Z3A3=Z3A3-ZA3B2/B4
      Z3B3=Z3B2
      ZA3B3=ZA3B2
      B3=B4
      GOTO 670
  630 W4=B2*(3.0*B3+B2)
      W5=2.0*B3*(B3-B2)+W4
      DO 660 JX=2,3
      IF(JX.EQ.3.AND.IX.EQ.LXP1)GO TO 640
      IF(JX.EQ.2.AND.IX.EQ.1)GO TO 640
      ZY(JX,4)=(W4*ZB(JX-1,4)+W5*ZB(JX-1,5))/(W4+W5)
      ZX(JX,4)=ZX(JX,3)+ZX(JX,3)-ZX(JX,2)
      ZXY(JX,4)=ZXY(JX,3)+ZXY(JX,3)-ZXY(JX,2)
  640 DO 650 JY=2,3
      ZY(JX,JY)=ZY(JX,JY+1)
      ZX(JX,JY)=ZX(JX,JY+1)
      ZXY(JX,JY)=ZXY(JX,JY+1)
  650 CONTINUE
  660 CONTINUE
      Y3=Y4
      Z33=Z33+Z3B3/B3
      Z3A3=Z3A3+ZA3B3/B3
      Z3B3=Z3B4
      ZA3B3=ZA3B4
      B3=B2
  670 IF(IX.NE.1.AND.IX.NE.LXP1) GO TO 680
      JX=IX/LXP1+2
      JX1=5-JX
      JY=IY/LYP1+2
      JY1=5-JY
      ZX(JX,JY)=ZX(JX1,JY)+ZX(JX,JY1)-ZX(JX1,JY1)
      ZY(JX,JY)=ZY(JX1,JY)+ZY(JX,JY1)-ZY(JX1,JY1)
      ZXY(JX,JY)=ZXY(JX1,JY)+ZXY(JX,JY1)-ZXY(JX1,JY1)
  680 ZX3B3=(ZX34-ZX33)*B3
```

```
      ZX4B3=(ZX44-ZX43)*B3
      ZY3A3=(ZY43-ZY33)*A3
      ZY4A3=(ZY44-ZY34)*A3
      A=ZA3B3-ZX3B3-ZY3A3+ZXY33
      B=ZX4B3-ZX3B3-ZXY43+ZXY33
      C=ZY4A3-ZY3A3-ZXY34+ZXY33
      D=ZXY44-ZXY43-ZXY34+ZXY33
      E=A+A-B-C
      A3SQ=A3*A3
      B3SQ=B3*B3
      P02=(2.0*(Z3B3-ZY33)+Z3B3-ZY34)*B3
      P03=(-2.0*Z3B3+ZY34+ZY33)*B3SQ
      P12=(2.0*(ZX3B3-ZXY33)+ZX3B3-ZXY34)*B3
      P13=(-2.0*ZX3B3+ZXY34+ZXY33)*B3SQ
      P20=(2.0*(Z3A3-ZX33)+Z3A3-ZX43)*A3
      P21=(2.0*(ZY3A3-ZXY33)+ZY3A3-ZXY43)*A3
      P22=(3.0*(A+E)+D)*A3*B3
      P23=(-3.0*E-B-D)*A3*B3SQ
      P30=(-2.0*Z3A3+ZX43+ZX33)*A3SQ
      P31=(-2.0*ZY3A3+ZXY43+ZXY33)*A3SQ
      P32=(-3.0*E-C-D)*B3*A3SQ
      P33=(D+E+E)*A3SQ*B3SQ
  690 DY=VK-Y3
      Q0=P00+DY*(P01+DY*(P02+DY*P03))
      Q1=P10+DY*(P11+DY*(P12+DY*P13))
      Q2=P20+DY*(P21+DY*(P22+DY*P23))
      Q3=P30+DY*(P31+DY*(P32+DY*P33))
      DX=UK-X3
      W(K)=Q0+DX*(Q1+DX*(Q2+DX*Q3))
  700 CONTINUE
      RETURN
  710 WRITE(IU0,9999)
      GOTO 800
  720 WRITE(IU0,9998)
      GOTO 800
  730 WRITE(IU0,9997)
```

