

CRPL-F53
National Bureau of Standards
Library, N. W. Bldg.

FEB 2 1949

Reference book not to be
taken from the Library.

IONOSPHERIC DATA

ISSUED
JANUARY 1949

U.S. BUREAU
OF
STANDARDS
LIBRARY

PREPARED BY CENTRAL RADIO PROPAGATION LABORATORY
National Bureau of Standards
Washington, D.C.

National Bureau of Standards

MAY 9 1951

71288

W.H. Goss
Accumulator
Division

IONOSPHERIC DATA

CONTENTS

	Page
New Terminology	2
Monthly Average and Median Values of World-Wide Ionospheric Data	11
Ionospheric Data for Every Day and Hour at Washington, D. C.	13
Ionosphere Disturbances	13
Solar Coronal Intensities Observed at Climax, Colorado .	14
American and Zürich Provisional Relative Sunspot Numbers	15
Tables of Ionospheric Data	17
Graphs of Ionospheric Data	44
Index of Tables and Graphs of Ionospheric Data in CRPL-F53	58

NEW TERMINOLOGY

Beginning with data reported for January 1949, the symbols and terminology used in this report (CRPL-F series) will conform as far as practicable to those adopted at the Fifth Meeting of the International Radio Consultative Committee (C.C.I.R.) in Stockholm, 1948.

The following excerpts are taken from Document No. 293 E, 29 July 1948, Standardization of Symbols and Presentation of Results of Ionospheric Soundings:

The C.C.I.R. . . . RECOMMENDS:

1. That use of the symbols detailed below be recognized in the interchange of ionospheric data:

- a. General Symbols (See Appendix 1).
- b. Symbols representing numerical values of characteristics most commonly observed or derived from ionospheric records (See Appendix 2).
- c. Qualifying Symbols (See Appendix 3).
- d. Descriptive Symbols (See Appendix 4)

APPENDIX 1

GENERAL SYMBOLS

- | | | |
|----|-------|---|
| 1. | f | frequency |
| 2. | fo | ordinary-wave critical frequency |
| 3. | fx | extraordinary-wave critical frequency |
| 4. | fz | critical frequency corresponding to the lowest-frequency branch of triply-split h'f curve |
| 5. | h' | virtual height (frequently used to denote minimum virtual height) |
| 6. | hp | virtual height measured on ordinary-wave branch at a frequency equal to 0.834 times fo |
| 7. | MUF | maximum usable frequency |
| 8. | d-MUF | maximum usable frequency for a path of some specified standard length d |

9. FOT optimum traffic frequency (formerly optimum working frequency)
10. LUF lowest useful high frequency
11. Md maximum usable frequency factor for a path of some specified standard length d
12. h'f an observation displaying the virtual height h' as a function of frequency f
13. h't an observation displaying the virtual height h' as a function of time t for a specified fixed frequency

NOTE: It is now very nearly universal practice to specify quantities in the above list representing frequencies in megacycles per second, and to specify quantities representing height or distance in kilometers. Exceptions should always be clearly indicated, as for example the use of miles in symbols 8 and 11.

In the table above the abbreviations MUF, FOT, and LUF should be left unaltered in sequence of letters when translated into various languages in order to preserve them as pronounceable words.

APPENDIX 2

SYMBOLS REPRESENTING NUMERICAL VALUES OF CHARACTERISTICS MOST COMMONLY OBSERVED OR DERIVED FROM IONOSPHERIC RECORDS

1. foE critical frequency for E-layer ordinary wave
(See Remark 1)
2. foF1 critical frequency for F1-layer ordinary wave
3. foF2 critical frequency for F2-layer ordinary wave
4. fxE critical frequency for E-layer extraordinary wave
5. fxF1 critical frequency for F1-layer extraordinary wave
6. fxF2 critical frequency for F2-layer extraordinary wave
7. fzF1 critical frequency for F1 layer corresponding to the lowest-frequency branch of an $h'f$ curve showing triple splitting in the F1 layer
8. fzF2 critical frequency for F2 layer corresponding to the lowest-frequency branch of an $h'f$ curve showing triple splitting in the F2 layer

9. fEs highest frequency on which echoes of the sporadic type are observed from the E layer (See Remark 2)
10. fbEs the lowest frequency at which echoes from the F layer are observed when the sporadic echoes from the E layer are of the intense or blanketing type
11. h'E minimum virtual height of E layer on ordinary-wave branch
12. h'F1 minimum virtual height of F1 layer on ordinary-wave branch
13. h'F2 minimum virtual height of F2 layer on ordinary-wave branch
14. h'Es minimum virtual height of sporadic echoes from the E layer
15. hpF1 virtual height of F1 layer measured on the ordinary-wave branch at a frequency equal to 0.834 times foF1
16. hpF2 virtual height of F2 layer measured on the ordinary-wave branch at a frequency equal to 0.834 times foF2
17. E-d-MUF maximum usable frequency for E-layer transmission for path of some specified standard length d
18. F1-d-MUF maximum usable frequency for F1-layer transmission for path of some specified standard length d
19. F2-d-MUF maximum usable frequency for F2-layer transmission for path of some specified standard length d
20. (Md)E maximum usable frequency factor for E-layer transmission for a path of some specified standard length d
21. (Md)F1 maximum usable frequency factor for F1-layer transmission for a path of some specified standard length d
22. (Md)F2 maximum usable frequency factor for F2-layer transmission for a path of some specified standard length d

REMARK 1: In the event that clear stratification is evident within the regular E layer, and a second critical frequency is observed, it is increasingly common practice to refer to the upper critical frequencies as foE2 and fxE2, and the minimum virtual height as h'E2.

REMARK 2: Understanding of the processes which give rise to sporadic-E reflections is still largely lacking. There have been cases reported in which sufficient retardation, and also change in echo intensity, has been observed to suggest the possibility of using such symbols as foEs and fxEs. When this resolution is not possible, it is customary to regard fEs as equivalent to foEs.

NOTE: It is now very nearly universal practice to specify quantities in the above list representing frequencies in megacycles per second, and to specify quantities representing height or distance in kilometers. Exceptions should always be clearly indicated, as for example the use of miles in symbols 17 to 22, inclusive.

It should be remarked that all symbols of the above list are to be typeset as typewritten, on a straight line, i.e., superscripts and subscripts are no longer to be used.

APPENDIX 3

QUALIFYING SYMBOLS

1. () Individual observed values thus enclosed are considered doubtful. The reason for doubt should be specified by an appropriate descriptive symbol (See Appendix 4) or by a footnote.
2. $\lceil \rceil$ Individual numerical values thus enclosed represent interpolations rather than observations. The reason for the interpolation should be specified by an appropriate descriptive symbol (See Appendix 4) or by a footnote.

NOTE CONCERNING INTERPOLATION:

In hourly tabulations of ionospheric characteristics it is considered desirable to replace a single missing value by an interpolated value. If, however, two or more consecutive hourly values are missing, interpolation should not be performed. The matter of interpolation is given further attention in Appendix 4.

APPENDIX 4

DESCRIPTIVE SYMBOLS

<u>Symbol</u>	<u>Notes on Use Which Refer</u>	<u>Definition</u>
1. A or a	2, 5, 6	characteristic not measurable because of blanketing by Es
2. B or b	2, 5, 6	characteristic not measurable because of absorption either partial or complete
3. C or c	1, 5	characteristic not observed because of equipment failure
4. D or d	1, 4	characteristic at a frequency higher than upper frequency limit of equipment
5. E or e	1, 4	characteristic at a frequency lower than lower frequency limit of equipment
6. F or f	2, 5, 6	spread echoes present
7. G or g	1, 4	(a) F2-layer critical frequency equal to or less than F1-layer critical frequency (b) no sporadic-E echoes observed
8. H or h	3, 6	stratification observed within the layer
9. J or j	3, 6	ordinary-wave characteristic deduced from measured extraordinary-wave characteristic
10. K or k	3, 6	ionosphere storm in progress
11. L or l	1, 5, 6	(a) critical frequency, MUF, or MUF factor for F1 layer omitted because no definite or abrupt change in slope of the $h'f$ curve is observed either for the first reflection or for any of the multiples (b) minimum virtual height for F2 layer omitted because the F2-layer trace is continuous with the F1-layer trace, but without a point of zero slope

<u>Symbol</u>	<u>Notes on Use Which Refer</u>	<u>Definition</u>
12. M or m	1, 5	characteristic not observed because of some failure or omission on the part of the operator, rather than owing to any mechanical or electrical fault in the equipment or its power supply
13. N or n	1, 5, 6	unable to make logical interpretation
14. P or p	3, 6	trace extrapolated to critical frequency
15. Q or q	1	distinct layer not present
16. R or r	2, 5, 6	curve becomes incoherent near F2-layer critical frequency
17. S or s	2, 5, 6	characteristic obscured by interference
18. T or t	1, 5	loss or destruction of successful observations
19. V or v	3, 6	trace forked near critical frequency
20. W or w	1, 4	characteristic at a height greater than the upper height limit of equipment
21. Y or y	3	Es trace intermittent in frequency range
22. Z or z	3	three components of h'f curve of layer observed

GENERAL NOTES:

For nearly all purposes enough symbols have been provided to make it unnecessary to leave any blank spaces in monthly tabulations of hourly values. In the event that no symbol should be found to be entirely satisfactory a suitable footnote should be given. Blank spaces in the tabulation sheets will be taken to indicate that no observation was scheduled at the given hour.

It should be noted that many occasions will arise when more than one letter symbol is appropriate to describe circumstances of a particular observation. There should be no hesitation at recording several descriptive symbols, if appropriate, in elucidating the circumstances surrounding a particular observation. In some cases it will be found that one letter symbol can well be used to describe or qualify another.

In use of the above letter symbols, capital or block letters are to be preferred on the grounds that small script letters are sometimes illegible or misleading, because of their resemblance to numbers. The capital or block letters are preferable in script.

NOTES ON THE USE OF THE DESCRIPTIVE SYMBOLS:

1. The following descriptive symbols are used only in place of an observed numerical value:

C, D, E, G, L, M, N, Q, T, and W

2. The following descriptive symbols may be used either in place of, or to qualify, an observed numerical value:

A, B, F, R, and S

3. The following descriptive symbols may be used only to qualify an observed numerical value:

H, J, K, P, V, Y, and Z.

4. Certain of the descriptive symbols when used in place of an observed numerical value, have the same force as an actual number when medians are taken, and should therefore be included in the median count in the manner made appropriate by their definitions. It should be noted, however, that if half or more of the observations are represented by these symbols, the median can only be indicated as greater than or less than the numerical value of the limitation represented. These symbols are:

D, E, G, and W

5. When an observed numerical value has been replaced with certain of the descriptive symbols, it is frequently permissible to enter an interpolated value (See discussion of interpolation practice in Appendix 3). Such symbols, which then qualify the interpolated value, are:

A, B, C, F, L, M, N, R, S, and T

6. When an observed numerical value is indicated as doubtful by the use of parentheses, the reason for doubt should always be indicated. The following descriptive symbols are often used to provide the explanation:

A, B, F, H, J, K, P, R, S, and V

APPENDIX 5

MEDIAN VALUES, MEDIAN COUNTS, CONVENTIONS FOR DETERMINATION OF MEDIAN VALUES OF IONOSPHERIC CHARACTERISTICS

1. Definitions

- a. For a set consisting of an odd number of numerical values, the median value is the middle value of the set when its members are arranged in order of size.
- b. For a set consisting of an even number of numerical values, the median value is the arithmetic mean of the two middle values of the set when its members are arranged in order of size.
- c. For a set of numerical values, the median count is the number of numerical values in the set.

2. Conventions

- a. Rounding off--A median value, found according to "b" above, should contain no more significant places than an individual member of the set. Therefore, rounding off, for example to the nearest even digit, in the last place may at times be necessary.
- b. Use of Certain Descriptive Letter Symbols as Numerical Values for Purposes of Finding a Median Value--This matter is discussed in Appendix 4 under note 4 on the usage of the descriptive symbols. The letter symbols which have the force of numerical values are D, E, G, and W.
- c. Doubtful Monthly Median Values--Such values for a characteristic observed at a specified hour are indicated, as in the case of doubtful single values, by inclusion in parentheses. See Appendix 3. The following conventions may be used to determine whether or not a median value is doubtful:

- i. If only four values or less are available, the data are considered insufficient and no median value is determined. The monthly summary should in such cases show a dash.
- ii. For the F2 layer, if only five to nine values are available, the median is considered doubtful. The E and F1 layers are so regular in their characteristics that, as long as there are at least five values, the median is not considered doubtful.
- iii. For all layers, if more than half of the numerical values used to compute the median are doubtful (either doubtful or interpolated), the median is considered doubtful.

MONTHLY AVERAGE AND MEDIAN VALUES OF WORLD-WIDE IONOSPHERIC DATA

The ionospheric data given here in tables 1 to 28 and figures 1 to 56 were assembled by the Central Radio Propagation Laboratory for analysis and correlation, incidental to CRPL predictions of radio propagation conditions. The data are median values unless otherwise indicated. The following are the sources of the data in this issue:

Australian Council for Scientific and Industrial Research,
Radio Research Board:
Brisbane, Australia
Canberra, Australia

British Department of Scientific and Industrial Research,
Radio Research Board:
Falkland Is.
Fraserburgh, Scotland
Lindau/Harz, Germany
Slough, England

South African Council for Scientific and Industrial Research:
Capetown, Union of S. Africa
Johannesburg, Union of S. Africa

Japanese Physical Institute for Radio Waves (under supervision of
Supreme Commander, Allied Powers):
Shibata, Japan

National Bureau of Standards (Central Radio Propagation Laboratory):
Baton Rouge, Louisiana (Louisiana State University)
Boston, Massachusetts (Harvard University)
Guam I.
Huancayo, Peru (Instituto Geofisico de Huancayo)
Maui, Hawaii
Palmyra I.
San Francisco, California (Stanford University)
San Juan, Puerto Rico (University of Puerto Rico)
Trinidad, British West Indies
Washington, D. C.
White Sands, New Mexico
Wuchang, China (National Wuhan University)

French Ministry of Naval Armaments (Section for Scientific Research):
Fribourg, Germany

National Laboratory of Radio-Electricity (French Ionospheric Bureau):
Bagneux, France

The tables and graphs of ionospheric data are correct for the values reported to the CRPL, but, because of variations in practice in the interpretation of records and scaling and manner of reporting of values, may at times give an erroneous conception of typical ionospheric characteristics at the station. Some of the errors are due to:

- a. Differences in scaling records when spread echoes are present.
- b. Omission of values when f_{oF2} is less than or equal to f_{oF1} , leading to erroneously high values of monthly averages or median values.
- c. Omission of values when critical frequencies are less than the lower frequency limit of the recorder, also leading to erroneously high values of monthly average or median values.

These effects were discussed on pages 6 and 7 of the previous F-series report IRPL-F5.

The dashed-line prediction curves of the graphs of ionospheric data are obtained from the predicted zero-muf contour charts of the CRPL-D series publications. The following points are worthy of note:

- a. Predictions for individual stations used to construct the charts may be more accurate than the values read from the charts since some smoothing of the contours is necessary to allow for the longitude effect within a zone. Thus, inasmuch as the predicted contours are for the center of each zone, part of the discrepancy between the predicted and observed values as given in the F series may be caused by the fact that the station is not centrally located within the zone.
- b. The final presentation of the predictions is dependent upon the latest available ionospheric and radio propagation data, as well as upon predicted sunspot number.
- c. There is no indication on the graphs of the relative reliability of the data; it is necessary to consult the tables for such information.

The following predicted smoothed 12-month running-average Zürich sunspot numbers were used in constructing the contour charts:

<u>Month</u>	<u>Predicted Sunspot No.</u>			
	<u>1948</u>	<u>1947</u>	<u>1946</u>	<u>1945</u>
December	114	126	85	38
November	115	124	83	36
October	116	119	81	23
September	117	121	79	22
August	123	122	77	20
July	125	116	73	
June	129	112	67	
May	130	109	67	
April	133	107	62	
March	133	105	51	
February	133	90	46	
January	130	88	42	

IONOSPHERIC DATA FOR EVERY DAY AND HOUR
AT WASHINGTON, D. C.

The data given in tables 29 to 40 follow the scaling practices given in the report IRPL-C61, "Report of International Radio Propagation Conference," pages 36 to 39, and the median values are determined by the conventions as given in previous issues of the F series.

IONOSPHERE DISTURBANCES

Table 41 presents ionosphere character figures for Washington, D. C., during December 1948, as determined by the criteria presented in the report IRPL-R5, "Criteria for Ionospheric Storminess," together with Cheltenham, Maryland, geomagnetic K-figures, which are usually covariant with them.

Table 42 lists for the stations whose locations are given the sudden ionosphere disturbances observed on the continuous field intensity recordings made at the Sterling Radio Propagation Laboratory during December 1948.

Table 43 lists for the stations whose locations are given the sudden ionosphere disturbances observed at the Point Reyes, California, receiving station of RCA Communications, Inc., for December 22, 23, 24, and 26, 1948.

Table 44 lists for the stations whose locations are given the sudden ionosphere disturbances observed at the Brentwood and Somerton, England, receiving stations of Cable and Wireless, Ltd., for December 9 and 11, 1948.

Table 45 lists for the stations whose locations are given the sudden ionosphere disturbances observed at the Platanos, Argentina, receiving station of the International Telephone and Telegraph Corporation for October 11 and 21, and November 13, 18, and 22, 1948.

Table 46 gives provisional radio propagation quality figures for the North Atlantic and North Pacific areas, for 01 to 12 and 13 to 24 GCT, November 1948, compared with the CRPL daily radio disturbance warnings, which are primarily for the North Atlantic paths, the CRPL weekly radio propagation forecasts of probable disturbed periods, and the half-day Cheltenham, Maryland, geomagnetic K-figures.

The radio propagation quality figures are prepared from radio traffic and ionospheric data reported to the CRPL, in a manner basically the same as that described in IRPL-R31, "North Atlantic Radio Propagation Disturbances, October 1943 through October 1945," issued February 1, 1946. The scale conversions for each report are revised for use with the data

beginning January 1948, and statistical weighting replaces what was, in effect, subjective weighting. Separate master distribution curves of the type described in IRPL-R31 were derived for the part of 1946 covered by each report; data received only since 1946 are compared with the master curve for the period of the available data. A report whose distribution is the same as the master is thereby converted linearly to the Q-figure scale. Each report is given a statistical weight which is the reciprocal of the departure from linearity. The half-daily radio propagation quality figure, beginning January 1948, is the weighted mean of the reports received for that period.

These radio propagation quality figures give a consensus of opinion of actual radio propagation conditions as reported by the half day over the two general areas. It should be borne in mind, however, that though the quality may be disturbed according to the CRPL scale, the cause of the disturbance is not necessarily known. There are many variables that must be considered. In addition to ionospheric storminess itself as the cause, conditions may be reported as disturbed because of seasonal characteristics, such as are particularly evident in the pronounced day and night contrast over North Pacific paths during the winter months, or because of improper frequency usage for the path and time of day in question. Insofar as possible, frequency usage is included in rating the reports. Where the actual frequency is not shown in the report to the CRPL, it has been assumed that the report is made on the use of optimum working frequencies for the path and time of day in question. Since there is a possibility that all the disturbance shown by the quality figures is not due to ionospheric storminess alone, care should be taken in using the quality figures in research correlations with solar, auroral, geomagnetic, or other data. Nevertheless, these quality figures do reflect a consensus of opinion of actual radio propagation conditions as found on any one half day in either of the two general areas.

SOLAR CORONAL INTENSITIES OBSERVED AT CLIMAX, COLORADO

In tables 47a and 47b are listed the intensities of green (5303A) line of the emission spectrum of the solar corona as observed November 30 and during December 1948 by the High Altitude Observatory of Harvard University and the University of Colorado at Climax, Colorado, for east and west limbs, respectively, at 5° intervals of position angle north and south of the solar equator at the limb computed to the nearest 5° . A correction, P, as listed, has been applied to the position angles of the actual observations which were on astronomical coordinates. The time of observation is given to the nearest tenth of a day, GCT. The tables of coronal observations in CRPL-F29 to F41 listed the data on astronomical coordinates; the present format on solar rotation coordinates is in conformity with the tables of CRPL-1-4, "Observations of the Solar Corona at Climax, 1944-46."

Tables 48a and 48b give similarly the intensities of the first red (6374A) coronal line; tables 49a and 49b list the intensities of the second red (6704A) coronal line. The following symbols are used in tables 47, 48, and 49: a, observation of low weight; -, corona not visible; and x, position angle not included in plate estimates.

Table 50 gives details of the Climax observations from July 1948 through December 1948. The first column lists the Greenwich date of observation; the next six columns give the threshold or lowest observable intensity of 5303A for each spectrum plate centered at astronomical position angles 45° , 90° , 135° , 225° , 270° , and 315° , respectively; the last two columns indicate the observer and the person responsible for the intensity estimates of the observation. This table is a continuation of table 1 of CRPL-1-4 and appears at intervals of six months.

AMERICAN AND ZÜRICH PROVISIONAL RELATIVE SUNSPOT NUMBERS

Table 51 presents the daily American relative sunspot number, R_A , computed from observations communicated to CRPL by observers in America and abroad. Beginning with the observations for January 1948, a new method of reduction of observations is employed such that each observer is assigned a scale-determining "observatory coefficient," ultimately referred to Zürich observations in a standard period, December 1944 to September 1945, and a statistical weight, the reciprocal of the variance of the observatory coefficient. The daily numbers listed in the table are the weighted means of all observations received for each day. Details of the procedure will be published shortly. The American relative sunspot number computed in this way is designated R_A . It is noted that a number of observatories abroad, including the Zurich observatory, are included in R_A . The scale of R_A was referred specifically to that of the Zürich relative sunspot numbers in the standard comparison period; since that time, R_A is influenced by the Zürich observations only in that Zürich proves to be a consistent observer and receives a high statistical weight. In addition, this table lists the daily provisional Zürich sunspot numbers, R_Z .

TABLES AND GRAPHS
OF
IONOSPHERIC DATA

TABLES OF IONOSPHERIC DATA

Table 1

Washington, D. C. (39.0°N , 77.5°W)

December 1948

Time	$h^{\circ}\text{F}2$	$f^{\circ}\text{F}2$	$h^{\circ}\text{F}1$	$f^{\circ}\text{F}1$	$h^{\circ}\text{E}$	$f^{\circ}\text{E}$	$f^{\circ}\text{Es}$	$F2-\text{N}3000$
00	250	4.1				2.9		
01	270	3.8				2.9		
02	260	3.9				2.9		
03	250	3.9				3.0		
04	250	3.9				2.9		
05	250	3.7				3.0		
06	250	3.5				3.0		
07	240	4.5				3.1		
08	220	7.7	120	2.2	2.1	3.5		
09	210	9.5	100	(2.7)		3.4		
10	220	10.3	210	100	3.1	3.4		
11	230	11.3	(210)	100	3.3	3.2		
12	230	11.7	210	100	3.4	3.2		
13	230	11.8	205	100	3.3	3.1		
14	220	11.5	210	100	3.1	3.1		
15	230	(11.4)		100	(2.7)	2.3	(3.1)	
16	220	(11.0)		100	2.2	1.9	3.2	
17	200	(10.0)			1.8	2.0	(3.3)	
18	210	8.4			1.8	3.2		
19	210	7.2				3.2		
20	210	5.8				3.2		
21	230	4.8				3.0		
22	250	4.3				3.0		
23	250	(4.3)				(3.0)		

Table 2

Boeton, Massachusetts (42.4°N , 71.2°W)

November 1948

Time	$h^{\circ}\text{F}2$	$f^{\circ}\text{F}2$	$h^{\circ}\text{F}1$	$f^{\circ}\text{F}1$	$h^{\circ}\text{E}$	$f^{\circ}\text{E}$	$f^{\circ}\text{Es}$	$F2-\text{N}3000$
00	262	5.4						2.7
01	260	5.2						2.6
02	260	5.0						2.6
03	255	4.6						1.2
04	250	4.1						2.7
05	250	4.2						1.2
06	255	4.2						2.7
07	242	7.6						2.7
08	230	9.6						3.0
09	230	10.2						3.2
10	230	10.6						3.1
11	238	11.0						3.2
12	235	11.4						3.1
13	242	11.2						3.1
14	242	11.3						3.1
15	235	11.0						3.1
16	235	10.8						3.0
17	230	10.0						3.1
18	230	9.7						2.9
19	240	8.2						2.9
20	245	7.4						2.8
21	250	6.7						2.7
22	255	5.8						2.7
23	258	5.7						2.7

Time: 75.0°W .

Sweep: 1.0 Mc to 25.0 Mc in 15 seconds.

Time: 75.0°W .

Sweep: 0.8 Mc to 14.0 Mc in 1 minute.

Table 3

San Francisco, California (37.4°N , 122.2°W)

November 1948

Time	$h^{\circ}\text{F}2$	$f^{\circ}\text{F}2$	$h^{\circ}\text{F}1$	$f^{\circ}\text{F}1$	$h^{\circ}\text{E}$	$f^{\circ}\text{E}$	$f^{\circ}\text{Es}$	$F2-\text{N}3000$
00	300	3.6				2.6	2.5	
01	290	3.6				2.6	2.5	
02	300	3.6				2.7	2.5	
03	300	3.6				2.5	2.6	
04	280	3.6				2.5	2.6	
05	300	3.5				2.6	2.5	
06	290	3.4				2.6		
07	240	6.5				2.5		
08	220	9.8	120	2.6		3.1		
09	220	10.8	120	2.9		3.0		
10	220	12.1	120	3.3		2.8		
11	220	13.2	120	3.4		2.9		
12	220	13.3	120	3.5		2.8		
13	230	13.1	120	3.4		2.8		
14	240	13.0	120	3.4		2.8		
15	240	13.0	120	3.1		2.8		
16	220	12.6	120	2.4		2.8		
17	220	11.2			2.6	2.8		
18	220	9.1			2.5	2.9		
19	220	7.2			2.6	2.9		
20	225	5.5			2.7	2.9		
21	240	4.1			2.8	2.8		
22	280	3.6			2.5	2.6		
23	300	3.4			2.4	2.6		

Table 4

White Sands, New Mexico (32.3°N , 106.5°W)

November 1948

Time	$h^{\circ}\text{F}2$	$f^{\circ}\text{F}2$	$h^{\circ}\text{F}1$	$f^{\circ}\text{F}1$	$h^{\circ}\text{E}$	$f^{\circ}\text{E}$	$f^{\circ}\text{Es}$	$F2-\text{N}3000$
00	295	3.8						3.3
01	280	3.8						2.8
02	280	3.7						2.6
03	295	3.8						3.0
04	280	3.6						2.7
05	300	3.5						2.4
06	300	4.0						2.5
07	245	(7.0)						2.6
08	240	10.4						2.6
09	240	12.0						3.1
10	220	12.1						3.1
11	230	12.8						3.0
12	220	12.8						2.9
13	230	12.7						2.9
14	240	12.5						2.9
15	240	12.0						2.9
16	240	11.8						2.9
17	220	11.4						2.9
18	220	9.4						3.0
19	220	7.6						3.0
20	230	5.8						3.0
21	250	4.6						3.0
22	280	4.1						3.0
23	300	3.9						2.6

Time: 120.0°W .

Sweep: 1.3 Mc to 18.5 Mc in 4 minutes 30 seconds.

Time: 105.0°W .

Sweep: 0.78 Mc to 14.0 Mc in 2 minutes.

Table 5

Wucheng, China (30.6°N, 114.4°E)

November 1948

Time	h°F2	f°F2	h°F1	f°F1	h°E	f°E	fEs	F2-M3000
00	260	6.0						2.8
01	255	5.5						2.9
02	245	5.0						3.0
03	245	4.9						3.0
04	230	4.3						3.2
05	255	3.2						2.9
06	280	3.2						2.9
07	235	7.5			145	1.8		3.2
08	220	10.0			100	2.5		3.4
09	220	11.2			100	3.0		3.3
10	225	12.2	220		100	3.3		3.2
11	228	13.4	210	4.6	100	3.5		3.1
12	240	13.6	218	6.2	100	3.6		3.0
13	240	14.5	210	5.6	100	3.5		3.0
14	230	14.7	218	5.4	100	3.4		3.0
15	230	14.6	228	(4.5)	100	3.1		3.0
16	225	14.0	230	5.2	100	2.7		3.0
17	225	13.5			100	2.1		3.0
18	210	12.2			100	2.6		3.1
19	220	10.9				2.7		3.0
20	225	10.5				2.6		3.0
21	220	9.1				2.4		3.1
22	222	7.8				1.8		3.0
23	242	6.5						2.9

Time: 120.0°E.

Sweep: 1.2 Mc to 19.0 Mc in 15 minutes, automatic operation.

Table 6

Baton Rouge, Louisiana (30.5°N, 91.2°W)

November 1948

Time	h°F2	f°F2	h°F1	f°F1	h°E	f°E	fEs	F2-M3000
00	280	4.2						3.0
01	290	4.0						2.9
02	290	4.0						3.0
03	290	3.8						2.9
04	290	3.7						2.9
05	310	3.7						2.9
06	290	4.1						3.0
07	250	8.2						3.3
08	270	10.4	230			120	2.7	3.2
09	270	11.6	230			120	3.2	3.2
10	280	12.0	220			120	3.4	3.1
11	280	12.3	220			120	(3.5)	3.1
12	280	12.5	220			120	3.6	3.0
13	290	12.5	230			120	3.6	2.9
14	290	12.5	230			120	3.5	3.0
15	280	12.0	230			120	3.2	3.0
16	280	11.6	230			120	2.6	3.0
17	240	11.0						3.0
18	220	9.4						3.1
19	230	7.8						3.1
20	230	6.6						3.1
21	240	5.4						3.1
22	270	5.0						3.0
23	280	4.4						3.0

Time: 90.0°W.

Sweep: 2.12 Mc to 15.3 Mc in 8 minutes 30 seconds, automatic operation.

Table 7

Maui, Hawaii (20.8°N, 156.5°W)

November 1948

Time	h°F2	f°F2	h°F1	f°F1	h°E	f°E	fEs	F2-M3000
00	225	6.1						3.0
01	220	5.3						3.1
02	220	4.5						3.1
03	235	3.4						2.9
04	320	3.0						2.6
05	345	3.0						2.6
06	340	3.2						2.6
07	250	7.4						3.1
08	240	11.4			105	2.8		3.2
09	250	13.4	225		100	3.3		3.1
10	250	14.0	230		110	3.4		3.1
11	260	15.1	220		110	3.7		3.0
12	280	15.6	210		100	3.7	(2.9)	
13	280	16.8	220		100	3.8	2.9	
14	300	16.8	230		100	3.6	4.2	(3.0)
15	250	16.6	230		100	3.2	4.0	3.0
16	240	15.8			100	3.0		3.0
17	230	14.8			140	2.5		3.1
18	210	13.0			E			3.1
19	200	11.3						(3.1)
20	220	11.2						(3.0)
21	210	10.2						(3.2)
22	220	9.1						(3.1)
23	220	8.0						3.1

Time: 160.0°W.

Sweep: 2.2 Mc to 16.0 Mc in 1 minute; above 16.0 Mc, manual operation.

Table 8

San Juan, Puerto Rico (18.4°N, 66.1°W)

November 1948

Time	h°F2	f°F2	h°F1	f°F1	h°E	f°E	fEs	F2-M3000
00								2.9
01								2.9
02								2.9
03								2.7
04								2.6
05								2.7
06								2.8
07	250	8.5				3.1		3.0
08	250	11.4				3.7		3.0
09	260	13.0						3.0
10	260	13.0						3.0
11	275	13.0						2.9
12	280	12.8						2.8
13	300	12.4						2.7
14	300	12.3				5.0	(3.7)	2.7
15	290	12.1						2.7
16	280	11.5						2.6
17	270	11.0						2.6
18	270	10.0						2.6
19	270	9.2						2.6
20								2.6
21								2.6
22								2.6
23								2.9

Time: 60.0°W.

Sweep: 2.8 Mc to 13.0 Mc in 9 minutes; supplemented by manual operation.

Table 9

Guam I. (13.6°N, 144.9°E)

November 1948*

Time	$h^{\circ}F2$	$f^{\circ}F2$	$h^{\circ}F1$	$f^{\circ}F1$	$h^{\circ}E$	$f^{\circ}E$	F_{Es}	$F2-N3000$
00	230	11.5			2.5	3.1		
01	230	10.5			2.9	3.2		
02	230	10.0			2.2	3.2		
03	220	8.0			2.5	3.2		
04	230	6.3			2.2	3.0		
05	240	5.1			2.6	3.1		
06	250	5.5			2.5	2.9		
07	250	9.6			3.6	3.1		
08	240	12.9			5.0	3.0		
09	230	14.7			5.0	2.9		
10	220	14.4			5.8	2.6		
11	210	14.0			5.5	2.4		
12	210	13.8			5.8	2.3		
13	215	13.6			6.0	2.3		
14	220	14.2			6.6	2.4		
15	230	14.4			5.8	2.4		
16	240	14.6			6.1	2.5		
17	250	14.7			6.0	2.5		
18	270	14.7			5.0	2.4		
19	320	14.3			4.8	2.3		
20	300	(14.4)			3.0	(2.4)		
21	260	14.2			3.4	2.6		
22	240	13.2			4.6	2.8		
23	230	12.0			2.6	(2.9)		

Time: 150.0°E.

Sweep: 1.25 Mc to 19.0 Mc in 12 minutes, manual operation.

*Data for November 1 through 20, only.

Table 10

Trinidad, Brit. West Indies (10.6°N, 61.2°W)

November 1948

Time	$h^{\circ}F2$	$f^{\circ}F2$	$h^{\circ}F1$	$f^{\circ}F1$	$h^{\circ}E$	$f^{\circ}E$	F_{Es}	$F2-N3000$
00	240	7.2						
01	230	6.6						
02	250	4.2						
03	260	3.2						
04	310	3.2						
05	290	3.9						
06	280	6.0						
07	250	9.8			120	2.5	3.0	3.2
08	240	12.4			120	3.1	3.8	3.2
09	250	13.8	230	4.7	120	3.5	4.1	3.1
10	250	13.9	220	4.9	120	3.8	4.4	3.1
11	260	13.5	220	5.0	120	3.9	4.4	3.0
12	265	13.2	220	5.1	120	3.9	4.6	2.9
13	260	12.6	220	5.1	120	3.8	4.6	2.8
14	260	12.6	220	4.8	120	3.6	4.4	2.8
15	250	12.2	220	4.7	120	3.5	4.3	2.8
16	270	12.0	240	4.8	120	3.1	4.2	2.8
17	250	11.8			120	2.5	3.8	2.8
18	255	11.6					3.2	2.9
19	250	11.2					3.0	2.9
20	250	10.4					2.5	2.9
21	250	10.0					2.3	2.9
22	250	9.5						3.0
23	250	8.0						3.0

Time: 60.0°W.

Sweep: 1.2 Mc to 16.0 Mc, manual operation.

Table 11

Palmyra I. (5.9°N, 182.1°W)

November 1948

Time	$h^{\circ}F2$	$f^{\circ}F2$	$h^{\circ}F1$	$f^{\circ}F1$	$h^{\circ}E$	$f^{\circ}E$	F_{Es}	$F2-N3000$
00	250	10.9			4.4	3.0		
01	250	(9.2)			4.2	2.9		
02	260	(8.2)			3.9	2.9		
03	255	7.8			3.8	2.9		
04	245	(7.3)			3.0	3.0		
05	250	6.8			3.0	2.9		
06	280	7.1			2.6	2.9		
07	270	10.2	130	2.5	2.8	2.8		
08	250	12.6	120	3.2	4.1	2.7		
09	270	13.7	240	3.7	4.3	2.6		
10	280	12.6	230	3.6	4.5	2.4		
11	270	12.0	220	4.0	4.3	2.3		
12	270	12.1	220	4.1	4.3	2.3		
13	260	12.5	200	4.0	4.3	2.3		
14	280	13.1	200	4.4	3.8	4.4	2.4	
15	250	13.7	200	3.6	4.3	2.4		
16	250	14.3			3.2	4.3	2.6	
17	270	14.6			130	2.7	4.3	2.5
18	290	14.5			155	3.8	2.6	
19	320	14.3				3.7	2.5	
20	300	14.0				3.6	2.6	
21	280	13.8				3.8	2.6	
22	270	13.6				4.6	2.6	
23	260	12.3				4.3	3.0	

Time: 157.5°W.

Sweep: 1.0 Mc to 13.0 Mc in 1 minute 36 seconds, automatic operation;

13.0 Mc to 18.0 Mc, manual operation.

Table 12

Huancayo, Peru (12.0°S, 76.2°W)

November 1948

Time	$h^{\circ}F2$	$f^{\circ}F2$	$h^{\circ}F1$	$f^{\circ}F1$	$h^{\circ}E$	$f^{\circ}E$	F_{Es}	$F2-N3000$
00	285	(9.4)						(2.7)
01	270	(8.6)						(2.9)
02	240	8.2						3.1
03	235	7.2						3.1
04	230	6.0						3.1
05	240	5.6						3.0
06	250	9.0						3.0
07	240	11.8					2.4	3.0
08	230	12.9					3.1	2.9
09	230	13.4	220	5.4			3.6	2.6
10	230	13.8	210	5.4			3.9	2.8
11	220	12.6	205	5.4			4.1	2.3
12	210	12.7	210	6.4			11.9	2.2
13	210	12.6	210	6.4			11.1	2.3
14	210	12.7					4.2	2.3
15	220	12.7					4.0	2.2
16	240	12.6					3.6	2.2
17	260	12.2					3.2	2.2
18	300	11.9					2.6	2.1
19	370	11.2					1.5	2.2
20	405	10.0						2.1
21	395	9.8						2.2
22	380	10.0						(2.4)
23	330	9.9						(2.5)

Time: 75.0°W.

Sweep: 16.0 Mc to 0.6 Mc in 15 minutes, automatic operation.

Table 13Lindau/Harz, Germany (51.6°N , 10.1°E)

October 1948

Time	$\text{h}^{\circ}\text{F2}$	$\text{f}^{\circ}\text{F2}$	$\text{h}^{\circ}\text{F1}$	$\text{f}^{\circ}\text{F1}$	h°E	f°E	fEs	F2-N3000
00	300	4.4				3.0		
01	300	4.3				3.2		
02	300	4.2				3.5		
03	300	3.8				3.4		
04	300	3.2				3.4		
05	300	3.2				3.5		
06	280	3.6				3.4		
07	230	5.5				3.8		
08	210	7.2	105	2.4	2.4	3.6		
09	210	8.5	105	2.8	3.8			
10	205	9.8	100	3.0	3.9			
11	200	10.5	100	3.1	3.8			
12	205	11.1	100	3.2	3.8			
13	205	10.8	100	3.2	3.8			
14	210	10.7	100	3.0	3.7			
15	210	11.3	100	2.8	3.4			
16	210	10.4	105	2.4	3.4			
17	210	10.3				3.5		
18	220	8.9				3.3		
19	210	7.9				3.3		
20	210	5.8				3.0		
21	250	5.4				3.1		
22	295	5.1				3.0		
23	300	4.4				3.0		

Time: 15.0°E .

Sweep: 1.0 Mc to 16.0 Mc in 12 minutes.

Table 14Johannesburg, Union of S. Africa (26.2°S , 28.0°E)

October 1948

Time	$\text{h}^{\circ}\text{F2}$	$\text{f}^{\circ}\text{F2}$	$\text{h}^{\circ}\text{F1}$	$\text{f}^{\circ}\text{F1}$	h°E	f°E	fEs	F2-N3000	
00	(270)	6.3							1.6
01	(260)	5.9							2.8
02	(250)	5.3							2.8
03	(265)	4.9							2.8
04	(270)	4.7							2.8
05	(270)	4.6							2.8
06	240	7.3							3.1
07	240	9.3	230				110	2.1	3.1
08	250	10.6	220				110	2.9	3.0
09	260	11.2	220	(4.9)	100	3.6			2.9
10	280	11.6	210	5.0	110	3.9			2.8
11	290	11.9	210	5.2	100	(4.0)			2.7
12	295	12.6	210	5.2	110	(4.0)			2.7
13	310	12.8	210	5.4	110	(4.0)			2.7
14	310	12.4	220	6.0	110	3.9	4.1		2.7
15	310	12.2	220		110	3.6	3.9		2.7
16	285	12.0	240		110	3.3	3.7		2.7
17	260	12.1	250		110	2.7	3.3		2.8
18	240	11.8					2.0	2.0	2.9
19	230	10.9						1.9	2.9
20	230	9.9							2.9
21	240	8.3							2.9
22	250	7.1							1.5
23	260	6.7							2.8

Time: 30.0°E .

Sweep: 1.0 Mc to 15.0 Mc in 7 seconds.

Table 15Capetown, Union of S. Africa (34.2°S , 18.3°E)

October 1948

Time	$\text{h}^{\circ}\text{F2}$	$\text{f}^{\circ}\text{F2}$	$\text{h}^{\circ}\text{F1}$	$\text{f}^{\circ}\text{F1}$	h°E	f°E	fEs	F2-N3000
00	(275)	5.1				2.8		
01	(290)	4.9				2.7		
02	(295)	5.0				2.7		
03	(280)	4.7				2.8		
04	(280)	4.6				2.7		
05	(280)	4.2				2.7		
06	270	5.4		1.8		2.9		
07	240	7.8	120	2.5		3.2		
08	250	9.4	240	110	3.0	3.0		
09	260	10.2	230	110	2.3	2.9		
10	(270)	11.1	220	4.9	110	(3.5)	2.8	
11	290	11.6		5.6	110	(2.8)		
12	300	12.2		5.9	110	2.7		
13	310	12.3		5.6	110	2.7		
14	310	12.6		5.8	110	2.7		
15	310	12.5		5.8	110	2.7		
16	300	12.3	240		110	3.5		
17	270	12.2	240		110	3.0		
18	250	12.0	240		120	2.4	2.6	
19	240	11.3			1.8	1.7	(2.9)	
20	230	9.7				3.0		
21	230	7.9			1.5	2.9		
22	(250)	6.6			1.4	2.9		
23	(250)	5.6				2.8		

Time: 30.0°E .

Sweep: 1.0 Mc to 15.0 Mc in 7 seconds.

Table 16Brisbane, Australia (27.5°S , 154.0°E)

September 1948

Time	$\text{h}^{\circ}\text{F2}$	$\text{f}^{\circ}\text{F2}$	$\text{h}^{\circ}\text{F1}$	$\text{f}^{\circ}\text{F1}$	h°E	f°E	fEs	F2-N3000
00	245	6.9						2.9
01	245	6.6						2.8
02	240	6.4						2.8
03	250	5.6						2.7
04	280	5.7						2.7
05	280	5.6						2.7
06	250	7.6						3.1
07	240	9.6					100	2.8
08	230	10.6					100	3.3
09	250	11.4		220			100	3.5
10	250	11.7	215	5.0	100	3.8		3.1
11	260	11.4	210	5.0	100	3.8		3.0
12	260	11.2	210	5.0	100	3.8		2.8
13	260	11.1	210	5.0	110	3.8		2.8
14	250	10.6	210	5.0	110	3.7		2.8
15	250	10.4	210		110	3.5		2.8
16	240	10.0			110	3.0		2.9
17	250	9.6			115	2.4		3.0
18	240	9.2						3.0
19	250	8.8						2.9
20	250	8.6						2.9
21	250	8.3						2.9
22	250	7.9						2.9
23	250	7.5						2.9

Time: 150.0°E .

Sweep: 1.0 Mc to 16.0 Mc in 1 minute 55 seconds.

Table 17

Canberra, Australia (35.3°S, 149.0°E)

September 1948

Time	h'F2	f'F2	h'Fl	f'Fl	h'E	f'E	f'Es	F2-M3000
00	250	6.2				2.7		
01	255	6.7			1.9	2.6		
02	250	5.6			2.2	2.7		
03	250	5.2				2.7		
04	260	4.9				2.6		
05	280	4.7				2.6		
06	260	5.1	120	1.8		2.9		
07	240	7.2	100	2.5	3.1	3.1		
08	230	9.0	100	3.0	3.2	3.1		
09	220	10.3	100	3.4		3.0		
10	218	10.6	205	4.8	100	3.6	3.0	
11	250	10.8	200	4.9	100	3.7	2.9	
12	260	11.0	200	5.0	100	3.7	2.9	
13	250	10.8	200	4.6	100	3.7	2.8	
14	220	10.4	200	4.6	100	3.6	2.8	
15	220	10.2	200	4.2	100	3.4	2.8	
16	220	9.8			100	3.0	2.9	
17	240	9.4			105	2.4	2.8	
18	240	8.8				1.7	3.0	
19	240	8.4					2.8	
20	250	7.8					2.8	
21	250	7.5					2.7	
22	250	7.0					2.8	
23	255	6.8					2.7	

Time: 150.0°E.