```
      GOTO 800
  740 WRITE(IUO,9996)
      GOTO 760
  750 WRITE(IUO,9995)
  760 WRITE(IUO,9994)IX,X(IX)
      GOTO 800
  770 WRITE(IUO,9993)
      GOTO 790
  780 WRITE(IUO,9992)
  790 WRITE(IUO,9991) IY,Y(IY)
  800 WRITE(IUO,9990) LXO,LYO,NO
      RETURN
 9999 FORMAT(1X/22H        LX = 1 OR LESS./)
 9998 FORMAT(1X/22H        LY = 1 OR LESS./)
 9997 FORMAT(1X/21H        N = 0 OR LESS./)
 9996 FORMAT(1X/26H        IDENTICAL X VALUES./)
 9995 FORMAT(1X/32H        X VALUES OUT OF SEQUENCE./)
 9994 FORMAT(7H   IX =,I6,10X,7HX(IX) =,E12.3)
 9993 FORMAT(1X/26H        IDENTICAL Y VALUES./)
 9992 FORMAT(1X/32H        Y VALUES OUT OF SEQUENCE./)
 9991 FORMAT(7H   IY =,I6,10X,7HY(IY) =,E12.3)
 9990 FORMAT(7H   LX =,I6,10X,4HLY =,I6,10X,3HN =,I7/36H ERROR DETECTED
     1IN ROUTINE    ITPLBV)
      END
```

APPENDIX C

FORTRAN Listing of field strength data cards

000001	25	1	2	3	4	5	10	20	30	40	50	60	70	80	90	100
000002	110	120	130	140	150	160	170	180	190	200						
000003	13	100	200	400	600	800	1000	1250	1500	1750	2000	3000	4000	5000		
000004	920	980	1006	1015	1019	1020	1021	1022	1023	1024	1025	1025	1025			
000005	797	859	910	934	946	950	956	959	960	961	963	965	965			
000006	727	790	848	878	894	904	912	918	920	922	925	925	925			
000007	678	738	800	833	854	868	877	883	889	892	899	901	902			
000008	640	700	760	796	820	837	850	858	863	867	876	880	881			
000009	520	580	640	676	700	720	739	754	767	779	802	813	819			
000010	394	455	515	550	576	596	617	633	649	662	700	724	742			
000011	310	370	430	467	490	510	532	551	570	585	626	650	665			
000012	253	295	355	390	415	436	459	479	500	515	554	578	596			
000013	203	235	288	320	344	367	391	415	435	450	489	512	530			
000014	162	181	220	253	277	299	320	344	367	382	425	449	464			
000015	128	145	171	198	220	239	260	283	307	324	369	391	408			
000016	98	110	134	152	170	188	210	232	252	270	310	332	350			
000017	69	82	102	118	131	147	168	188	204	220	257	281	300			
000018	40	55	74	89	101	115	131	149	160	173	210	235	255			
000019	15	29	48	60	72	84	99	111	125	137	171	198	218			
000020	-11	03	22	37	48	57	70	80	91	101	136	161	183			
000021	-36	-22	-03	10	20	30	41	52	62	71	103	130	150			
000022	-58	-48	-30	-14	-03	06	17	27	38	46	78	104	124			
000023	-81	-70	-52	-39	-27	-18	-07	02	11	20	51	80	100			
000024	-106	-94	-76	-61	-51	-42	-32	-22	-13	-04	28	55	77			
000025	-130	-117	-100	-87	-76	-66	-56	-46	-36	-27	05	31	51			
000026	-151	-140	-122	-110	-100	-90	-80	-70	-61	-51	-21	06	28			
000027	-172	-161	-146	-132	-121	-112	-102	-92	-84	-76	-45	-20	02			
000028	-192	-183	-169	-156	-146	-136	-125	-116	-106	-100	-68	-41	-20			
000029	30	10	20	30	40	50	60	70	80	90	100	110	120	130	140	150
000030	160	170	180	190	200	210	220	230	240	250	260	270	280	290	300	
000031	13	100	200	400	600	800	1000	1250	1500	1750	2000	3000	4000	5000		
000032	522	584	643	680	705	723	742	759	770	782	808	818	822			
000033	414	470	530	565	590	609	630	648	662	676	712	738	755			