Sweep: 1.0 Mc to 16.0 Mc in 1 minute 55 seconds.

Table 18*

Fraeerburgh, Scotland (57.6°N, 2.1°W)

August 1948

Time	h'F2	f'F2	h'Fl	f'Fl	h'E	f'E	f'Es	F2-M3000
00	330	(5.4)						
01	345	5.0						
02	355	4.4						
03	340	4.3						
04	320	4.4	350*		2.6*			
05	295	5.1	280		3.5			
06	280	6.0	265		4.0	125	2.6	2.8
07	270	7.0	245		4.6	125	2.9	2.6
08	310	(7.0)	240		4.9	120	3.2	3.4
09	305	7.2	230		5.2	115	3.4	3.7
10	355	7.0	235		5.4	120	3.6	2.8
11	350	(7.2)	230		5.5	120	3.9	3.8
12	360	7.0	230		5.5	115	3.9	2.7
13	380	7.1	225		5.5	120	3.8	2.6
14	355	7.0	235		5.6	115	3.8	2.8
15	340	7.2	235		5.5	115	3.6	2.7
16	315	7.4	240		5.1	115	3.4	3.8
17	270	7.8	240		4.7	120	3.1	3.7
18	270	7.8	160*		4.0*	120	2.7	4.1
19	260	7.9				125	2.4	2.6
20	260	(8.1)						
21	280	(7.2)						
22	300	7.0						
23	315	(5.4)						

Time: Local.

Sweep: 2.2 Mc to 16.0 Mc in 1 minute.

*Average values except f'F2 and f'Es, which are median values.

#One or two observations only.

Table 19*

Slough, England (51.5°N, 0.6°E)

August 1948

Time	h'F2	f'F2	h'Fl	f'Fl	h'E	f'E	f'Es	F2-M3000
00	307	6.2				2.8	2.5	
01	311	5.8				3.0	2.5	
02	316	5.4				3.1	2.5	
03	305	5.0				3.4	2.6	
04	302	4.7			1.5*	3.5	2.6	
05	296	5.3	271	3.4	122	1.8	3.7	2.7
06	289	6.1	268	4.0	119	2.3	4.8	2.8
07	312	7.0	244	4.6	116	2.9	5.0	2.8
08	355	7.8	235	5.0	114	3.2	5.0	2.8
09	362	7.4	235	6.2	112	3.5	5.1	2.8
10	359	7.8	229	5.4	112	3.6	5.0	2.8
11	383	7.8	231	5.5	112	3.8	5.0	2.8
12	376	7.8	232	6.5	112	3.9	5.0	2.8
13	384	7.9	228	5.5	113	3.9	5.0	2.7
14	382	7.9	236	5.5	114	3.7	4.9	2.7
15	359	7.8	238	5.4	114	3.6	5.0	2.7
16	345	7.8	240	5.1	113	3.4	4.9	2.8
17	299	8.1	246	4.6	115	3.0	5.0	2.8
18	273	8.5	250	4.2	118	2.4	4.9	2.8
19	266	8.7	260*	4.0*	131	2.0	3.5	2.8
20	269	8.2				3.5	2.8	
21	268	7.8				3.4	2.7	
22	292	7.1				3.2	2.6	
23	297	8.8				3.3	2.5	

Time: Local.

Sweep: 0.5 Mc to 16.5 in 5 minutes.

*Average values except f'F2 and f'Es, which are median values.

#One or two observations only.

Table 20

Shibata, Japan (37.9°N, 139.3°E)

August 1948

Time	h'F2	f'F2	h'Fl	f'Fl	h'E	f'E	f'Es	F2-M3000
00	280	7.4						3.4
01	290	7.6						3.0
02	290	7.2						2.8
03	270	6.8						2.7
04	280	6.6	240					2.8
05	270	6.8	240				(1.6)	2.9
06	240	7.5	225		3.7	100	2.4	3.1
07	240	8.7	200		4.5	100	2.8	3.2
08	260	9.1	200		4.9	100	3.3	3.1
09	270	9.2	200		5.1	100	3.4	3.2
10	300	9.2	200		5.3	100	3.7	3.0
11	300	9.3	200		5.5	100	3.8	3.0
12	300	9.8	200		5.5	100	4.0	3.5
13	310	9.6	200		5.6	100	3.8	3.2
14	300	9.2	200		5.2	100	3.8	3.0
15	290	9.0	200		4.9	100	3.7	3.0
16	280	9.0	200		5.0	100	3.4	3.1
17	260	8.9	210			100	3.0	3.1
18	245	9.0	225				2.4	3.2
19	240	8.5					(1.7)	3.0
20	240	7.8						2.9
21	300	7.7						4.6
22	280	7.8						2.7
23	280	7.7						3.8

Time: 135.0°E.

Sweep: 1.0 Mc to 17.0 Mc in 16 minutes, manual operation.

Table 21*

Fraserburgh, Scotland (57.6°N , 2.1°W)

July 1948

Time	$\text{h}^{\circ}\text{F2}$	$\text{f}^{\circ}\text{F2}$	$\text{h}^{\circ}\text{F1}$	$\text{f}^{\circ}\text{F1}$	h°E	f°E	fEs	F2-N3000
00	291	(7.2)						2.5
01	295	(6.9)						2.5
02	290	6.6						2.5
03	297	6.2	3.3#					2.6
04	293	6.2	312#	3.4#				2.7
05	276	6.6	244		2.5			2.7
06	301	6.6	218	4.6	104	3.0	2.9	2.6
07	357	6.9	217	4.8	104	3.3	4.2	2.6
08	336	7.3	234	5.2	109	3.3	4.2	2.7
09	350	7.3	234	5.4	102	3.6	4.2	2.8
10	363	7.5	231	5.4	96	3.7	4.1	2.6
11	343	7.2	218	5.6	103	3.7	4.2	2.6
12	397	7.1	232	5.7	109	3.8	4.0	2.6
13	385	7.2	216	5.5	104	3.7		2.7
14	400	7.0	218	5.6	104	3.8		2.7
15	375	7.2	219	5.5	108	3.8		2.7
16	344	7.1	222	5.3	107	3.5	4.0	2.8
17	306	7.3	235	5.1	109	3.4	4.1	2.8
18	266	7.6	217	4.6	108	3.1	4.2	2.7
19	248	7.5			111	2.7	3.8	2.9
20	251	(7.6)			135#	2.3#	2.6	2.9
21	258	(7.6)						2.8
22	265	(7.6)						2.8
23	280	7.5						2.4

Time: Local.

Sweep: 2.2 Mc to 16.0 Mc in 1 minute.

Average values except for $\text{f}^{\circ}\text{F2}$ and fEs , which are median values.

#One or two observations only.

Table 22*

Slough, England (51.5°N , 0.6°W)

July 1948

Time	$\text{h}^{\circ}\text{F2}$	$\text{f}^{\circ}\text{F2}$	$\text{h}^{\circ}\text{F1}$	$\text{f}^{\circ}\text{F1}$	h°E	f°E	fEs	F2-N3000
00	294	7.4						2.6
01	294	6.8						2.5
02	296	6.5						2.6
03	300	6.1						2.6
04	295	6.1	295	3.3	118	1.7	3.6	2.6
05	301	6.4	256	3.9	119	2.2		2.7
06	334	6.9	241	4.5	117	2.7	4.4	2.7
07	353	7.4	235	4.9	110	3.2	5.0	2.7
08	372	7.6	226	5.3	109	3.4	5.4	2.7
09	369	7.8	234	5.5	109	3.7	6.3	2.7
10	373	7.8	228	5.6	109	3.8	6.4	2.7
11	404	7.7	230	5.7	109	3.9	6.1	2.6
12	401	7.6	234	5.7	110	3.9	6.2	2.6
13	406	7.8	228	5.7	110	4.0	4.9	2.6
14	394	7.6	229	5.7	109	3.9	5.0	2.6
15	385	7.5	233	5.6	110	3.7	4.9	2.7
16	369	7.6	236	5.4	110	3.5	4.8	2.7
17	344	7.6	238	5.0	112	3.2		2.7
18	298	8.0	250	4.5	116	2.8	3.7	2.8
19	269	7.8	256	3.9	120	2.2	3.8	2.8
20	266	7.8	225#		115#	1.9#	3.2	2.8
21	266	7.8						3.1
22	281	7.8						2.6
23	290	7.6						2.6

Time: Local.

Sweep: 0.5 Mc to 16.5 Mc in 5 minutes.

Average values except for $\text{f}^{\circ}\text{F2}$ and fEs , which are median values.

#One or two observations only.

Table 23*

Falkland Is. (51.7°S , 57.8°W)

July 1948

Time	$\text{h}^{\circ}\text{F2}$	$\text{f}^{\circ}\text{F2}$	$\text{h}^{\circ}\text{F1}$	$\text{f}^{\circ}\text{F1}$	h°E	f°E	fEs	F2-N3000
00	284	3.0				2.4		
01	372	3.0				2.4		
02	369	2.9				2.4		
03	365	2.9				2.5		
04	341	2.9				2.5		
05	305	3.0				2.6		
06	308	2.8				2.8		
07	275	4.1				2.9		
08	223	6.9	155#	2.4#		3.2		
09	219	8.2	165#	2.6		3.4		
10	222	9.4				3.3		
11	222	10.2	133#	2.7#		3.3		
12	222	9.8	125#	2.9#		3.3		
13	223	8.9	125#	2.9#		3.3		
14	225	8.2	147#	2.6#		3.4		
15	228	7.8				3.2		
16	221	6.1				3.2		
17	241	4.8				3.1		
18	251	4.4				3.0		
19	262	3.6				2.9		
20	289	2.9				2.8		
21	315	2.8				2.6		
22	361	2.9				2.4		
23	392	3.0				2.4		

Time: Local.

Sweep: 2.2 Mc to 16.0 Mc in 1 minute.

Average values except $\text{f}^{\circ}\text{F2}$, which are median values.

#One or two observations only.

Table 24

Fribourg, Germany (48.1°N , 7.8°E)

June 1948

Time	$\text{h}^{\circ}\text{F2}$	$\text{f}^{\circ}\text{F2}$	$\text{h}^{\circ}\text{F1}$	$\text{f}^{\circ}\text{F1}$	h°E	f°E	fEs	F2-N3000
00	310	(8.0)						2.9
01	310	7.7						2.5
02	310	7.5						2.5
03	315	7.3						2.4
04	312	7.2						2.5
05	(290)	(7.7)	270		120	2.3	3.6	(2.7)
06	320	(8.3)	250	4.6	110	2.7	4.2	(2.6)
07	330	(8.8)	248	(5.2)	110	3.2	5.0	(2.7)
08	365	9.0	240	5.5	102	3.4	5.6	2.6
09	370	9.0	230	5.6	105	3.6	5.6	2.6
10	375	(9.1)	240	5.6	100	3.7	5.8	2.6
11	390	(9.0)	230	6.0	100	3.8	5.6	(2.6)
12	390	8.9	235	5.8	102	3.8	5.9	(2.6)
13	390	8.7	225	5.8	100	3.7	5.3	(2.6)
14	402	8.5	230	5.7	108	3.7	5.8	2.5
15	390	8.4	240	5.6	110	3.5	4.5	(2.6)
16	385	8.2	240	5.4	110	3.4	4.6	2.6
17	360	(8.1)	250	5.2	110	3.2	4.4	(2.6)
18	320	(8.4)	260		110	2.7	4.9	2.6
19	300	8.4						
20	280	(8.4)						
21	280	(8.3)						
22	300	(8.3)						
23	300	(8.3)						

Time: Local.

Sweep: 1.6 Mc to 17.6 Mc in 10 minutes, automatic operation.

Table 25*

Falkland Is. (51.7°S, 57.8°W)

June 1948

Time	$h^{\circ}F2$	$f^{\circ}F2$	$h^{\circ}F1$	$f^{\circ}F1$	$h^{\circ}E$	$f^{\circ}E$	$f^{\circ}Es$	F2-M3000
00	392	3.1				2.3		
01	376	3.1				2.4		
02	381	3.1				2.4		
03	377	3.1				2.4		
04	355	3.0				2.4		
05	326	3.0				2.6		
06	276	3.0				2.8		
07	270	3.9				2.7		
08	226	6.8			2.4#	3.1		
09	223	8.4		148	2.6	3.3		
10	219	9.9		135	2.9	3.3		
11	231	9.9		131	2.9	3.3		
12	235	9.9		129	3.0	3.3		
13	234	9.2		135	2.9#	3.2		
14	233	8.8		144	2.7	3.3		
15	227	7.8		160#	2.6#	3.3		
16	222	6.4				3.0		
17	241	4.7				3.0		
18	252	4.1				3.0		
19	268	3.5				2.9		
20	283	3.0				2.7		
21	320	3.0				2.6		
22	393	3.1				2.4		
23	386	3.2				2.4		

Time: Local.

Sweep: 2.2 Mc to 16.0 Mc in 1 minute.

*Average values except $f^{\circ}F2$, which are median values.

#One or two observations only.

Table 26

Bagneux, France (48.8°N, 2.3°E)

May 1948

Time	$h^{\circ}F2$	$f^{\circ}F2$	$h^{\circ}F1$	$f^{\circ}F1$	$h^{\circ}E$	$f^{\circ}E$	$f^{\circ}Es$	F2-M3000
00					260			
01					235			
02					230			
03					220			
04					240			
05					240			
06	300	6.8						(2.9)
07	340	8.0						
08	370	6.8					4.4	(3.0)
09	370	8.7					4.1	2.7
10	395	9.0					4.5	2.5
11	400	9.5					4.2	2.7
12	395	8.6						2.6
13	410	9.0						4.4 (2.5)
14	400	8.6						4.4 (2.6)
15	365	8.6						4.1 (2.6)
16	370	8.6						4.0
17	360	8.8						2.8
18	300	8.6						(3.0)
19	300	9.0						(2.8)
20	280	7.7						
21	320	8.2						
22	330	7.8						
23								

Time: 0.0°.

Sweep: 3.9 Mc to 6.8 Mc, and 7.8 Mc to 13.5 Mc in 12 minutes, manual operation.

*Medians in this column were obtained from observed values of $f^{\circ}F2$ and values derived from $f^{\circ}F2$.

Table 27

Fribourg, Germany (48.1°N, 7.8°E)

May 1948

Time	$h^{\circ}F2$	$f^{\circ}F2$	$h^{\circ}F1$	$f^{\circ}F1$	$h^{\circ}E$	$f^{\circ}E$	$f^{\circ}Es$	F2-M3000
00	(335)	7.4			2.4	2.4		
01	340	6.9			2.6	2.4		
02	340	6.7			2.5	2.3		
03	340	6.3			2.5	2.3		
04	340	5.8			3.3	2.4		
05	290	6.4	290	3.5	130	2.0	3.6	2.6
06	360	6.8	262	4.1	115	2.6	4.4	2.6
07	395	7.3	250	4.8	110	3.2	4.0	2.5
08	385	7.8	240	5.2	110	3.5	4.8	2.6
09	410	8.4	230	5.7	110	3.7	4.5	(2.5)
10	435	8.6	235	5.7	110	3.9	4.6	2.4
11	420	8.8	230	5.8	110	3.9	5.0	2.4
12	405	8.7	230	6.0	110	4.0	4.6	2.5
13	400	8.6	225	5.9	110	3.9	4.6	2.4
14	422	8.7	240	5.7	110	3.9	4.7	2.5
15	405	8.5	240	5.6	110	3.7	4.5	2.5
16	390	8.3	250	5.6	110	3.4	4.4	2.6
17	360	8.4	260	5.0	110	3.1	4.1	2.6
18	285	8.4	260	120	2.6	3.6	(2.7)	
19	288	(8.4)		140	1.8	3.1	(2.6)	
20	290	(8.2)				3.2	(2.6)	
21	295	(7.9)				2.8	(2.4)	
22	320	(8.0)				2.6	(2.5)	
23	320	(7.6)				2.5	(2.4)	

Time: Local.

Sweep: 1.6 Mc to 17.6 Mc in 10 minutes, automatic operation.

Table 28

Fribourg, Germany (48.1°N, 7.8°E)

April 1948

Time	$h^{\circ}F2$	$f^{\circ}F2$	$h^{\circ}F1$	$f^{\circ}F1$	$h^{\circ}E$	$f^{\circ}E$	$f^{\circ}Es$	F2-M3000
00	310	7.7						2.5
01	320	7.3						2.5
02	320	7.0						2.4
03	310	6.5						2.5
04	310	6.0						2.4
05	290	6.0						2.4
06	265	6.8						2.8
07	260	(7.7)	250					(2.9)
08	260	8.5	240	(5.0)	110	3.2	3.8	2.8
09	310	9.6	230	5.1	110	3.5	4.0	2.7
10	310	10.5	220	5.6	110	3.7	4.3	2.6
11	330	11.0	220	(6.0)	110	3.7	4.4	2.7
12	340	11.1	220	6.1	110	3.8	4.2	2.6
13	330	10.7	230	5.3	110	3.7	4.4	2.6
14	340	10.7	230	5.5	110	3.6	4.1	2.6
15	300	10.4	238	5.6	110	3.4	4.0	2.6
16	250	10.4	250		110	3.2	3.5	2.7
17	260	10.4			110	2.8	3.5	(2.8)
18	265	9.9			120	2.2	3.3	2.8
19	260	(9.8)			120	2.4	(2.7)	
20	262	(8.6)						2.2 (2.8)
21	270	(8.2)						2.2 (2.6)
22	290	7.8						2.2 2.6
23	305	7.8						2.3 2.6

Time: Local.

Sweep: 1.6 Mc to 17.6 Mc in 10 minutes, automatic operation.

Central Radio Propagation Laboratory, National Bureau of Standards, Washington 25, D.C.
TABLE 29
IONOSPHERIC DATA

Day	75°W												Mean Time												
	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	
Observed at	Washington, D. C.												Lat. 39.0°N., Long. 77.5°W.												
(Characteristic)	hF2	Km	(Unit)	December	1948	(Month)																			
1	250	260	250	260	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250	
2	250	250	250	250	250	240	240	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250	
3	250	270	270	260	260	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250	
4	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250	
5	260	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250	
6	250	300	310	280	260	230	240	240	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250	
7	250	270	270	270	270	270	270	270	270	270	270	270	270	270	270	270	270	270	270	270	270	270	270	270	
8	290	270	270	270	270	270	270	270	270	270	270	270	270	270	270	270	270	270	270	270	270	270	270	270	
9	240	260	260	260	260	260	260	260	260	260	260	260	260	260	260	260	260	260	260	260	260	260	260	260	
10	260	280	280	280	280	280	280	280	280	280	280	280	280	280	280	280	280	280	280	280	280	280	280	280	
11	230	240	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250	
12	250	(260) ⁵	(300) ⁵	290	290	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250	
13	(280) ⁵	(280) ⁵	(280) ⁵	290	280	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250	
14	260	300	350	240	230	200	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250	
15	250	250	270	260	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250	
16	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250	
17	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250	
18	250	260	260	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250	
19	250	260	260	260	260	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250	
20	250	280	280	260	260	240	220	240	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250	
21	250	290	260	260	250	250	270	340	270	270	270	270	270	270	270	270	270	270	270	270	270	270	270	270	
22	250	270	270	270	270	270	270	270	270	270	270	270	270	270	270	270	270	270	270	270	270	270	270	270	
23	250	270	270	270	270	270	270	270	270	270	270	270	270	270	270	270	270	270	270	270	270	270	270	270	
24	270	320	350	310	280	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250	
25	250	260	260	260	260	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250	
26	230	260	270	270	270	270	270	270	270	270	270	270	270	270	270	270	270	270	270	270	270	270	270	270	
27	280	300	300	280	250	230	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250	
28	270	300	280	280	250	250	240	240	240	240	240	240	240	240	240	240	240	240	240	240	240	240	240	240	
29	250	280	260	260	260	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250	
30	260	270	270	270	270	270	270	270	270	270	270	270	270	270	270	270	270	270	270	270	270	270	270	270	
31	240	260	260	270	270	310	310	280	220	230	230	230	230	230	230	230	230	230	230	230	230	230	230	230	
Median	250	270	260	260	260	250	250	250	240	240	240	240	240	240	240	240	240	240	240	240	240	240	240	240	
Count	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	

Sweep 10 Mc to 250 Mc in 0.25 min
Manual □ Automatic X

TABLE 30
Central Radio Propagation Laboratory, National Bureau of Standards, Washington 25, D. C.
IONOSPHERIC DATA

National Bureau of Standards
(Institution)
Scaled by: E. J. W., J. J. S., A. G. K.

f₂F₂ Mc Dec 1948
(Characteristic) (Unit) (Month)

Observed at Washington, D. C.