000034	364	409	459	490	517	537	560	579	596	609	645	670	690			
000035	330	360	399	430	454	475	500	520	540	552	589	614	633			
000036	300	319	350	377	400	419	444	467	485	500	539	563	584			

000037	267	280	305	328	349	368	392	416	435	450	490	517	535
000038	235	249	269	288	304	320	349	371	392	407	442	469	488
000039	204	220	240	256	270	284	308	330	350	362	398	420	440
000040	174	190	209	225	239	250	270	290	308	320	354	378	397
000041	145	161	182	198	210	220	239	255	269	280	313	338	357
000042	115	131	153	169	182	192	208	220	232	241	276	300	321
000043	85	101	124	139	151	162	178	190	200	210	244	270	291
000044	59	77	98	110	123	134	148	160	171	180	216	241	261
000045	30	49	69	82	97	107	120	132	142	153	189	215	235
000046	06	20	41	57	69	80	91	103	116	125	160	188	209
000047	-20	-04	16	29	41	53	67	79	90	100	136	161	180
000048	-43	-30	-10	03	16	27	39	50	60	70	107	136	157
000049	-66	-51	-34	-22	-10	00	11	22	33	44	80	109	130
000050	-87	-74	-58	-46	-34	-25	-14	-02	09	18	52	81	102
000051	-105	-94	-80	-69	-57	-49	-39	-28	-18	-08	28	53	75
000052	-125	-114	-101	-90	-80	-70	-60	-50	-40	-30	03	30	50
000053	-146	-134	-120	-110	-100	-90	-80	-70	-62	-53	-20	04	26
000054	-166	-155	-141	-130	-120	-112	-102	-92	-82	-74	-45	-19	00
000055	-186	-174	-160	-150	-140	-132	-122	-113	-105	-98	-70	-43	-24
000056	-205	-193	-180	-170	-160	-151	-142	-133	-125	-118	-90	-67	-46
000057	-224	-212	-199	-189	-179	-170	-162	-153	-146	-140	-111	-90	-69
000058	-243	-232	-219	-209	-199	-190	-181	-172	-163	-158	-132	-110	-90
000059	-262	-250	-237	-225	-217	-210	-200	-192	-184	-178	-150	-129	-110
000060	-281	-270	-256	-246	-236	-230	-220	-211	-202	-196	-170	-149	-130
000061	-300	-290	-274	-263	-254	-246	-237	-228	-220	-213	-190	-169	-150
000062	946	1007	1016	1018	1019	1020	1023	1023	1023	1024	1024	1024	1025
000063	828	889	923	939	946	950	954	957	959	960	962	962	965
000064	757	818	866	887	898	905	913	918	920	921	926	926	927
000065	707	769	822	848	862	870	880	887	891	895	900	900	901
000066	668	730	788	816	832	845	857	863	870	873	880	880	880
000067	550	610	672	708	732	750	770	781	791	800	811	818	820
000068	425	486	547	581	607	625	650	676	695	710	739	748	750
000069	340	400	461	498	521	542	567	590	610	628	663	674	680
000070	263	320	381	417	440	460	488	510	533	550	587	603	611
000071	207	241	301	338	361	380	409	435	460	479	520	538	546
000072	163	185	230	262	288	306	335	363	390	410	450	470	481

000073	129	144	170	200	221	240	268	296	320	340	382	406	420
000074	99	112	135	152	170	189	212	239	260	280	320	344	361
000075	70	83	105	120	137	150	170	190	210	226	263	288	306
000076	43	55	75	90	104	115	131	149	162	175	211	238	255
000077	15	29	48	62	75	86	100	112	127	136	170	198	218
000078	-10	05	23	37	48	58	70	82	95	105	140	166	185
000079	-35	-20	-03	10	22	32	44	55	65	74	107	131	151
000080	-57	-43	-27	-12	-01	09	20	30	40	49	80	104	123
000081	-80	-69	-50	-37	-25	-15	-05	06	15	22	56	82	101
000082	-104	-92	-73	-60	-49	-40	-30	-20	-10	-02	30	55	75