Lat 39°N, Long 77.5°W

Day	75°W Mean Time											
	00	01	02	03	04	05	06	07	08	09	10	11
1	4.1	3.9	3.8	3.8	3.9	4.1	4.3	4.5	5.7	8.2	9.8	10.0
2	4.8	4.5	4.9	4.7	4.3	4.1	3.9	3.7	3.5	4.9	7.9	9.1
3	4.3	4.1	4.1	3.9	3.9	3.7	3.3	4.7	7.7	9.0	9.5	10.7
4	4.1	3.7	(3.6)	3.5	(2.9)	(3.1)	(3.1)	(3.1)	4.9	8.2	(9.3)	9.7
5	4.6	4.9	4.9	4.5	3.9	3.9	3.9	5.4	8.3	9.2	10.3	10.8
6	7	(4.3)	(3.9)	(3.9)	(4.1)	(4.4)	(4.4)	(4.4)	4.3	5.1	7.9	9.7
7	5.8	(6.1)	6.4	5.7	4.5	(4.2)	(4.2)	5.1	7.8	9.7	10.5	10.9
8	2.8	F	2.8	3.1	F	3.0	F	3.2	3.9	5.2	10.3	(10.1)
9	3.7	3.5	3.7	3.9	3.8	F	2.9	F	2.7	F	10.1	11.0
10	(4.0)	(4.6)	F	4.7	4.9	4.5	4.1	3.7	F	4.5	7.1	9.0
11	5.1	(4.7)	4.6	4.3	3.9	(3.9)	5	3.9	4.7	7.9	10.3	11.6
12	3.1	F	(2.7)	F	(2.7)	(3.0)	F	(3.6)	F	4.4	7.7	11.7
13	3.0	F	3.0	F	3.0	F	3.5	(4.0)	4.2	(7.6)	8.8	9.7
14	4.3	F	4.6	5.0	5.4	F	3.9	F	3.1	F	10.0	11.0
15	3.5	F	3.5	F	3.4	F	3.4	F	2.8	F	6.7	8.6
16	4.4	F	(3.8)	F	(4.7)	F	(5.1)	F	4.5	4.3	4.1	5.0
17	(4.6)	F	(4.9)	F	5.0	4.9	14.6	5	3.9	F	4.1	4.9
18	4.3	4.6	4.6	4.5	4.5	4.3	4.3	4.1	3.7	7.1	9.2	10.8
19	3.9	F	(4.9)	F	(4.8)	(4.7)	(4.7)	3.7	3.7	7.2	9.5	10.3
20	3.7	F	3.7	F	(3.7)	F	3.4	F	3.0	F	7.7	9.7
21	4.5	4.6	4.9	4.5	4.0	(4.0)	(4.0)	4.5	2.8	F	7.7	11.4
22	5.5	(4.8)	F	5.0	F	(3.4)	(5.5)	2.2	F	2.4	F	4.0
23	(5.7)	F	(5.7)	F	(5.4)	F	(4.4)	5	3.5	F	7.5	11.7
24	(3.9)	F	(4.5)	F	(4.4)	F	(4.3)	5	3.0	F	7.5	11.7
25	4.9	4.9	5.0	4.9	4.9	4.8	4.7	4.7	4.8	7.1	9.6	11.4
26	(4.6)	F	(4.5)	F	(3.0)	5	3.2	F	3.1	F	(3.1)	5
27	3.1	F	2.9	3.1	F	3.1	F	3.1	F	3.1	F	3.7
28	2.9	(4.8)	F	(3.0)	F	3.2	F	3.4	F	3.4	F	3.4
29	3.7	3.5	F	3.7	3.7	3.8	(3.5)	5	4.5	F	7.6	8.8
30	3.7	3.4	F	3.4	3.5	3.4	3.4	3.5	3.1	3.8	7.2	8.4
31	3.9	3.6	3.4	3.1	3.0	F	[2.8]	F	2.0	3.1	F	7.0
Median	4.1	3.8	3.9	3.9	3.9	3.7	3.5	4.5	7.1	9.5	10.3	11.5
Count	31	31	31	31	31	31	31	31	31	31	31	31

Sweep LO Mc in. 0.25 min
Manual □ Automatic ■

TABLE 31
IONOSPHERIC DATA
Central Radio Propagation Laboratory, National Bureau of Standards, Washington 25, D. C.

Characteristic) Mc December, 1948
(Unit) (Month)

Observed at Washington, D. C.
Lat 39.0°N, Long 77.5°W

National Bureau of Standards
(Institution) J. J. S., J. M. C.
Calculated by: J. J. S., A. G. K.

Day	75°W												Mean Time
	0030	0130	0230	0330	0430	0530	0630	0730	0830	0930	1030	1130	
1	3.9	3.9	3.8	3.9	4.2	4.3	4.6	7.2	10.8	[12.0] ⁵	[11.0] ²	[9.0] ³	4.7
2	(4.6) ⁵	4.9	4.6	4.5	4.3	3.9	[3.9] ⁵	[6.8] ⁵	[9.0] ⁵	[9.5] ⁵	[10.0] ⁵	[10.5] ⁵	4.7
3	4.1	4.1	3.9	3.8	3.5	3.5	3.5	6.3	8.8	[9.3] ⁵	[11.4] ⁵	[11.6] ⁵	4.7
4	(3.9) ⁵	(3.7) ⁵	(3.1) ⁵	(3.1) ⁵	2.9F	2.9F	(2.9) ⁵	(3.9) ⁵	6.8	5.9	11.3	[11.6] ⁵	[9.8] ⁵
5	4.8	5.1	4.9	(4.2) ⁵	(3.6) ⁵	(4.0) ⁵	7.3	9.1	9.3	11.5	10.4	[11.4] ⁵	[9.8] ⁵
6	(3.9) ⁵	3.9	(3.9) ⁵	(4.3) ⁵	(4.4) ⁵	4.3	(4.3) ⁵	6.7	9.8S	11.2	11.8	[11.4] ⁵	[9.7] ⁵
7	(5.9) ⁵	6.4	[6.3] ⁵	(4.9) ⁵	(4.3) ⁵	4.7	(4.0) ⁵	6.7	(9.8) ⁵	9.7	11.6	[11.6] ⁵	[9.8] ⁵
8	2.8F	3.0F	3.1F	3.0F	3.2F	3.1F	4.0	6.6	9.6	10.0	(10.0) ⁵	[11.3] ⁵	12.0
9	3.6F	3.6F	3.9F	3.9F	3.1F	2.8F	2.8F	8.7	9.4	10.9	11.4	[11.0] ⁵	[9.8] ⁵
10	4.1	4.8	5.2	4.7	4.9	4.1F	4.2F	8.0	8.3	9.8	11.0	[11.0] ⁵	[9.7] ⁵
11	4.9	(4.7) ⁵	4.5	(4.0) ⁵	(4.3) ⁵	4.1	3.9	(3.5) ⁵	6.4	8.6	11.7	[11.4] ⁵	[9.8] ⁵
12	2.9F	(2.6) ⁵	(2.3) ⁵	(3.0) ⁵	(3.0) ⁵	3.4F	3.4F	6.1	8.3	9.9	11.5	[10.0] ⁵	[11.6] ⁵
13	3.0F	2.9F	(3.3) ⁵	3.7F	4.1	(4.1) ⁵	(4.0) ⁵	6.0	9.0	9.2	10.5	[10.8] ⁵	[11.3] ⁵
14	4.2F	4.9	5.2	4.7F	3.1F	3.2F	6.4	9.8	10.0	11.3	11.5	[10.8] ⁵	[11.9] ⁵
15	3.4F	3.4F	3.3F	2.6F	2.4F	2.2F	2.6F	8.3	[9.4] ⁵	11.0	11.6	[11.0] ⁵	[11.6] ⁵
16	4.5F	4.6F	4.9	4.9	4.3	4.2	4.4	6.4	9.5	10.0	11.4	[11.2] ⁵	[11.7] ⁵
17	(4.9) ⁵	(5.0) ⁵	(5.0) ⁵	(4.7) ⁵	(4.3) ⁵	4.1	4.2	6.7	9.8	(10.5) ⁵	11.9	[11.3] ⁵	[11.4] ⁵
18	4.3	4.6	4.5	4.3	4.1	3.5	(2.9) ⁵	5.5	9.0	10.2	11.3	[11.4] ⁵	[11.3] ⁵
19	(4.0) ⁵	(4.1) ⁵	(4.0) ⁵	(4.0) ⁵	(4.5) ⁵	(3.7) ⁵	3.7	6.2	9.7	(11.0) ⁵	(11.2) ⁵	[11.4] ⁵	[11.3] ⁵
20	3.7	(3.7) ⁵	(3.9) ⁵	3.7F	3.3F	2.9F	2.7F	5.6	8.9	11.0	11.6	[11.9] ⁵	[11.7] ⁵
21	(4.4) ⁵	4.7	4.7	4.2	(3.3) ⁵	(4.7) ⁵	(4.3) ⁵	4.1	4.2	6.7	9.8	[11.2] ⁵	[11.7] ⁵
22	(5.5) ⁵	5.1F	(4.9) ⁵	(4.7) ⁵	(4.7) ⁵	(4.7) ⁵	5.7F	5.9	9.3	10.2	11.4	[11.4] ⁵	[11.3] ⁵
23	(3.7) ⁵	(3.7) ⁵	(4.1) ⁵	(3.5) ⁵	(3.5) ⁵	(3.3) ⁵	3.7F	(6.3) ⁵	8.8	10.3	(10.7) ⁵	[11.7] ⁵	11.8
24	(6.9)F	(4.4)F	(4.9)F	(3.9)F	(3.9)F	4.3	(3.8) ⁵	3.7F	8.8	(10.9) ⁵	11.7	[11.6] ⁵	[11.5] ⁵
25	4.9	4.9	4.9	4.9	4.7	(4.6) ⁵	4.4	6.6	8.9	10.0	10.6	[10.6] ⁵	[10.8] ⁵
26	(3.3)F	(4.9)F	(3.7)F	3.1F	2.2F	(2.7) ⁵	2.2F	5.9	8.8	10.2	11.4	[11.4] ⁵	[11.3] ⁵
27	3.1F	2.9	3.0	3.3	3.1	3.1	3.1	5.9	9.2	10.9	11.6	[11.8] ⁵	[12.0] ⁵
28	2.8	2.8	3.2	3.2F	3.4	3.5F	3.7	5.9	(8.3) ⁵	9.2	(10.3) ⁵	11.3	11.2
29	3.5	(3.7) ⁵	3.7	3.8	3.7	(3.3) ⁵	3.5F	5.9	9.2	10.0	10.2	[11.0] ⁵	[11.0] ⁵
30	3.4F	3.6	3.4	3.4	3.4	[3.5]7A	[3.4]7A	3.2	5.6	8.3	(10.0) ⁵	(10.4) ⁵	11.5
31	3.6	3.6	3.4	3.4	3.0F	3.1	2.1F	3.2F	5.0	8.4	(9.7) ⁵	(9.5) ⁵	11.2
Median	3.9	3.9	3.9	3.9	3.8	3.7	6.2	8.9	9.9	10.8	11.2	11.7	11.7
Count	31	31	31	31	31	31	31	31	31	31	31	31	31

Sweep...Mc to 25.0 Mc in 0.25...min
Manual Automatic

TABLE 32
Central Radio Propagation Laboratory, National Bureau of Standards, Washington 25, D.C.
IONOSPHERIC DATA

Form adopted June 1946
National Bureau of Standards
Scaled by E.J.W., J.J.S. (Institution) J.M.C.

		75°W												Mean Time					
		Lat 39.0°N, Long 77.5°W																	
		Washington, D. C.																	
nFI	Km	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17
(Characteristic)	(Unit)	December	is 48																
Observed at	Washington, D. C.	Day	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16
		1																	
		2																	
		3																	
		4																	
		5																	
		6																	
		7																	
		8																	
		9																	
		10																	
		11																	
		12																	
		13																	
		14																	
		15																	
		16																	
		17																	
		18																	
		19																	
		20																	
		21																	
		22																	
		23																	
		24																	
		25																	
		26																	
		27																	
		28																	
		29																	
		30																	
		31																	
Median																			
Count																			

Sweep 1.0 — Mc to 2.50 Mc in 0.05 min
Manual Automatic

TABLE 33
Central Radio Propagation Laboratory, National Bureau of Standards, Washington 25, D. C.
IONOSPHERIC DATA

f₀F1 Mc December, 1948
(Characteristic) (Unit) (Month)
Observed at Washington, D. C.

Lati 39.0°N, Long 77.5°W

Day	75°W																								Mean Time	
	0.0	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0	1.1	1.2	1.3	1.4	1.5	1.6	1.7	1.8	1.9	2.0	2.1	2.2	2.3		
1																										
2																										
3																										
4																										
5																										
6																										
7																										
8																										
9																										
10																										
11																										
12																										
13																										
14																										
15																										
16																										
17																										
18																										
19																										
20																										
21																										
22																										
23																										
24																										
25																										
26																										
27																										
28																										
29																										
30																										
31																										
Median																										
Count																										

Note : 1.0 = Mc to 250 Mc in 0.25
Manual Automatic

Form adopted June 1946

TABLE 34
IONOSPHERIC DATA

Central Radio Propagation Laboratory, National Bureau of Standards, Washington 25, D.C.

hE — **Km** — **December, 1948**
 (Characteristic) (Unit) (Month)

Observed at Washington, D. C.**Lat. 39.0°N., Long 77.5°W.**

Day	75°W Mean Time											
	00	01	02	03	04	05	06	07	08	09	10	11
1												
2												
3												
4												
5												
6												
7												
8												
9												
10												
11												
12												
13												
14												
15												
16												
17												
18												
19												
20												
21												
22												
23												
24												
25												
26												
27												
28												
29												
30												
31												

Manual Automatic
 Sweep LO Mc 10.250 Mc in 0.25 min

Sweep LO

Automatic

Sweep LO

Automatic

U. S. GOVERNMENT PRINTING OFFICE 1946 O-3048

TABLE 35
IONOSPHERIC DATA
Central Radio Propagation Laboratory, National Bureau of Standards, Washington 25, D. C.
December, 1948
Lot. 39.0°N., Long. 77.5°W.

(Characteristic)	Mc (Unit)	Day	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	Mean Time				
																											75°W				
1																															
2																															
3																															
4																															
5																															
6																															
7																															
8																															
9																															
10																															
11																															
12																															
13																															
14																															
15																															
16																															
17																															
18																															
19																															
20																															
21																															
22																															
23																															
24																															
25																															
26																															
27																															
28																															
29																															
30																															
31																															
Median																															
Count																															

Sweep 1.0 Mc to 25.0 Mc in 0.25-min
Manual Automatic

National Bureau of Standards
(Institution)
E.U.W., J.J.S., J.M.C.

Scaled by: J.J.S., A.C.K.

Calculated by: J.J.S., A.C.K.

75°W

1948

1948

TABLE 36
Central Radio Propagation Laboratory, National Bureau of Standards, Washington 25, D. C.
IONOSPHERIC DATA

Form adopted June 1946
National Bureau of Standards
(Institutional)
Scaled by: E. J. W. J. S. J. M. C.
Calculated by: A. G. K. J. S.

Es Mc Km December, 1948
(Characteristic) (Units) (Month)
Observed at Washington, D. C.
Lat. 39.0°N, Long. 77.5°W

Day	75°W												Mean Time													
	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23		
1	31/100	37/100	31/100	29/100	38/100				3.2/100	27/100	30/90	29/100	27/20	23/10	31/100	35/100	34/100	52/100	37/100	39/100	31/100					
2	31/100	37/100	31/100	29/100	38/100				3.2/100	37/100	30/90	29/100	27/20	23/10	C	C	C	C	C	C	C	C	C	C		
3		32/100	32/100	30/100	30/100				3.6/10	3.6/10	3.3/100	3.0/100	3.2/100	3.1/100	3.5/100	3.5/100	3.5/100	5.9/100	4.2/100	2.1/100	3.0/100					
4		32/100	32/100	30/100	30/100				4.1/100	3.0/100	3.9/100	4.3/100	3.2/100	3.1/100	2.9/100	3.0/100	3.0/100	3.4/100	3.2/100	3.2/100	3.0/100					
5	30/90	32/90	32/90	30/100	30/100				4.5/100	3.7/100	3.2/100	3.2/100	3.2/100	3.0/100	2.9/100	3.0/100	3.0/100	6.6/100	6.6/100	6.6/100	6.6/100	6.6/100	6.6/100			
6		31/100	32/100	32/100	32/100				3.2/100	3.2/100	4.1/100	4.1/100	3.5/100	3.8/100	3.6/100	4.0/100	3.9/100	3.4/100	2.9/100	2.9/100	3.0/100	3.0/100	3.0/100			
7		44/100	30/100	37/100	38/100	49/100	43/100	36/100	5.6/100	3.0/100	3.0/100	3.0/100	3.0/100	3.3/100	2.5/90	2.3/90	1.9/90	1.9/90	1.7/90	1.7/90	1.7/90	1.7/90	2.0/160			
8		44/100	30/100	37/100	38/100	49/100	43/100	36/100	5.6/100	3.1/100	3.2/100	3.2/100	3.2/100	3.5/100	2.5/100	2.5/100	2.5/100	3.6/100	5.2/100	5.2/100	5.2/100	5.2/100	5.4/100			
9	19/100				3.9/100																					
10	36/100				2.2/100																					
11	31/90	33/90																								
12	19/100	21/80	32/100	35/100																						
13	34/90	19/90	20		2.8/90	1.7/100				1.9/90	4.3/80	2.0/90	3.6/90	90	2.6/100											
14															3.1/100											
15															3.0/100											
16															2.0/100	2.0/90										
17															3.1/100	2.3/100	2.1/100									
18																4.8/100	3.3/100	3.7/100	1.9/100	1.9/100	2.3/100	2.0/100	2.0/100			
19															1.9/100	2.2/100	1.9/100	1.9/90	1.9/90	1.9/90	1.9/90	1.9/90	2.3/90			
20															3.3/90	3.9/90	3.5/90	3.5/90	1.8/100	3.2/90	3.6/100	4.9/90	3.8/100	3.6/100		
21															2.0/100	2.2/100	2.0/90									
22																3.2/90										
23	21/100	46/100	38/100	22/100												21/100	3.5/100	3.5/100	3.6/100	5/20/100	20/100	3.3/100	3.7/100			
24																3.9/100	4.8/100	3.2/90	3.0/90	1.9/90	1.9/90	1.9/90	1.9/90			
25																19/100	19/100	19/100	19/100	19/100	19/100	19/100				
26																33/100	4.0/100	4.8/100	8.0/100							
27																				2.4/100	6.0/100	1.9/100		3.1/100		
28																				2.3/90	2.1/90	3.4/90		C		
29																				3.1/110			2.0/100	3.2/100		
30																								2.9/100 ³		
31																										
Median	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**			
Count	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31		

** MEDIAN FEWER THAN MEDIAN 10 E, OR LESS THAN LOWER LIMIT OF RECORDER.

Manual Automatic

Sweep 10 Mc to 250 Mc in 0.25 min
Mean Time

31

TABLE 37
 Central Radio Propagation Laboratory, National Bureau of Standards, Washington 25, D.C.
 ONOSPHERIC DATA

F2-M1500, (Characteristic), (Unit)
December, 1946, (Month)
 Observed at Washington, D.C.

Lat 39.0°N., Long 77.5°W.

Day	75W Mean Time																									
	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23		
1	2.0	2.0	2.1	v	2.0	v	1.9	(2.0)s	2.0	2.3	2.4	2.2	2.3	2.2	2.2	2.2	2.2	2.2	2.3	2.3	2.1	1.9	2.0			
2	2.0	2.0	2.0	v	2.1	v	2.0	(1.9)s	2.2	2.4	2.3	2.3	2.3	2.2	2.3	P(2.2)s	(2.2)s	2.3	v	v	2.0	2.0	(2.0)s			
3	2.0	1.9	1.9	v	1.9	v	2.0	2.0	2.2	2.1	2.3	2.2	2.3	2.2	P(2.2)s	(2.3)s	C	C	C	C	C	C	C			
4	2.2	2.1	v	(2.1)s	v	(2.2)s	v	(2.1)s	v	2.1	2.5	(2.5)s	2.3	2.3	2.2	P(2.2)s	2.1	2.1	2.2	2.2	2.2	2.2	2.2	(2.2)s		
5	2.0	2.0	2.0	v	2.0	v	2.1	2.0	2.0	2.4	2.5	2.4	2.3	2.2	2.2	2.2	2.2	2.2	2.3	2.3	2.3	2.3	2.3	(2.0)s		
6	6	F(2.0)s	F(1.8)s	s	(1.7)s	s	(1.9)s	(1.9)s	2.0	2.0	2.3	2.3	2.2	2.2	2.2	P(2.2)s	(2.2)s	C	C	C	C	C	C	C		
7	1.9	1.9	2.1	2.3	F(2.1)s	v	(2.1)s	v	2.0	2.3	2.6	2.4	2.3	2.4	2.3	P(2.2)s	(2.2)s	C	C	C	C	C	C	C		
8	1.9	F	1.9	F	2.1	F	2.1	2.0	2.0	2.4	2.5	2.0	2.3	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2		
9	2.1	1.9	F	1.9	F	2.1	v	2.3	2.3	1.9	F	2.1	2.0	2.4	2.3	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2		
10	1.9	1.9	F(1.9)s	v	2.0	2.1	1.9	2.0	2.1	2.2	(2.1)s	2.2	(2.2)s	2.3	2.2	2.3	2.3	2.2	2.3	2.2	2.1	(2.0)s	1.9	1.9		
11	2.2	(2.0)s	2.0	2.0	1.9	(2.1)s	v	(2.1)s	v	2.2	2.4	2.4	2.4	2.2	2.2	2.3	2.3	2.3	2.2	2.3	2.1	2.1	2.1	2.0		
12	2.1	1.9	v	(1.9)s	F	(1.9)s	(2.0)s	v	(2.1)s	v	2.1	2.3	2.3	2.3	2.2	P(2.2)s	(2.2)s	2.2	2.1	2.3	2.3	(2.4)s	(2.2)s	(2.0)s		
13	1.9	F	1.8	F	2.0	F	(2.1)s	v	(2.1)s	v	2.0	(2.1)s	2.1	2.4	2.4	2.3	(2.4)s	2.1	2.1	2.1	(2.4)s	2.1	1.9	1.9		
14	1.8	F	1.7	1.8	2.1	F	2.1	F	2.2	F	2.3	(2.1)s	2.2	2.2	2.3	2.3	P(2.2)s	(2.2)s	2.1	2.1	2.1	2.1	2.1	2.1	2.0	
15	2.2	1.9	F	2.0	F	1.9	F	2.1	F	2.2	F	2.1	2.2	2.4	2.4	2.2	P(2.2)s	(2.2)s	2.1	2.1	2.1	2.1	2.1	2.1	2.1	
16	2.1	F	2.1	F	s	(2.0)s	(2.1)s	v	2.2	1.9	2.0	2.0	2.3	2.3	2.3	2.3	P(2.2)s	(2.2)s	2.1	2.1	2.2	2.2	2.2	2.2	2.1	
17	1.9	1.9	(2.1)s	2.0	2.1	(2.0)s	v	(2.0)s	2.0	2.0	2.3	2.4	2.1	2.1	2.1	2.3	2.1	2.1	2.1	2.1	2.1	2.0	2.0	2.0		
18	1.9	1.9	1.9	1.9	F	2.1	F	2.2	F	2.1	F	2.0	2.5	(2.2)s	2.1	2.1	2.2	2.0	2.1	2.1	2.1	2.1	2.1	2.0	2.0	
19	2.0	F	1.9	F	1.9	s	(1.9)s	(2.0)s	v	2.1	2.2	2.2	2.3	2.4	2.2	P(2.2)s	(2.2)s	2.1	2.1	2.1	2.1	2.1	2.1	2.1		
20	2.1	F	2.0	F	2.1	F	(2.3)s	v	(2.3)s	v	2.0	2.5	(2.5)s	2.3	2.3	2.2	2.2	P(2.2)s	(2.2)s	2.2	2.2	2.2	2.2	2.2	2.2	
21	1.9	1.7	2.0	1.9	F	(2.0)s	(1.7)s	(1.7)s	(1.7)s	1.8	(2.0)s	2.0	2.3	2.3	2.4	P(2.2)s	(2.2)s	2.3	2.3	2.3	2.3	2.3	2.3	2.3		
22	2.0	(2.0)s	2.1	F	(2.0)s	F	2.0	2.0	2.4	2.4	2.3	2.5	2.5	2.3	2.1	P(2.2)s	(2.2)s	2.1	2.1	2.2	2.2	2.2	2.2	2.2		
23	(2.0)s	(2.0)s	(2.0)s	s	(2.0)s	F	(2.0)s	F	2.1	F	2.4	2.4	2.4	2.2	2.2	P(2.2)s	(2.2)s	2.1	2.1	2.3	2.3	2.2	2.2	2.2		
24	5	(1.8)s	F	(1.7)s	F	(1.8)s	F	(1.8)s	v	(1.9)s	F	(2.0)s	v	(2.3)s	2.4	2.4	P(2.2)s	(2.2)s	2.1	2.1	2.1	2.1	2.0	2.0	2.0	
25	1.9	1.8	F	1.9	1.8	1.9	1.8	1.9	1.8	2.0	1.9	2.3	2.4	2.2	2.0	2.0	P(2.2)s	(2.2)s	2.1	2.1	2.1	2.1	2.0	2.0	2.0	
26	(2.0)s	(1.9)s	F	(1.9)s	2.0	F	1.9	F	1.8	F	(2.0)s	2.5	F	(2.3)s	2.3	2.1	P(2.2)s	(2.2)s	2.1	2.1	2.1	2.1	2.1	2.1	2.0	
27	1.9	F	1.7	1.8	1.6	2.0	F	2.0	2.0	2.5	(2.0)s	2.3	2.2	2.2	2.2	P(2.2)s	(2.2)s	2.3	2.3	2.3	2.3	2.3	2.3	2.3		
28	1.8	F	(1.9)s	v	2.0	F	2.0	F	2.1	F	2.0	2.3	2.5	P(2.2)s	(2.2)s	2.1	2.1	2.2	2.2	2.2	2.2	2.2	2.2			
29	2.0	1.9	F	1.9	1.9	2.0	F	2.0	F	1.9	F	2.3	2.5	2.4	2.2	2.2	P(2.2)s	(2.2)s	2.0	2.0	2.0	2.0	2.0	2.0	2.0	
30	2.1	F	2.0	F	2.0	1.9	F	2.0	2.0	2.1	1.9	2.4	2.3	2.3	2.3	(2.2)s	(2.2)s	2.1	2.1	2.1	2.1	2.1	2.1	2.1		
31	2.0	2.0	2.0	1.9	F	2.0	F	1.6	F	1.6	F	2.4	2.3	(2.3)s	2.3	(2.3)s	P(2.2)s	(2.2)s	2.1	2.1	2.1	2.1	2.1	2.1	2.1	
Median	2.0	1.9	2.0	2.0	2.0	2.0	2.0	2.0	2.1	2.4	2.4	2.3	2.2	2.2	2.1	P(2.2)s	(2.2)s	2.1	2.1	2.2	2.2	2.2	2.2	2.2		
Count	31	30	31	31	31	30	31	31	31	31	31	30	31	31	31	30	30	30	30	30	30	30	30	31		

Scaled by: J.J.W., J.J.S., A.C.K.,
 Calculated by: E.U.W., J.J.S., J.M.C.