000083	-128	-115	-98	-84	-73	-63	-53	-43	-35	-26	06	31	51
000084	-150	-138	-120	-107	-97	-87	-76	-66	-58	-50	-18	09	29
000085	-172	-160	-144	-130	-120	-110	-100	-90	-82	-73	-42	-18	03
000086	-191	-182	-168	-155	-144	-134	-123	-113	-105	-98	-66	-40	-19
000087	554	616	677	710	735	753	771	786	796	804	820	824	825
000088	444	500	558	591	617	637	665	689	708	720	750	759	762
000089	392	435	486	520	546	565	590	615	636	652	686	698	702
000090	340	380	427	456	480	500	525	549	569	588	625	640	649
000091	299	325	359	388	410	430	458	482	508	530	570	589	598
000092	266	282	310	334	354	374	400	430	454	476	520	538	548
000093	235	250	270	289	307	323	350	374	400	420	468	489	500
000094	203	220	240	255	270	283	304	329	350	368	415	437	450
000095	174	190	210	224	238	250	269	288	304	320	358	382	401
000096	143	160	181	196	208	220	235	250	264	277	310	336	355
000097	113	130	151	167	180	191	205	220	230	240	276	300	320
000098	86	100	122	137	150	163	176	188	199	207	240	268	289
000099	58	72	94	108	120	133	147	159	170	180	214	240	260
000100	29	47	68	81	95	106	120	130	141	152	188	212	234
000101	03	19	38	52	65	78	90	103	115	125	160	187	207
000102	-21	-07	12	27	39	50	64	75	88	98	131	159	180
000103	-44	-32	-14	00	12	24	37	49	60	70	106	132	154
000104	-67	-54	-38	-23	-12	00	10	21	33	43	79	106	128
000105	-89	-78	-61	-48	-38	-26	-14	-03	08	17	50	80	100
000106	-108	-98	-82	-70	-60	-50	-40	-30	-20	-10	25	52	73
000107	-129	-118	-103	-90	-82	-71	-60	-51	-42	-33	00	28	49
000108	-148	-138	-123	-111	-102	-93	-82	-74	-65	-56	-24	02	22

000109	-169	-158	-143	-131	-122	-112	-102	-94	-86	-78	-47	-20	-01
000110	-188	-177	-163	-151	-142	-133	-123	-114	-106	-98	-69	-43	-24
000111	-207	-197	-183	-170	-162	-153	-143	-135	-128	-120	-90	-65	-47
000112	-227	-214	-201	-190	-180	-172	-162	-154	-148	-140	-111	-90	-70
000113	-246	-233	-220	-209	-200	-191	-182	-174	-168	-160	-131	-110	-90
000114	-264	-252	-240	-229	-219	-210	-200	-192	-185	-180	-151	-130	-110
000115	-282	-271	-259	-248	-239	-230	-220	-211	-203	-196	-170	-150	-130
000116	-301	-290	-277	-265	-255	-249	-239	-230	-221	-215	-190	-168	-150
000117	920	979	1007	1015	1019	1020	1021	1022	1023	1024	1025	1025	1025
000118	800	860	910	930	941	948	952	956	959	960	963	965	965
000119	729	790	847	874	890	900	908	913	918	920	925	928	930
000120	679	740	800	833	851	863	873	880	886	889	896	900	903
000121	638	700	760	795	815	829	841	850	858	862	873	879	881
000122	519	580	640	676	700	720	738	753	765	772	796	805	810
000123	390	452	512	546	572	591	610	626	640	650	682	700	711
000124	275	335	396	430	457	480	505	523	539	550	584	608	625
000125	178	227	282	315	345	373	403	427	443	457	494	521	540
000126	130	160	196	223	251	283	318	341	360	376	417	448	467
000127	101	117	144	168	191	217	247	270	293	310	354	386	410
000128	70	85	108	125	142	163	190	213	234	250	298	330	357
000129	42	55	77	93	108	124	145	163	180	198	245	280	308
000130	16	28	47	60	75	89	106	120	136	150	198	234	260
000131	-10	02	19	32	46	57	71	85	97	108	150	188	218