Sweep 10 Mc to 250 Mc in 0.25 min
 Manual □ Automatic ☒

30

31

32

33

F2-M3000. (Characteristic) December, 1948
 (Unit) (Month) Observed at Washington, D. C.

Central Radio Propagation Laboratory, National Bureau of Standards, Washington 25, D. C.
 Lat 39°0'N., Long 77.5°W.

TABLE 38
IONOSPHERIC DATA

National Bureau of Standards
 (Inclination)
 Scaled by E.J.W. J.S.S., J.M.C.

Day	75°W Mean Time											
	00	01	02	03	04	05	06	07	08	09	10	11
1	3.0	3.0	3.1	3.0	2.9	(2.9)	3.1	3.3	3.5	3.2	3.4	3.3
2	2.9	2.9	3.1	3.1	2.9	3.1	(2.8)	3.2	3.6	3.3	3.3	3.2
3	3.0	2.9	2.9	2.9	2.9	3.0	3.1	3.5	3.3	3.3	(3.3)	3.3
4	3.2	3.2	3.1	3.1	3.1	(3.2)	(3.0)	3.2	3.6	3.3	3.3	(3.2)
5	2.9	2.9	2.9	3.1	3.1	3.0	3.0	3.5	3.6	3.3	3.3	(3.0)
6	(3.1)	(2.8)	(2.7)	(2.6)	(2.7)	(2.9)	(3.0)	3.0	3.1	(3.2)	(3.2)	(3.0)
7	2.9	(2.8)	3.1	3.3	3.3	(3.2)	(3.0)	(3.1)	3.4	3.6	3.4	(3.2)
8	2.8	2.9	2.9	2.7	2.7	2.9	2.8	3.2	3.5	3.2	3.2	(3.2)
9	3.0	2.9	2.9	3.1	3.1	3.3	3.3	3.0	3.4	3.2	3.2	(3.2)
10	(2.8)	(2.8)	3.0	3.1	2.8	2.9	3.1	3.2	3.4	3.2	3.2	(3.2)
11	3.2	(3.0)	3.0	3.0	3.0	(3.0)	(3.0)	3.2	3.6	3.4	3.3	(3.2)
12	3.2	(2.7)	(2.7)	(2.8)	(2.9)	(3.1)	(3.2)	3.0	3.2	3.5	3.2	(3.2)
13	2.9	2.9	2.9	2.7	2.7	(2.9)	(2.9)	3.1	(3.5)	3.4	3.2	(3.2)
14	2.7	2.7	2.7	3.1	3.1	(2.9)	(3.4)	3.5	3.5	3.3	3.2	(3.2)
15	3.1	2.9	3.0	2.8	2.8	3.0	3.0	3.2	3.4	3.3	3.2	(3.2)
16	3.0	(2.9)	(2.9)	(3.1)	(3.1)	(3.1)	(2.9)	3.1	3.1	3.0	3.0	(3.0)
17	(2.8)	(3.1)	3.0	3.1	(2.9)	(2.9)	(2.9)	2.9	3.4	3.4	3.1	(3.1)
18	2.8	2.8	2.9	2.9	3.0	2.9	3.0	3.5	3.4	3.2	(3.2)	(3.2)
19	(3.0)	2.8	(2.8)	(2.8)	(3.0)	(3.1)	(3.0)	3.1	3.4	3.5	3.2	(3.2)
20	3.1	3.0	3.0	3.0	3.2	3.0	3.0	3.5	3.4	3.2	3.2	(3.2)
21	2.7	2.7	3.1	2.7	(3.0)	(2.7)	(2.9)	3.0	3.6	(3.3)	3.1	(3.1)
22	3.1	(3.0)	(3.0)	(3.2)	(3.1)	(3.1)	(3.0)	3.6	3.6	(3.3)	3.2	(3.2)
23	(2.9)	(2.9)	(2.9)	(2.9)	(2.9)	(2.9)	(2.9)	3.5	3.5	3.5	3.2	(3.2)
24	(2.8)	(2.7)	(2.7)	(2.7)	(2.7)	(2.8)	(2.9)	3.0	3.4	3.4	3.2	(3.2)
25	2.9	2.8	2.8	2.8	2.9	2.9	3.4	3.4	3.2	2.9	3.0	(3.0)
26	(3.0)	(3.1)	(2.9)	(2.9)	(2.9)	(2.9)	(3.0)	3.3	3.5	3.4	3.2	(3.2)
27	2.8	2.5	2.7	2.7	3.0	2.8	2.8	3.6	(3.5)	(3.3)	3.2	(3.2)
28	2.8	(2.7)	(2.7)	(2.7)	(2.7)	(2.8)	(2.9)	2.9	3.4	3.5	3.2	(3.2)
29	3.1	2.9	2.9	3.0	(2.9)	(2.9)	(2.9)	2.8	3.4	3.4	3.2	(3.2)
30	3.0	3.0	3.0	3.0	3.2	2.9	3.5	3.2	3.3	3.0	3.0	(3.0)
31	2.9	3.0	3.0	2.9	3.0	3.0	3.5	3.4	3.4	3.1	3.2	(3.0)
Median	2.9	2.9	2.9	3.0	2.9	3.0	3.1	3.5	3.4	3.2	3.2	3.0
Count	31	30	31	31	31	30	31	31	30	30	30	31

Sweep 1.0 Mc in 0.25 min
 Manual □ Automatic ■

TABLE 39
Central Radio Propagation Laboratory, National Bureau of Standards, Washington 25, D.C.
IONOSPHERIC DATA

FL-M 3000, (1 min)
(Characteristic) (Month)
Washington, D. C.
Observed at Lat 39.0°N, Long 77.5°W

Form adopted June 1946
National Bureau of Standards
Institution: J.J.S., J.M.C.
Scaled by E. J.W., J.J.S., J.M.C.
Calculated by J.J.S., A.C.K.

75°W Mean Time											
Day	00	01	02	03	04	05	06	07	08	09	10
1											
2											
3											
4											
5											
6											
7											
8											
9											
10											
11											
12											
13											
14											
15											
16											
17								L	(L) ^c		
18								L	L		
19								L	L		
20								L	L		
21								L	L		
22								L	L		
23								L	L		
24								L	L		
25								L	L		
26								L	L		
27											
28											
29											
30											
31											
Median Count											

Swept LO Mc to 25.0 Mc in 0.25 min
Manual Automatic
I. G. GOVERNMENT PRINTING OFFICE: 1946 O-70016

Form adopted June 1946

E-M1600
(Characteristic)
Washington, D.C.December, 1946
(Month)

Central Radio Propagation Laboratory, National Bureau of Standards, Washington 25, D.C.

TABLE 40
IONOSPHERIC DATA

Lat. 39°0'N., Long. 77°5'W.

Observed at E.J.W. (Institution)

J.J.S., J.M.C.

National Bureau of Standards

Scaled by E.J.W., J.J.S., J.M.C.

75°W Mean Time

Day	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
1																								
2																								
3																								
4																								
5																								
6																								
7																								
8																								
9																								
10																								
11																								
12																								
13																								
14																								
15																								
16																								
17																								
18																								
19																								
20																								
21																								
22																								
23																								
24																								
25																								
26																								
27																								
28																								
29																								
30																								
31																								
Median																								
Count																								

U. S. GOVERNMENT PRINTING OFFICE 1640-1745-1

Sweep 1.0 Mc to 8.0 Mc in 0.05 min

Manual □ Automatic ■

Table 41

Ionospheric Storminess at Washington, D. C.December 1948

Day	Ionospheric character*		Principal storms Beginning GCT End GCT	Geomagnetic character** 00-12 GCT 12-24 GCT	
	00-12 GCT	12-24 GCT		00-12 GCT	12-24 GCT
1	2	2		1	1
2	1	2		2	1
3	2	2		3	0
4	1	2		1	1
5	1	3		2	1
6	3	2		3	4
7	2	2		4	3
8	3	2		2	2
9	2	2		2	1
10	2	2		1	2
11	1	2		3	2
12	3	2		1	0
13	3	2		1	3
14	2	2		4	3
15	2	2		2	2
16	1	2		2	3
17	2	1		2	1
18	2	2		2	1
19	2	2		2	1
20	2	1		1	2
21	2	1		3	3
22	1	1		3	1
23	2	2		1	2
24	3	1		3	2
25	1	1		3	4
26	2	1		2	1
27	3	1		2	2
28	3	1		0	1
29	2	1		2	2
30	2	1		2	4
31	2	2		4	3

*Ionosphere character figure (I-figure) for ionospheric storminess at Washington, D. C., during 12-hour period, on an arbitrary scale of 0 to 9, 9 representing the greatest disturbance.

**Average for 12 hours of Cheltenham, Maryland, geomagnetic K-figures on an arbitrary scale of 0 to 9, 9 representing the greatest disturbance.

Table 42Sudden Ionosphere Disturbances Observed at Washington, D. C.December 1948

Day	GCT		Location of transmitters	Relative intensity at minimum*	Other phenomena
	Beginning	End			
7	1353	1405	Ohio, D.C., England, Mexico	0.3	
8	1654	1705	Ohio, D.C.	0.1	
9	1145	1225	England	0.0	
20	1725	1800	Ohio, D.C., England	0.05	
23	1212	1305	Ohio, England	0.0	Terr.mag.pulse** 1211-1225 Solar flare*** 1210
24	1634	1805	Ohio, D.C., England, New Brunswick	0.0	
27	1426	1435	Ohio, D.C., England	0.2	
27	1710	1805	Ohio, D.C., England, New Brunswick	0.0	
30	1556	1705	Ohio, D.C., England, New Brunswick	0.0	Terr.mag.pulse** 1558-1635

*Ratio of received field intensity during SID to average field intensity before and after, for station W8XAL, 6080 kilocycles, 600 kilometers distant, for all SID except the following: Station GLH, 13525 kilocycles, 5800 kilometers distant, was used for the SID on December 9 and 23.

**As observed on Cheltenham magnetogram of the United States Coast and Geodetic Survey.

***Time of observation at Greenwich Observatory, England.

Table 43Sudden Ionosphere Disturbances Reported byRCA Communications, Inc., as Observedat Point Reyes, California

1948 Day	GCT		Location of transmitters
	Beginning	End	
December 22-23	2355	0030	Australia, China, Hawaii, Japan, Philippine Is.
24	2155	2300	Australia, Java
26	0200	0230	Australia, China, Japan, Java, Philippine Is.

Table 44Sudden Ionosphere Disturbances Reported by Engineer-in-Chief.Cable and Wireless, Ltd., as Observed in England

1948 Day	GCT		Receiving station	Location of transmitters
	Beginning	End		
December 9	1145	1215	Brentwood	Austria, Bahrein I., Belgian Congo, Bulgaria, Canary Is., Chili, Colombia, Greece, India, Iran, Kenya, Malta, Palestine, Portugal, Southern Rhodesia, Spain, Syria, Switzerland, Turkey, Uruguay, U.S.S.R., Yugoslavia, Zanzibar
	1152	1210	Somerton	Aden, Argentina, Ascension I., Austria, Brazil, Canada, Ceylon, China, Egypt, Gold Coast, India, Malay States, New York, Union of S. Africa
	0822	0840	Brentwood	Austria, Bahrein I., Belgian Congo, Canary Is., Eritrea, French Equatorial Africa, Greece, India, Iran, Kenya, Madagascar, Palestine, Portugal, Southern Rhodesia, Spain, Syria, Trans-Jordan, Turkey, Yugoslavia, Zanzibar
	0822	0840	Somerton	Aden, Ascension I., Ceylon, Egypt, Gold Coast, India, Union of S. Africa

Table 45Sudden Ionosphere Disturbances Reported by
International Telephone and Telegraph Corporation.as Observed at Platanos, Argentina

1948 Day	GCT		Location of transmitters
	Beginning	End	
October 11	1220	1410	Bolivia, Brazil, Denmark, England, New York, Peru, Switzerland, Venezuela
	1400	1430	Bolivia, Brazil, Chile, Colombia, Denmark, England, France, Germany, New York, Peru, Switzerland, Venezuela
November 13	1651	1710	Bolivia, Brazil, Chile, Denmark, England, Germany, Netherlands, New York, Peru, Spain, Venezuela
	1840	1905	Bolivia, Brazil, Chile, Denmark, England, France, Germany, New York, Peru, Spain, Venezuela
	1353	1445	Bolivia, Brazil, Colombia, England, Germany, New York, Peru, Switzerland, Venezuela

Note: Observers are invited to send to the CRPL information on times of beginning and end of sudden ionosphere disturbances for publication as above. Address letters to the Central Radio Propagation Laboratory, National Bureau of Standards, Washington 25, D. C.

Table 46

Provisional Radio Propagation Quality Figures

(Including Comparisons with CRPL Warnings and CRPL Probable Disturbed Period Forecasts)

November 1948

Day	North Atlantic						North Pacific					
	Quality figure	CRPL* Warning	Forecast of probable disturbed periods	CRPL** Geomagnetic K _{Ch}	Quality figure	CRPL* Warning	Forecast of probable disturbed periods	CRPL** Geomagnetic K _{Ch}	01-12 GCT	13-24 GCT	01-12 GCT	13-24 GCT
1	5 6			1 3	7 7						1 3	
2	(4) (4)	X X		5 3	6 6	X X					5 3	
3	(4) 5	X		3 2	6 7	X					3 2	
4	5 6			0 0	7 7						0 0	
5	6 7			1 1	7 6						1 1	
6	7 7			1 1	7 7						1 1	
7	6 7			3 2	8 7						3 2	
8	6 7			3 3	7 7						3 3	
9	6 7			3 3	7 7						3 3	
10	7 7	X		2 1	6 7	X					2 1	
11	6 7			2 1	6 7						2 1	
12	6 7			0 0	6 7						0 0	
13	7 7			0 2	6 7						0 2	
14	6 7			1 1	7 8						1 1	
15	7 7			2 3	7 7						2 3	
15	7 7			3 2	7 6						3 2	
17	6 5		X	3 3	7 6			X			3 3	
18	5 6	X X	X	3 3	7 6	X X		X			3 3	
19	6 6	X X	X	4 2	6 6	X X		X			4 2	
20	5 5	X X		4 4	6 5	X X					4 4	
21	(4) 6	X X	X	5 3	6 6	X X		X			5 3	
22	5 6	X X	X	4 3	6 5	X X		X			4 3	
23	6 5	X X		3 2	6 5	X X					3 2	
24	6 5			3 3	7 6						3 3	
25	5 6	X		3 3	5 (4)	X					3 3	
26	5 6			2 3	6 7						2 3	
27	6 6			3 2	6 6						3 2	
28	6 6			3 2	6 5						3 2	
29	6 6		X	2 1	7 6			X			2 1	
30	7 7		X	1 0	6 5			X			1 0	
Score:												
H		3	1			1	0					
M		0	2			0	1					
G		20	21			20	22					
(S)		5	3			3	2					
S		2	3			6	5					

*Broadcast on WWV, Washington, D.C. Times of warnings recorded to nearest half day as broadcast.

**In addition to dates marked X, the following were designated as probable disturbed days on forecasts more than eight days in advance of said dates: November 14 and 15.

Quality Figure Scale:

- 1 - Useless
- 2 - Very poor
- 3 - Poor
- 4 - Poor to fair
- 5 - Fair
- 6 - Fair to good
- 7 - Good
- 8 - Very good
- 9 - Excellent

Symbols:

- X Warning given or probable disturbed date
- H Quality 4 or worse on day or half day of warning
- M Quality 4 or worse on day or half day of no warning
- G Quality 5 or better on day of no warning
- (S) Quality 5 on day of warning
- S Quality 6 or better on day of warning
- () Quality 4 or worse (disturbed)

Geomagnetic K_{Ch} on the standard scale of 0 to 9, 9 representing the greatest disturbance

Table 47a

Coronal observations at Climax, Colorado (5303A), east limb

Date GCT	Degrees north of the solar equator														0°	Degrees south of the solar equator														P														
	90	85	80	75	70	65	60	55	50	45	40	35	30	25	20	15	10	5	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90								
1948	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	15	17	17	17	20	34	18	18	17	22	30	27	15	11	10	10	7	8	7	4	3	-	-	-	-	+15	
Nov. 30.8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4	8	10	25	30	30	25	14	13	18	24	23	12	10	8	6	5	4	3	2	-	-	X	X	X	X	+15
Dec. 2.8	-	-	-	2	3	3	3	3	3	2	-	-	-	-	-	-	-	4	8	10	25	30	30	25	14	13	18	24	23	12	10	8	6	5	4	3	2	-	-	X	X	X	X	+15
3.7	-	-	2	2	3	3	3	3	3	4	4	4	4	5	9	20	23	28	27	16	13	14	16	37	24	20	14	12	10	9	8	9	5	4	4	-	-	-	-	+15				
9.8	-	-	-	-	-	-	2	3	10	9	9	5	12	13	14	15	17	19	20	22	16	14	11	12	13	11	9	7	6	5	4	-	-	-	-	-	+15							
13.7	-	-	-	-	-	-	-	-	-	-	3	3	3	10	11	12	20	30	22	14	13	14	17	20	14	7	5	4	4	3	-	-	-	-	+10									
14.7	-	-	-	-	-	-	-	-	-	-	3	3	3	7	12	16	20	29	27	16	14	17	15	14	11	8	7	7	8	8	7	5	3	3	2	-	+10							
27.8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5	12	22	33	32	16	15	16	18	26	18	12	12	10	9	9	8	7	5	4	3	3	2	-	+5		
29.7	-	-	-	3	3	3	3	3	3	-	-	-	-	-	-	-	-	8	11	22	21	15	12	10	9	15	32	23	16	13	13	9	9	8	4	3	2	-	-	-	+5			
30.9	X	X	X	X	X	X	X	X	X	-	-	-	-	5	5	9	9	8	9	5	4	10	13	22	26	20	10	9	8	8	7	5	4	4	3	-	-	X	X	+5				

Table 48a

Coronal observations at Climax, Colorado (6374A), east limb

Date GCT	Degrees north of the solar equator														0°	Degrees south of the solar equator														P										
	90	85	80	75	70	65	60	55	50	45	40	35	30	25	20	15	10	5	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90				
1948	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	4	1	1	1	-	-	1	2	7	8	10	1	-	-	-	-	-	-	-	+15		
Nov. 30.8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	3	2	2	1	-	9	8	7	7	7	8	9	7	-	-	-	-	-	X	X	X	+15
Dec. 2.8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1	1	1	1	1	4	3	2	3	14	5	4	3	-	-	-	-	1	1	1	1	+15
3.7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1	1	1	1	1	4	2	-	6	8	12	5	-	-	-	-	-	-	-	+15		
9.8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	5	10	1	1	1	4	2	-	-	1	10	5	1	-	-	-	-	-	-	+10		
13.7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	3	3	8	10	-	-	-	-	-	-	-	-	-	-	-	-	+10			
14.7	-	1	1	1	1	1	1	1	1	-	-	-	-	-	-	-	-	1	1	1	1	1	1	7	13	-	-	2	3	2	-	-	-	-	-	+10				
27.8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	2	2	2	3	1	2	12	18	3	1	11	10	3	-	-	-	-	+5				
29.7	3	2	2	1	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1	1	3	7	2	3	3	3	7	8	8	10	1	1	-	-	-	+5				
30.9	X	X	X	X	X	X	X	X	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	2	2	3	3	1	-	-	-	-	X	X	+5				

Table 49a

Coronal observations at Climax, Colorado (6704A), east limb

Date GCT	Degrees north of the solar equator														0°	Degrees south of the solar equator														P											
	90	85	80	75	70	65	60	55	50	45	40	35	30	25	20	15	10	5	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90					
1948	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1	1	1	1	1	1	1	1	1	1	1	1	-	-	-	-	-	-	+15				
Nov. 30.8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	3	3	2	1	1	1	9	8	7	7	7	8	9	-	-	-	-	-	X	X	X	+15	
Dec. 2.8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1	2	2	2	2	1	1	1	1	1	2	2	2	2	1	-	-	-	-	-	-	-	+15
3.7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	2	2	3	2	1	1	1	-	-	-	-	-	-	-	-	-	-	-	-	+15			
9.8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+15			
13.7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+10			
14.7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+10			
27.8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+5			
29.7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+5			
30.9	X	X	X	X	X	X	X	X	X	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1	2	3	3	1	-	-	-	-	X	X	+5				

Table 50

Particulars of observations, Climax, Colorado
July-December 1948

Date GOT	Green line threshold intensity at 45° 90° 135° 225° 270° 315°								Obs.	Meas.	Date GOT	Green line threshold intensity at 45° 90° 135° 225° 270° 315°								Obs.	Meas.		
	E	F	E	F	E	F	E	F				E	F	E	F	E	F	E	F	E	F		
1948																							
July 1.6	12	10	9	9	9	8			F	E	Sept. 1.7	7	6	7	6	5	5			F		E	
2.6	9	11	9	8	8	7			F	E	2.6a	9	9	9	9	8			F		E		
4.6	8	8	7	8	7	8			F	E	3.7a	11	11	10	12	11	12			F		E	
5.6	7	8	8	8	8	9			F	E	4.8	>15	>15	15	-	-	-			F		E	
6.6	8	7	8	8	7	6			F	E	5.6	14	12	13	14	12	12			F		E	
7.6	10	10	10	10	10	10			F	E	8.0	13	14	13	-	-	-			F		E	
8.6	8	7	7	7	7	7			F	E	9.6	14	12	10	-	-	-			F		E	
9.6	8	7	7	7	7	7			F	E	10.7	13	9	11	11	10	9			F		E	
10.6	10	11	3	11	9	2			F	E	11.9	13	15	15	>15	14	14			F		E	
11.6	10	9	11	-	-	-			F	E	12.7	>15	>15	>15	>15	>15	>15			F		E	
12.7	13	12	11	11	13	15			F	E	20.9a	6	7	5	6	8	6			F		E	
13.7	10	10	10	9	9	10			F	E	21.7a	4	4	5	4	5	5			F		E	
14.7	8	9	9	9	9	6			F	E	23.7a	6	6	6	7	6	5			F		E	
15.7	11	11	11	11	17	10			F	E	25.7a	12	13	13	-	-	-			F		E	
16.7	14	14	13	15	14	13			F	E	Oct. 1.8	11	14	11	-	14	-			F		E	
17.6	13	12	10	12	11	12			F	E	2.7	11	11	11	11	10	12			F		E	
19.7	8	10	8	11	11	11			F	E	3.7	-	14	>15	-	-	-			F		E	
20.9	11	10	12	15	12	13			F	E	7.9	8	12	6	6	7	7			F		E	
21.8	10	10	11	8	8	8			F	E	8.6	12	12	11	11	11	12			F		E	
22.7	8	9	9	8	8	7			F	E	9.7	7	12	5	5	5	5			F		E	
23.6	21	18	10	9	10	12			F	E	10.6	5	5	5	5	5	6			F		E	
24.8	9	9	9	9	10	7			F	E	12.6	6	7	5	5	5	6			F		E	
26.0	-	10	-	-	-	-			F	E	13.6	8	6	6	9	4	9			F		E	
26.6	11	9	11	11	11	11			F	E	14.6	4	4	4	4	4	3			F		E	
28.0	7	10	8	-	-	-			F	E	15.7	-	5	5	5	5	5			F		E	
29.0	-	8	12	-	-	-			F	E	17.6	5	7	7	7	7	6			F		E	
29.6	10	12	11	12	12	10			F	E	18.6	3	3	3	3	5	5			F		E	
30.7	23	10	9	10	13	10			F	E	20.7	6	6	6	6	6	6			F		E	
31.7	7	12	12	9	9	9			F	E	21.9	13	14	>15	>15	>15	12			F		E	
Aug. 1.7	1	1	0	7	7	7			F	E	23.8	10	11	9	13	10	10			F		E	
2.8	13	12	11	10	10	9			F	E	24.6	4	4	4	4	4	4			F		E	
3.8	11	9	10	10	10	13			F	E	25.6	6	6	6	6	7	6			F		E	
6.8	-	10	13	-	-	-			F	E	26.8	11	7	8	13	11	7			F		E	
8.6	8	7	8	9	9	8			F	E	29.8	13	11	9	9	8	7			F		E	
10.9	8	8	8	9	15	13			F	E	31.7	5	6	6	6	7	7			F		E	
11.7	8	8	9	11	9	10			F	E	Nov. 1.7	10	7	7	7	8	8			F		E	
13.3	4	4	9	9	7	10			F	E	5.8	8	8	9	8	8	8			F		E	
15.5	2	2	3	2	2	2			F	E	13.8	7	6	6	7	6	6			F		E	
16.8	13	3	7	7	7	10			F	E	14.7	7	7	7	8	6	6			F		E	
17.6	5	6	5	5	4	5			F	E	15.6	6	6	6	6	6	6			F		E	
18.9	-	3	3	6	3	3			F	E	21.7	8	9	9	10	6	6			F		E	
19.7	1	3	3	3	3	3			F	E	28.7	7	6	6	8	6	6			F		E	
20.7	6	4	5	5	7	6			F	E	Dec. 2.8	10	8	9	9	8	9			J		E	
22.7	3	3	4	4	3	3			F	E	3.7	3	3	3	3	3	3			J		E	
24.6	3	5	4	4	4	4			F	E	9.8	7	7	7	9	7	7			J		E	
25.6	3	4	4	4	3	3			F	E	13.7	9	9	10	9	9	9			J		E	
26.8	5	5	5	5	8	6			F	E	14.7	4	6	5	5	4	4			J		E	
27.6	5	5	5	5	6	6			F	E	27.8	5	5	4	4	5	4			J		E	
28.6	5	5	5	4	4	5			F	E	29.7	4	4	4	5	4	4			J		E	
30.6	4	5	5	4	4	5			F	E	30.9	-	12	8	-	14	-			J		E	
31.6	7	5	5	6	6	6			F	E									J		E		

E = J. W. Evans

F = W. Fleming

J = Johnson

a = low weight

Table 51American and Zurich Provisional Relative Sunspot NumbersDecember 1948

Date	R _A *	R _Z **	Date	R _A *	R _Z **
1	86	64	17	232	192
2	81	70	18	286	213
3	103	100	19	289	221
4	108	110	20	280	210
5	92	85	21	250	200
6	134	85	22	204	176
7	148	85	23	218	188
8	144	92	24	220	169
9	142	102	25	215	211
10	121	96	26	193	172
11	116	92	27	191	152
12	162	124	28	189	138
13	162	131	29	203	140
14	169	128	30	153	144
15	230	132	31	129	135
16	239	177	Mean:	177.1	139.8

*Combination of reports from 47 observers; see page 15.