000132	-32	-20	-04	07	19	30	43	56	67	77	115	148	175
000133	-50	-42	-27	-15	-04	05	17	28	38	48	82	111	137
000134	-72	-63	-49	-38	-29	-20	-09	00	10	19	50	78	100
000135	-91	-84	-70	-59	-50	-42	-32	-23	-16	-09	20	46	67
000136	-110	-103	-89	-79	-70	-61	-52	-43	-36	-30	-02	19	37
000137	-131	-123	-109	-99	-90	-80	-71	-62	-55	-48	-22	-01	17
000138	-151	-142	-128	-117	-108	-100	-90	-82	-75	-68	-43	-22	-04
000139	-172	-162	-148	-138	-128	-119	-110	-102	-95	-89	-63	-42	-23
000140	-193	-183	-168	-158	-148	-139	-130	-122	-114	-108	-83	-61	-44
000141	-214	-201	-187	-177	-168	-159	-150	-141	-132	-125	-100	-80	-63
000142	522	583	647	680	705	723	741	754	764	774	795	807	813
000143	416	467	524	560	585	603	623	639	652	662	693	712	726
000144	350	380	430	463	488	508	529	549	563	576	609	630	645

000145	303	321	353	376	400	424	451	471	487	500	536	561	580
000146	270	283	308	326	347	367	390	408	424	437	477	502	524
000147	238	252	276	291	304	320	345	364	379	390	431	460	480
000148	208	222	245	260	272	284	304	322	339	351	392	421	443
000149	178	193	213	230	242	254	270	288	302	317	358	387	407
000150	148	165	185	200	212	224	239	252	266	278	320	350	373
000151	120	134	156	171	183	197	210	221	234	246	283	313	338
000152	92	107	127	140	152	165	180	193	203	213	249	278	303
000153	66	80	99	112	126	138	153	164	173	183	217	243	270
000154	40	51	71	88	100	110	125	138	148	157	188	212	237
000155	12	25	44	60	73	83	97	109	119	128	159	182	205
000156	-13	-02	18	32	46	57	70	81	91	100	131	155	174
000157	-38	-24	-08	08	19	30	44	56	67	76	106	128	147
000158	-60	-49	-31	-17	-05	06	18	29	39	48	79	100	120
000159	-84	-72	-55	-41	-30	-20	-07	03	13	21	51	73	92
000160	-103	-93	-77	-62	-52	-43	-32	-22	-12	-04	22	47	65
000161	-125	-113	-98	-84	-74	-66	-54	-45	-36	-28	00	21	40
000162	-145	-135	-120	-104	-96	-88	-77	-67	-58	-50	-22	00	18
000163	-165	-155	-140	-127	-117	-108	-98	-89	-79	-71	-43	-22	-04
000164	-185	-174	-159	-146	-138	-130	-120	-110	-100	-92	-66	-46	-28
000165	-205	-193	-178	-165	-156	-149	-140	-130	-122	-113	-89	-68	-50
000166	-224	-213	-198	-186	-177	-170	-160	-150	-142	-134	-110	-88	-70
000167	-242	-232	-216	-204	-196	-189	-179	-170	-162	-154	-130	-108	-90
000168	-260	-250	-234	-222	-213	-208	-199	-191	-182	-175	-150	-129	-110
000169	-278	-270	-255	-242	-233	-227	-218	-210	-202	-194	-170	-149	-130
000170	-295	-285	-271	-260	-250	-244	-237	-228	-220	-213	-190	-169	-150
000171	-310	-301	-289	-279	-270	-263	-256	-248	-240	-232	-210	-189	-168

Appendix D

This program is available for use by FCC personal through the OCE terminal to the UNIVAC 1106 in Chicago. The necessary control cards are as follows:

```
@RUN,/TP    RUNID,ACCOUNTID,PROJECTID,TIME,PAGES

@ASG,AX     RSD*FCCCURVES//GSK.

@ASG,AX     RSD*TVCURVES//GSK.

@ADD,P      RSD*FCCCURVES.TVFMFS

@ADD,P      RSD*TVCURVES.

          ( station data card sets )

@EOF

@FIN
```

Note: See "Spectrum Management Standards Manual" section 4.8, for definition of the RUN card parameters.