**Dependent on observations at Zurich Observatory and its stations at Locarno and Arosa.

GRAPHS OF IONOSPHERIC DATA

44

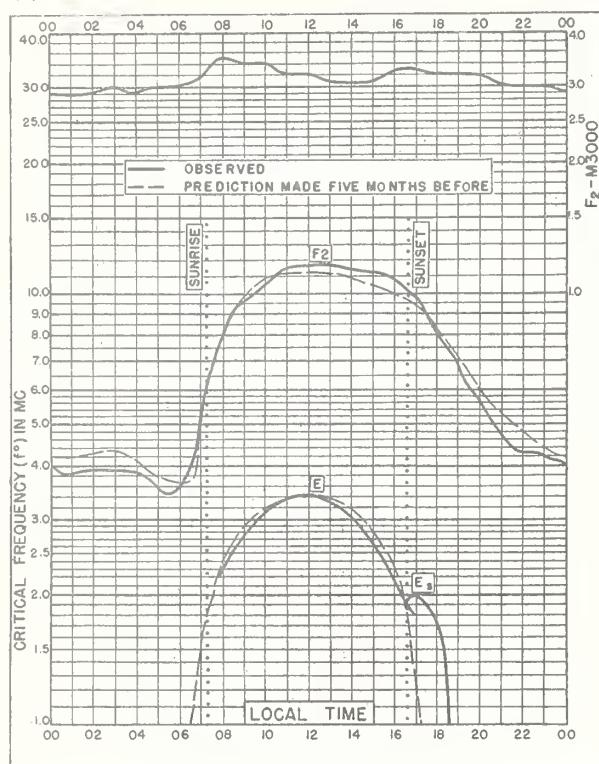


Fig. 1. WASHINGTON, D. C.
39. 0°N, 77. 5°W DECEMBER 1948

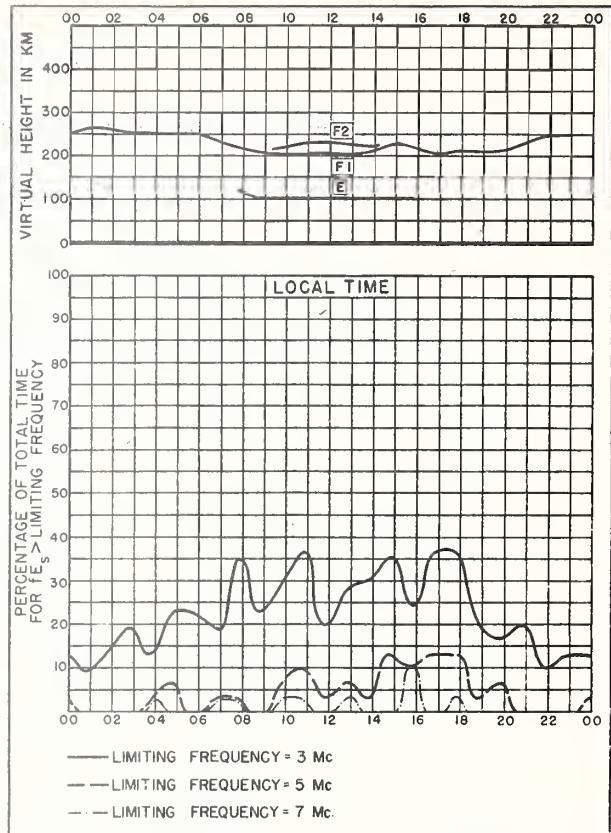


Fig. 2. WASHINGTON, D. C. DECEMBER 1948

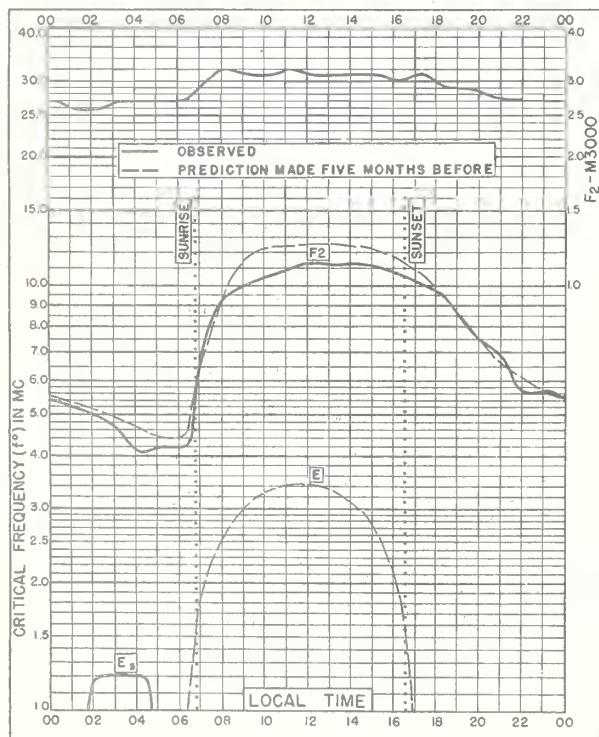


Fig. 3. BOSTON, MASSACHUSETTS
42. 4°N, 71. 2°W NOVEMBER 1948

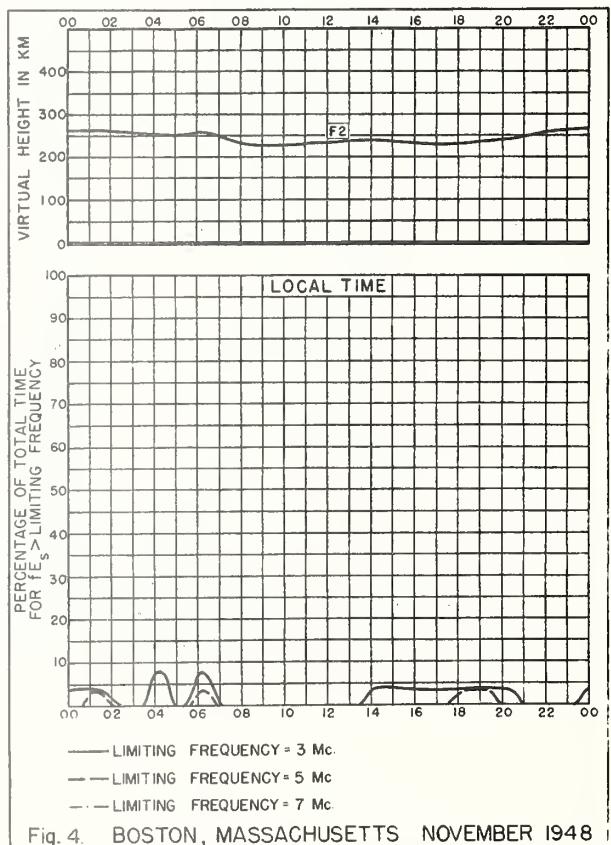
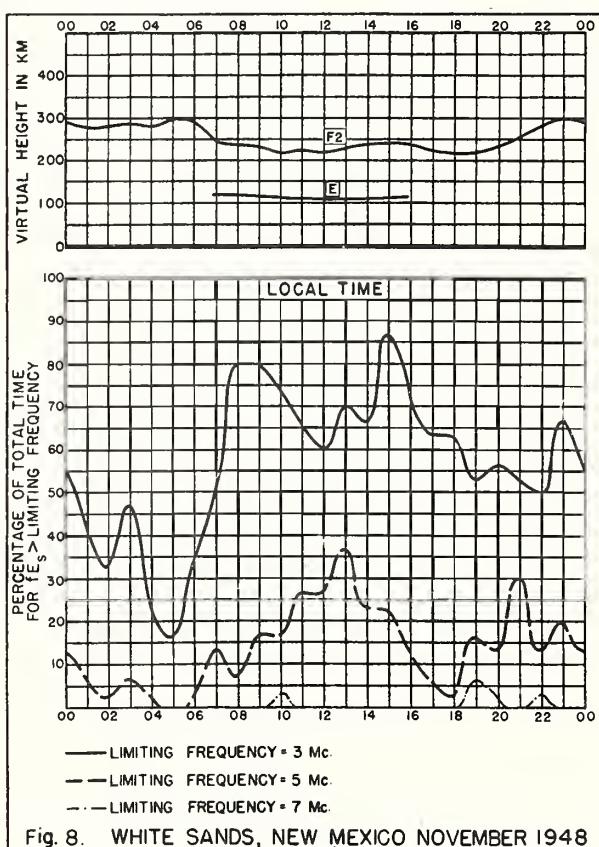
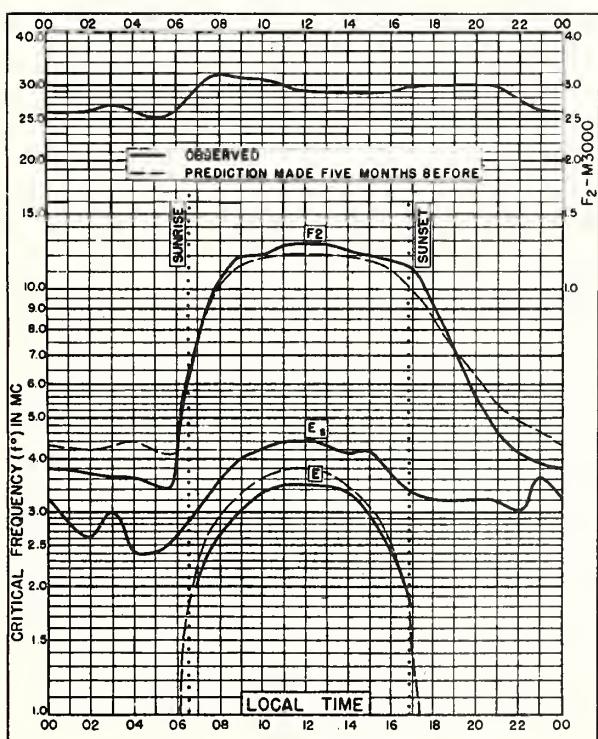
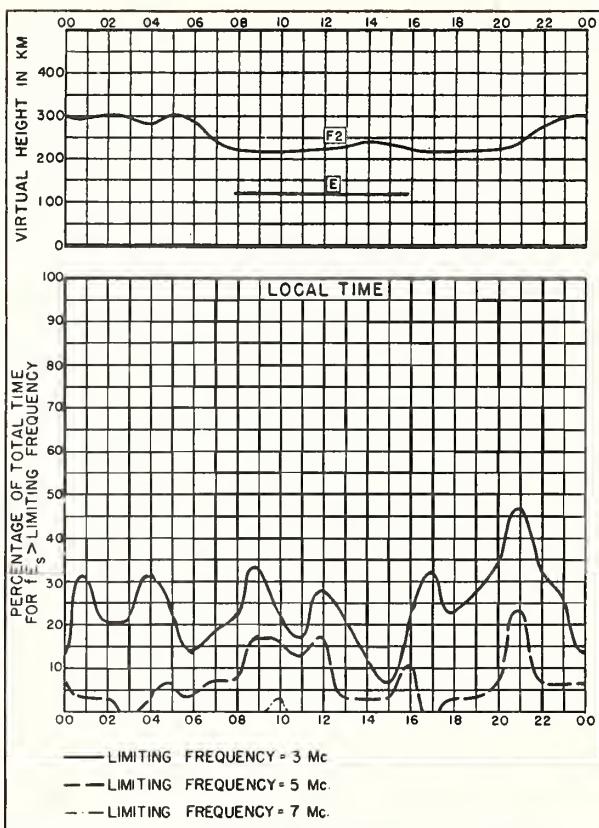
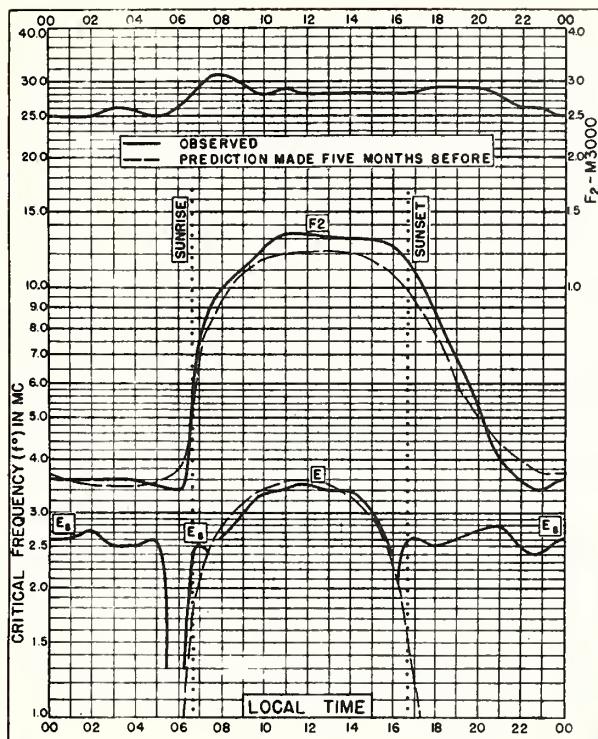
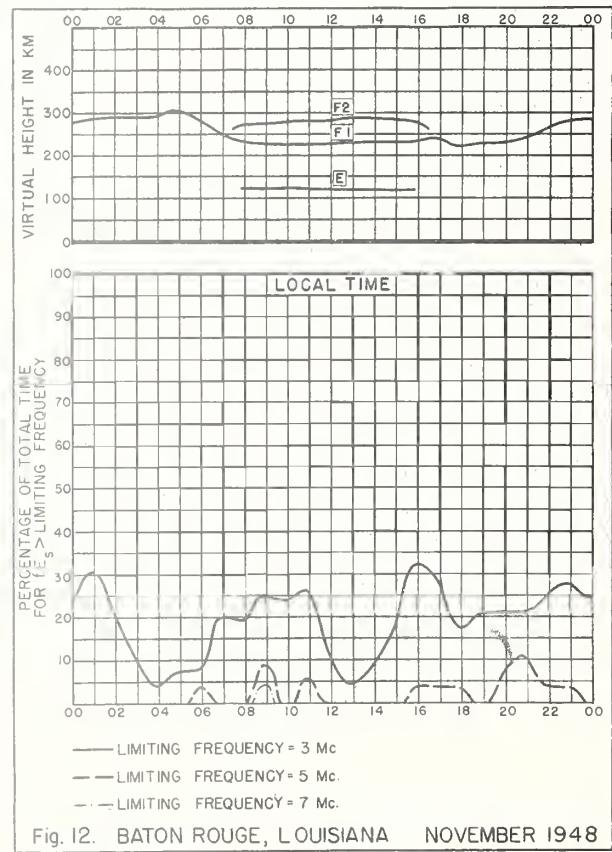
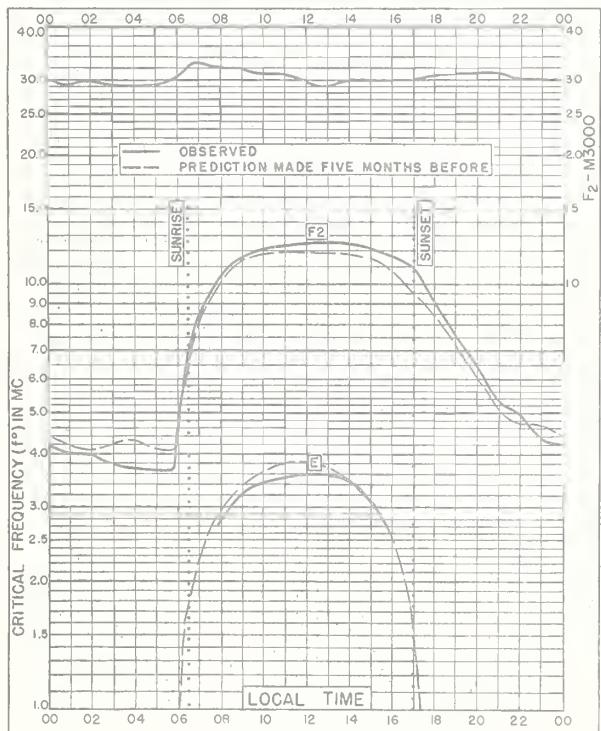
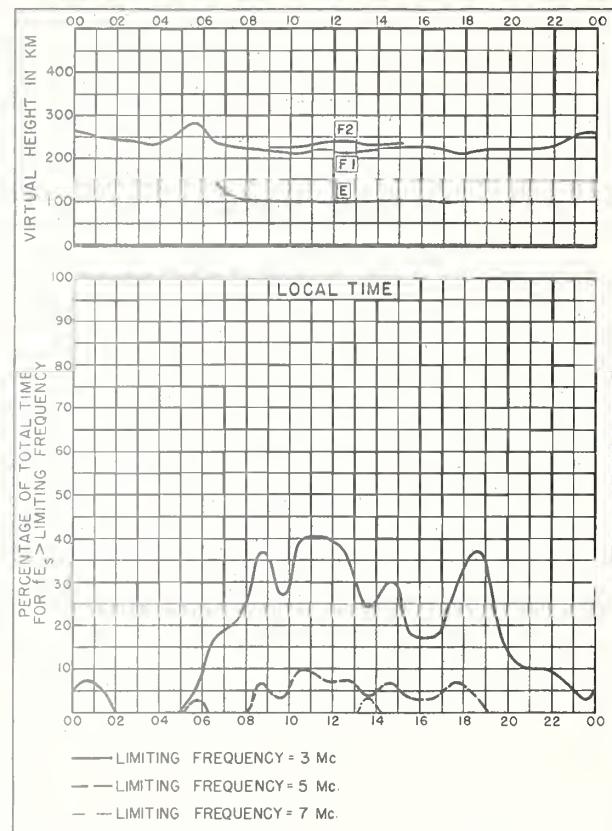
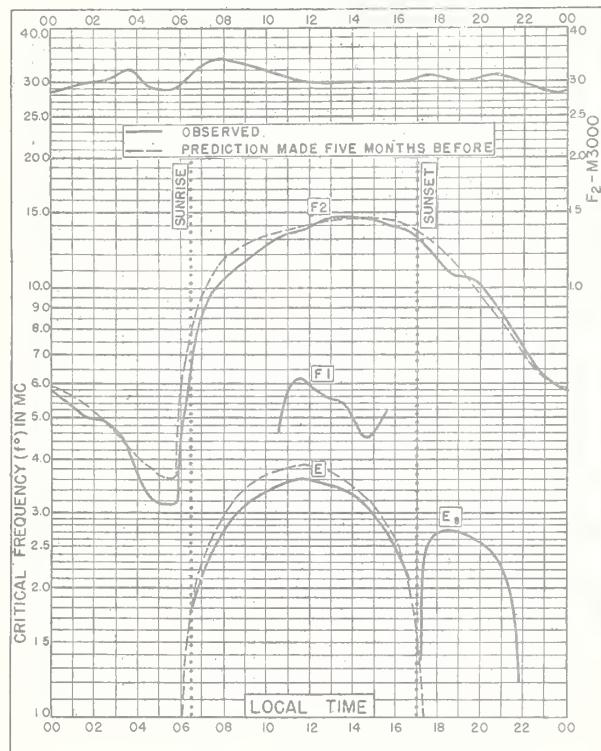
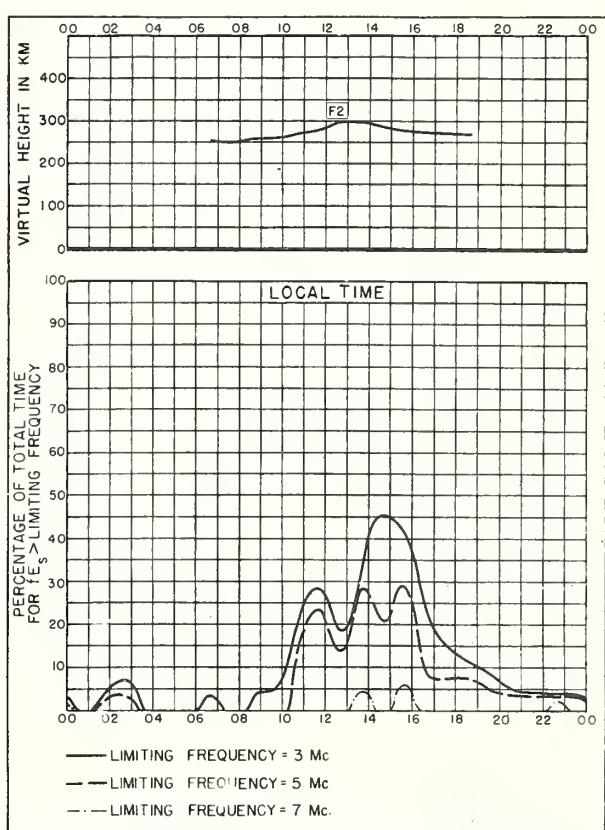
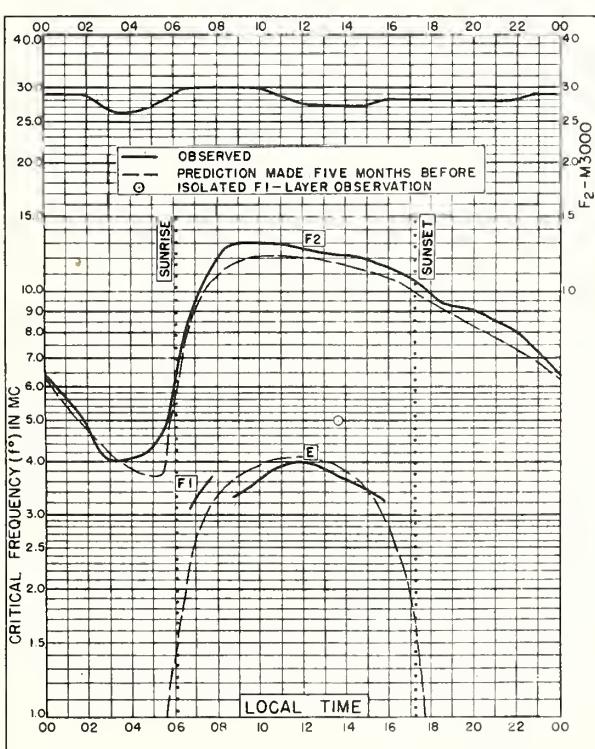
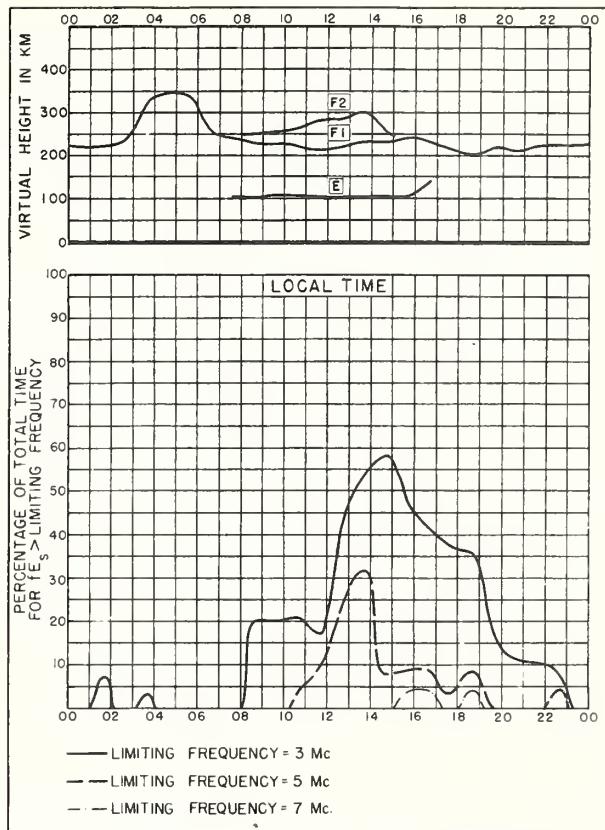
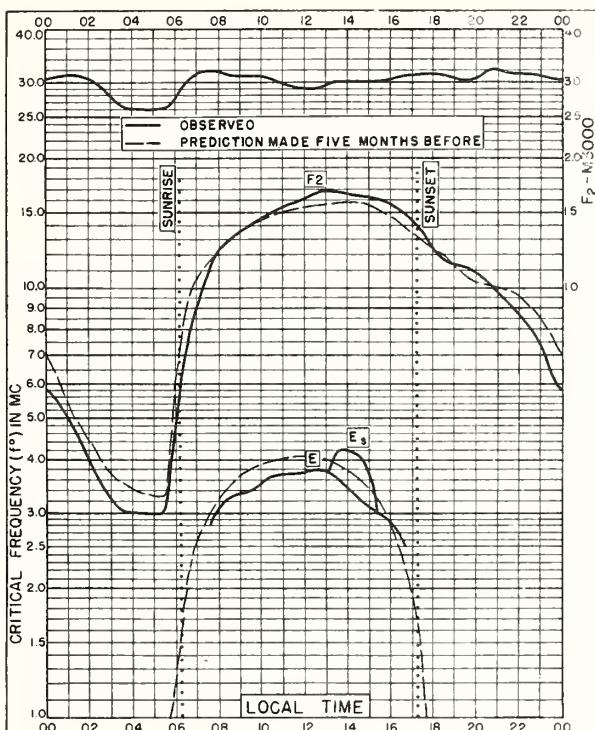
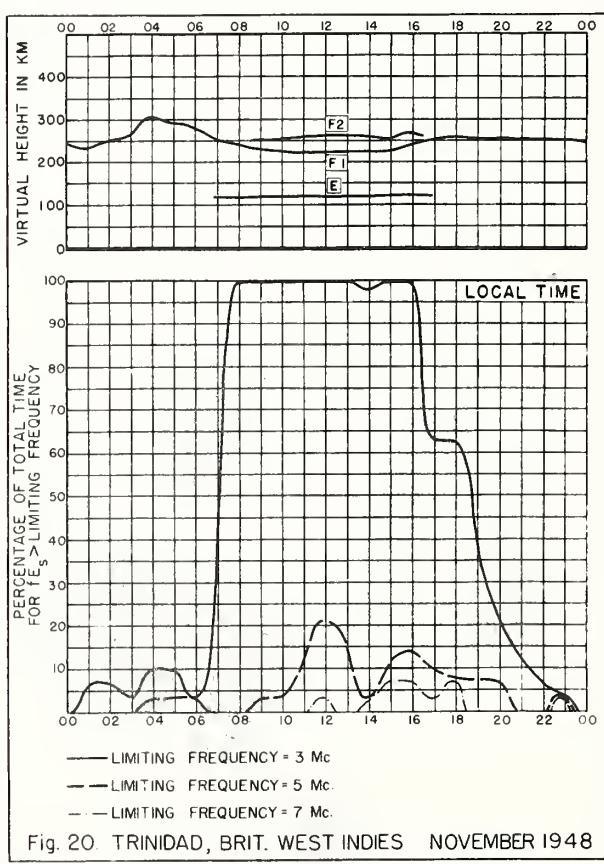
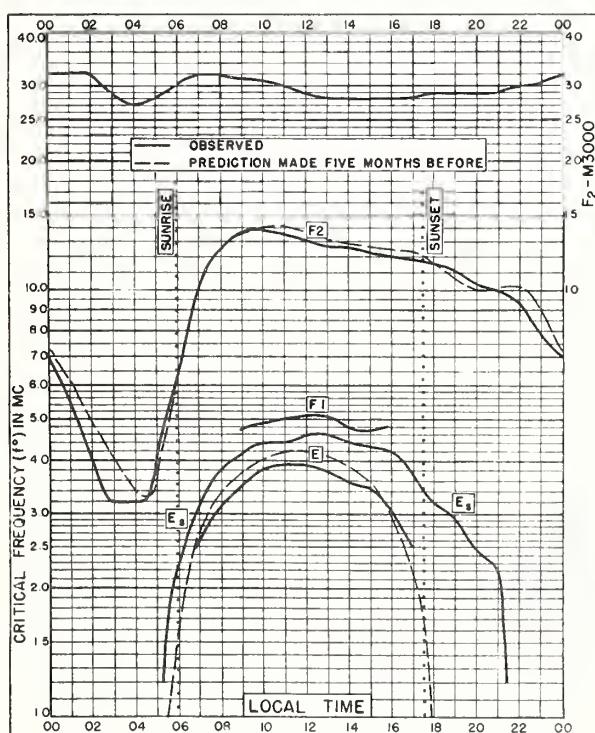
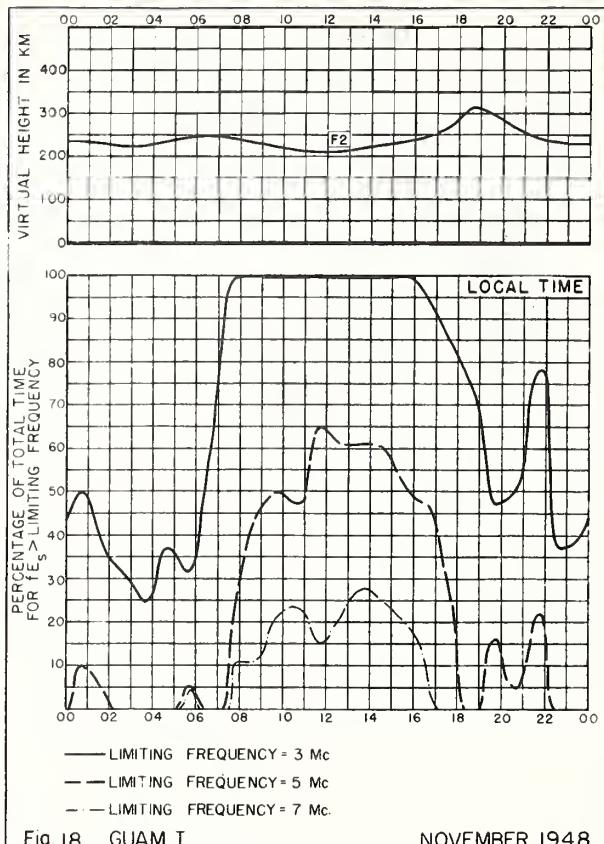
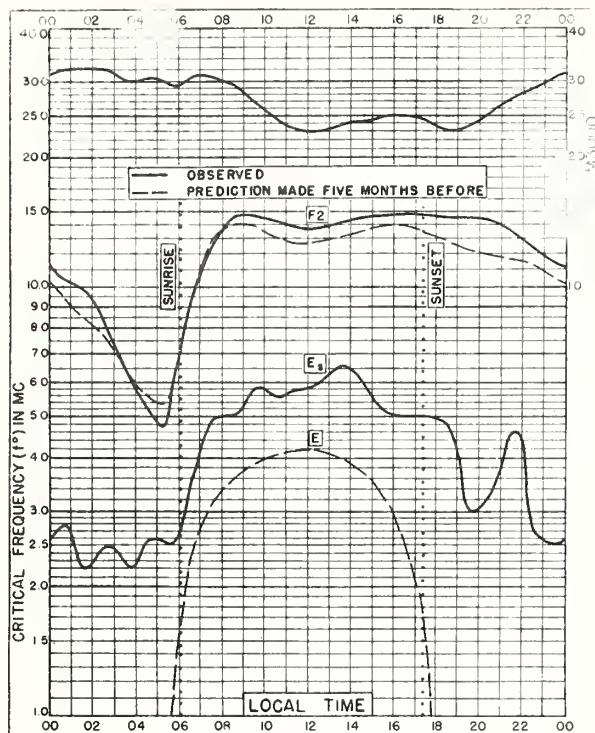


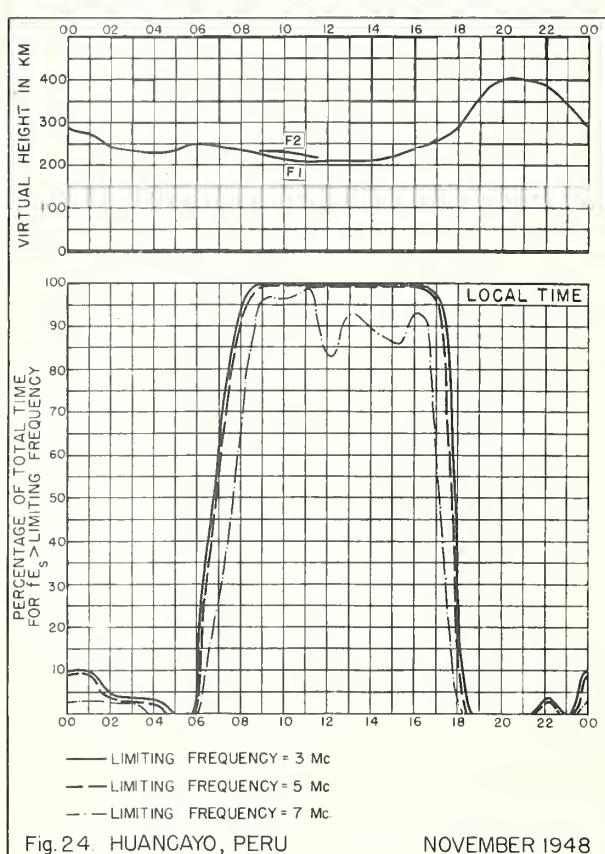
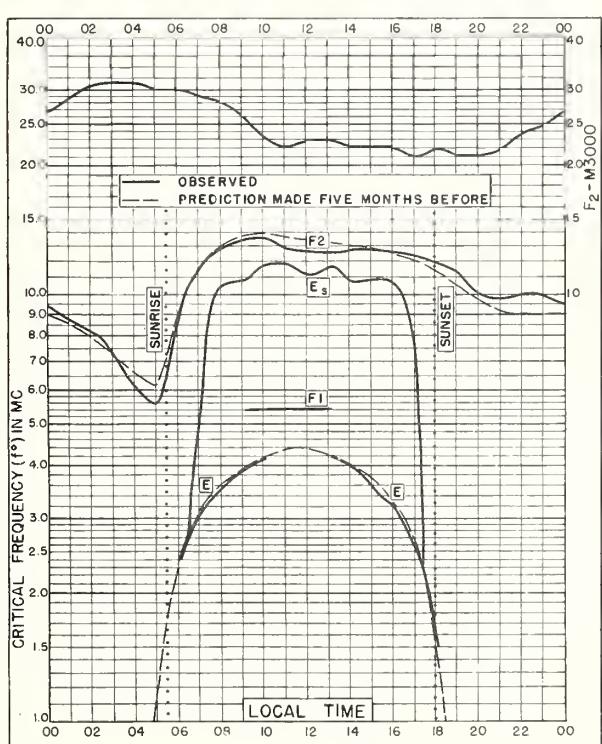
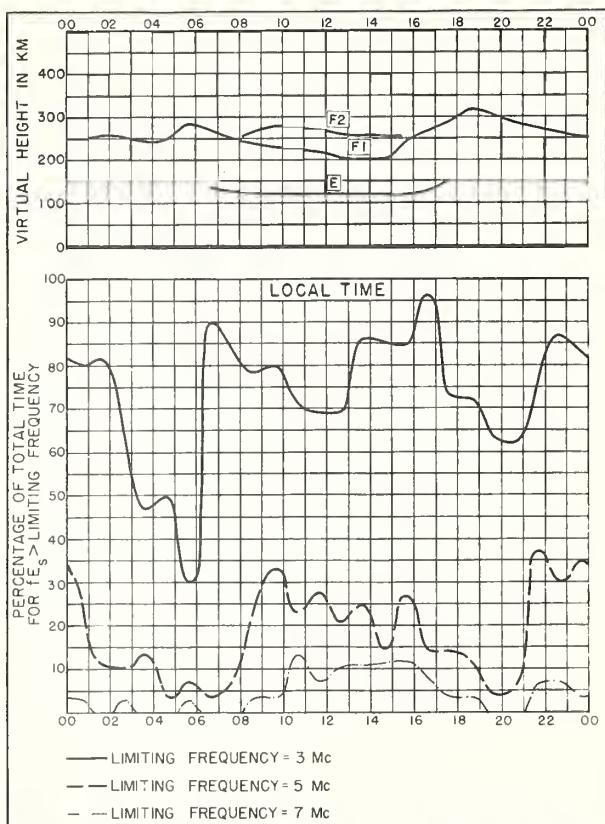
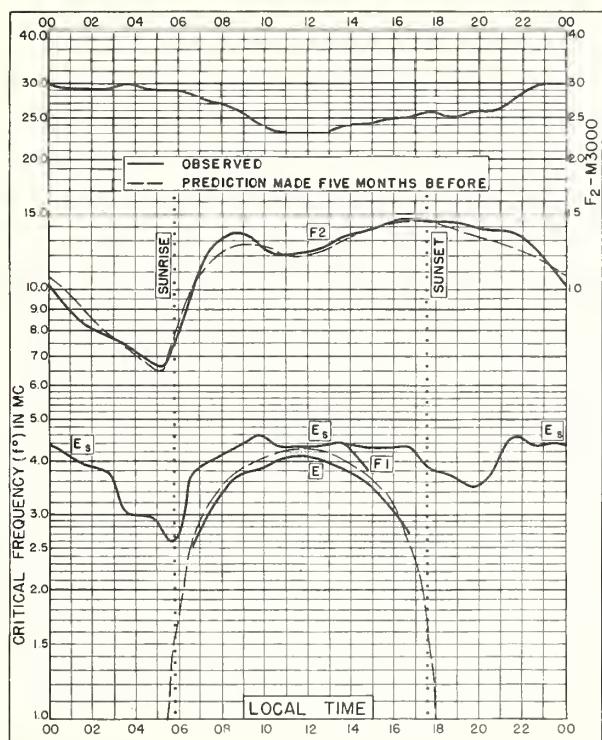
Fig. 4. BOSTON, MASSACHUSETTS NOVEMBER 1948











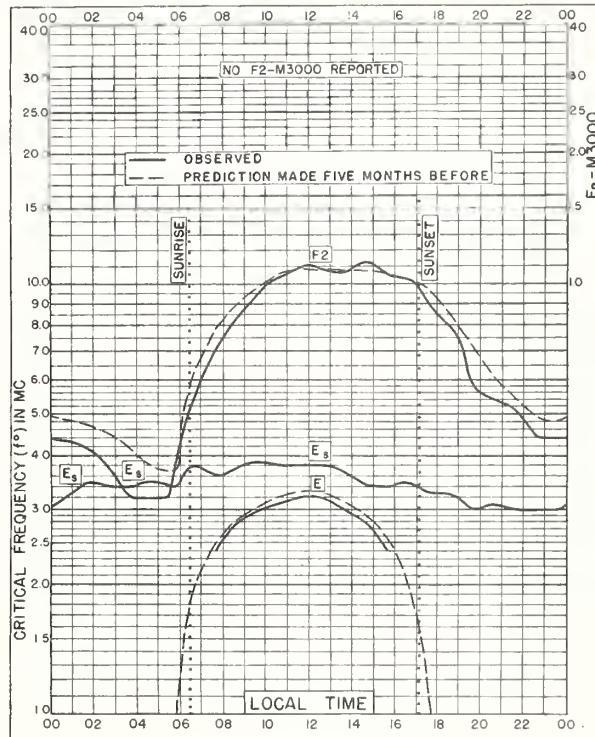


Fig. 25. LINDAU/HARZ, GERMANY
51. 6°N, 10.1°E OCTOBER 1948

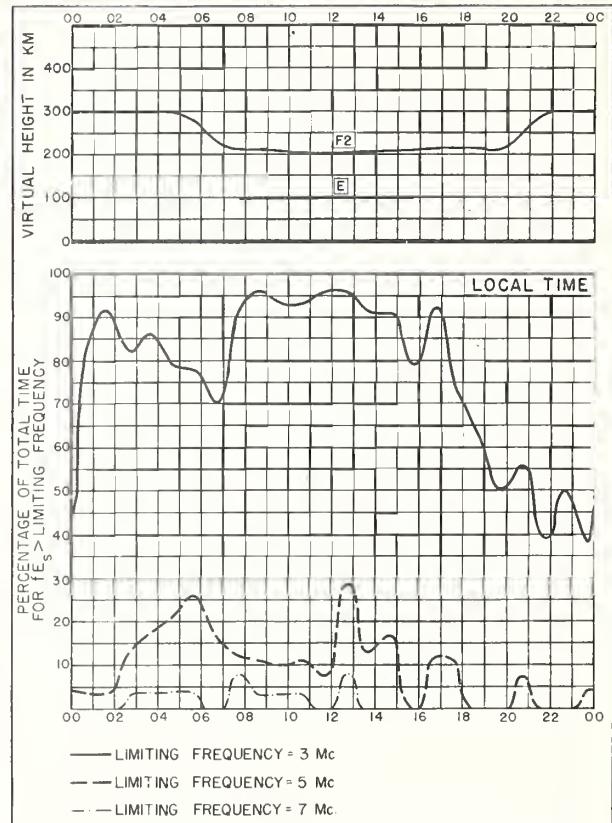


Fig. 26. LINDAU/HARZ, GERMANY OCTOBER 1948

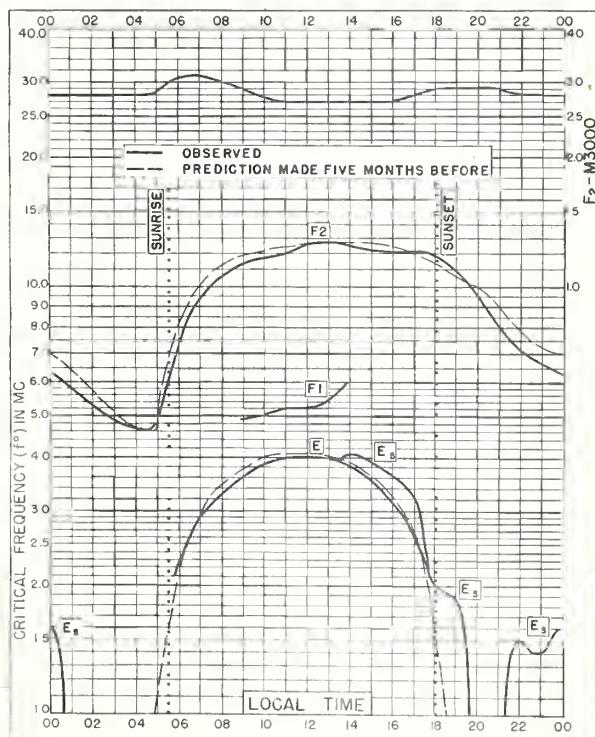


Fig. 27. JOHANNESBURG, U OF S. AFRICA
26.2°S, 28.0°E OCTOBER 1948

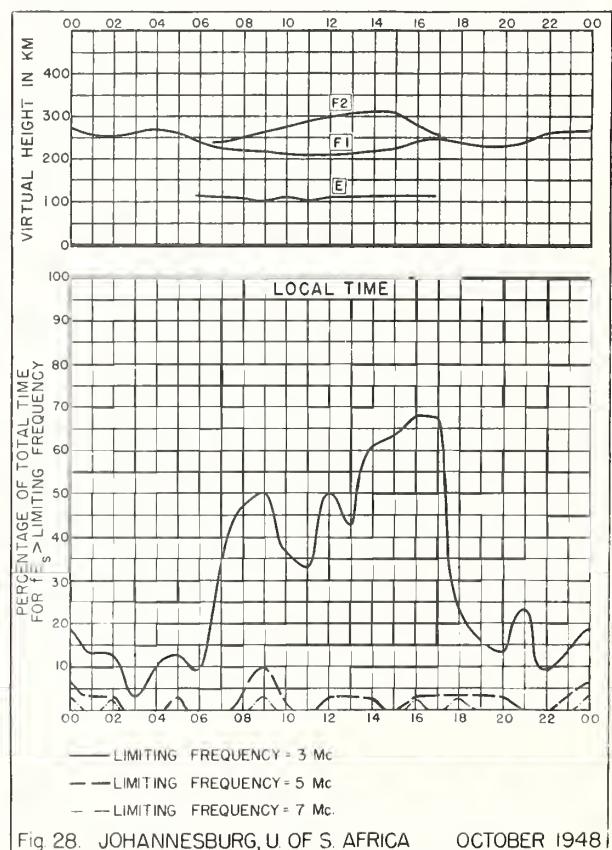


Fig. 28. JOHANNESBURG, U OF S. AFRICA OCTOBER 1948

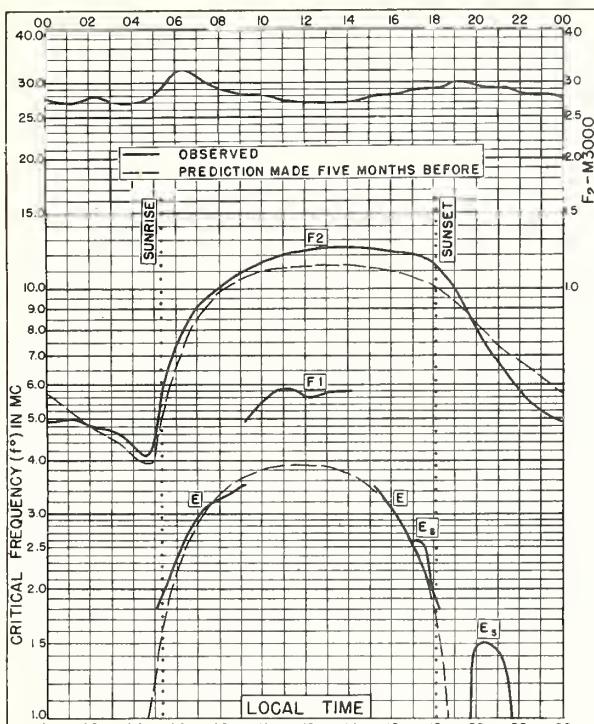


Fig. 29. CAPETOWN, U. OF S. AFRICA
34.2°S, 18.3°E OCTOBER 1948

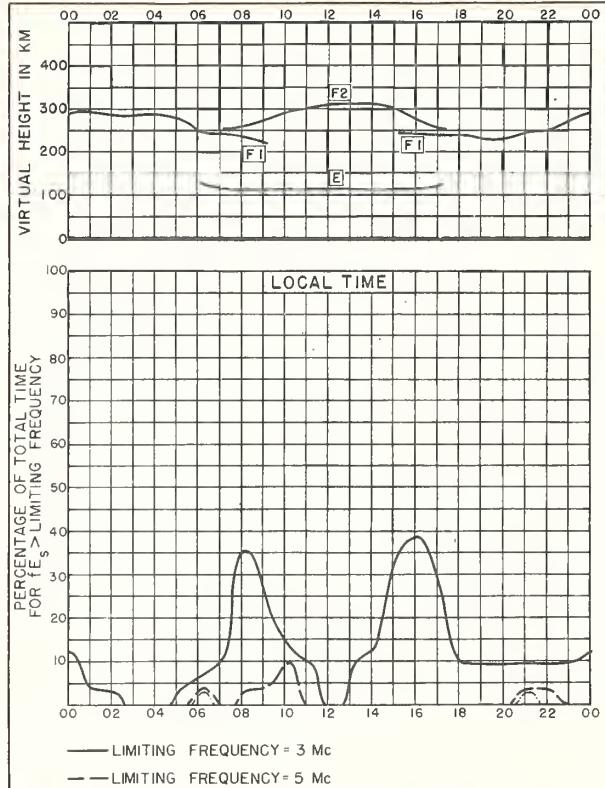


Fig. 30. CAPETOWN, U. OF S. AFRICA OCTOBER 1948

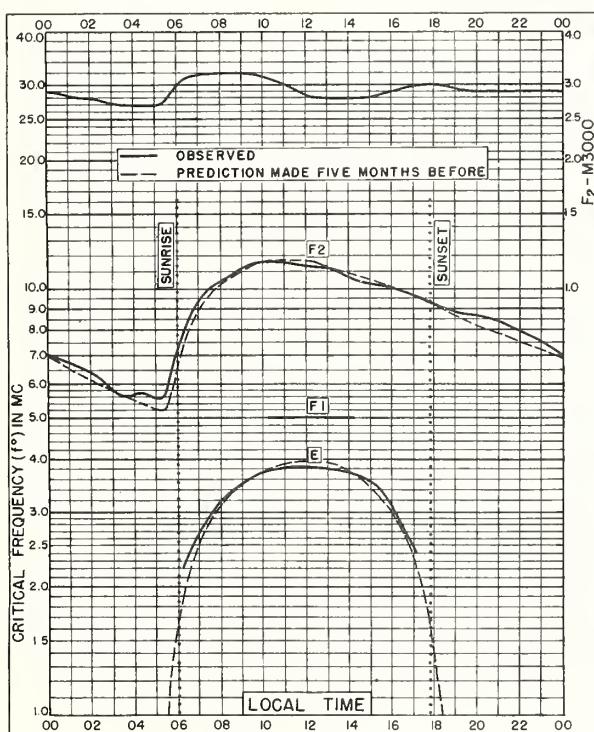


Fig. 31. BRISBANE, AUSTRALIA
27.5°S, 153.0°E SEPTEMBER 1948

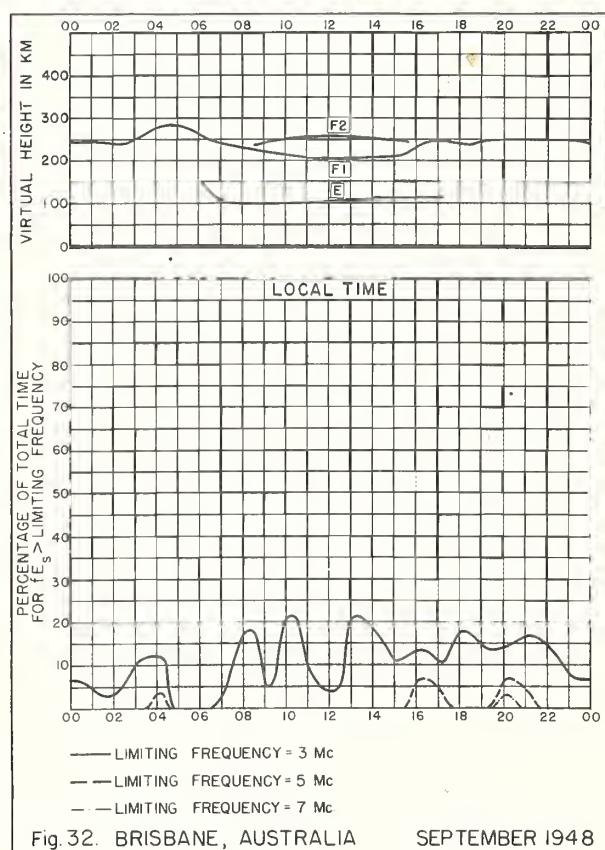


Fig. 32. BRISBANE, AUSTRALIA SEPTEMBER 1948

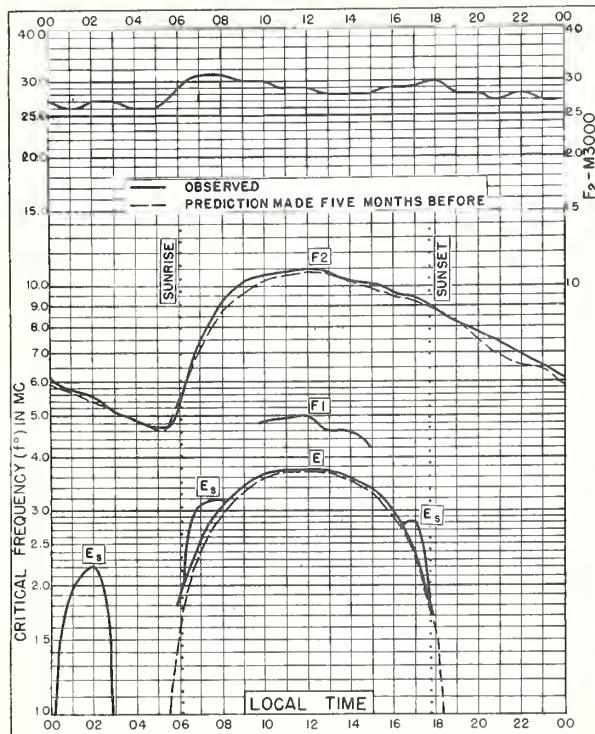


Fig. 33. CANBERRA, AUSTRALIA
35.3°S, 149.0°E SEPTEMBER 1948

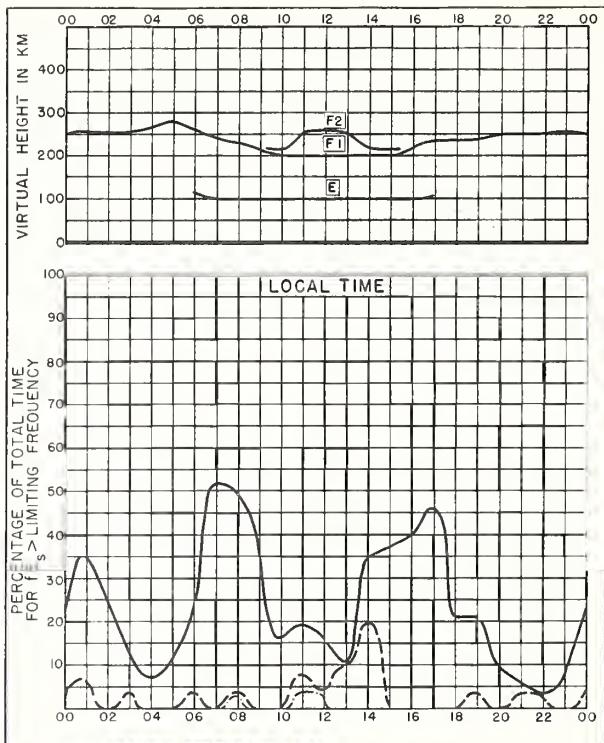


Fig. 34. CANBERRA, AUSTRALIA SEPTEMBER 1948

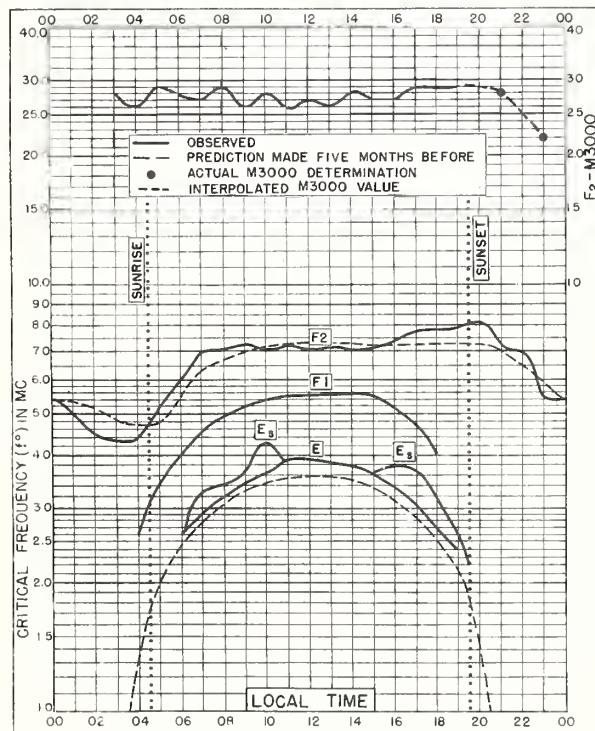


Fig. 35. FRASERBURGH, SCOTLAND
57.6°N, 2.1°W AUGUST 1948

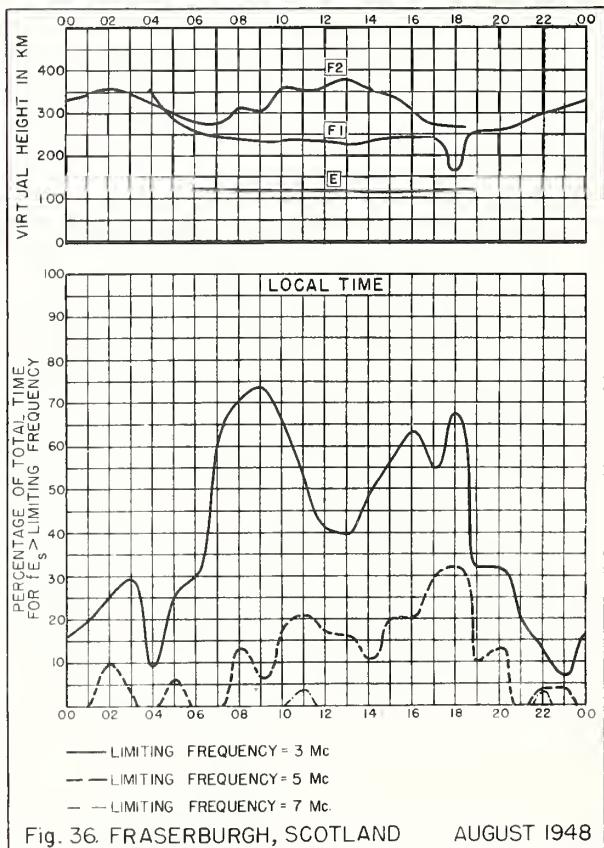


Fig. 36. FRASERBURGH, SCOTLAND AUGUST 1948

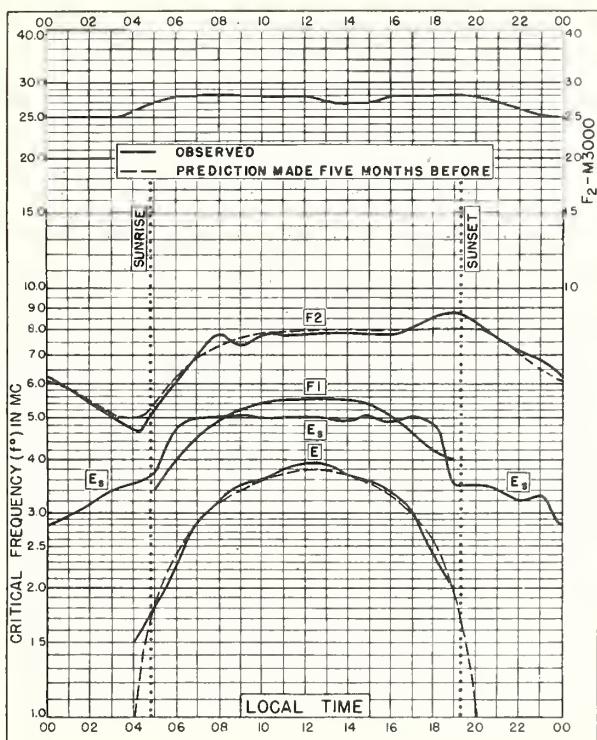


Fig. 37. SLOUGH, ENGLAND
51.5°N, 0.6°W AUGUST 1948

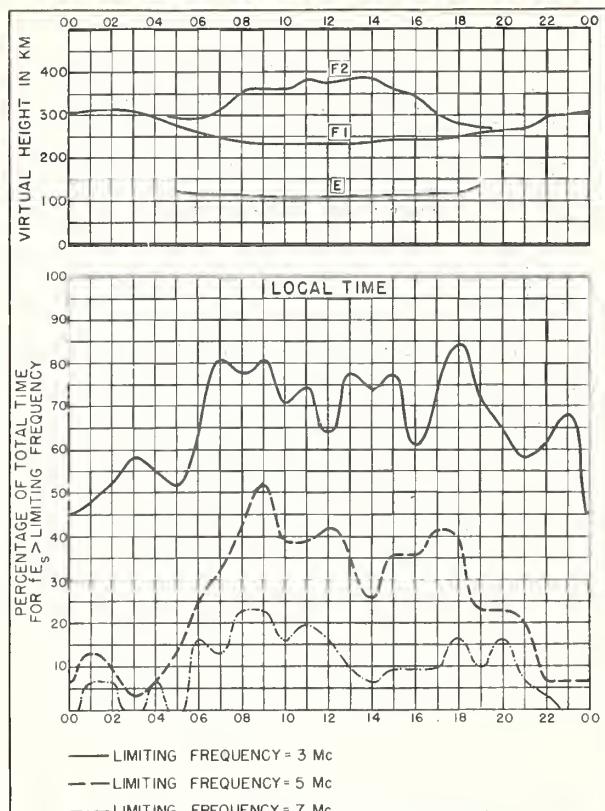


Fig. 38. SLOUGH, ENGLAND AUGUST 1948

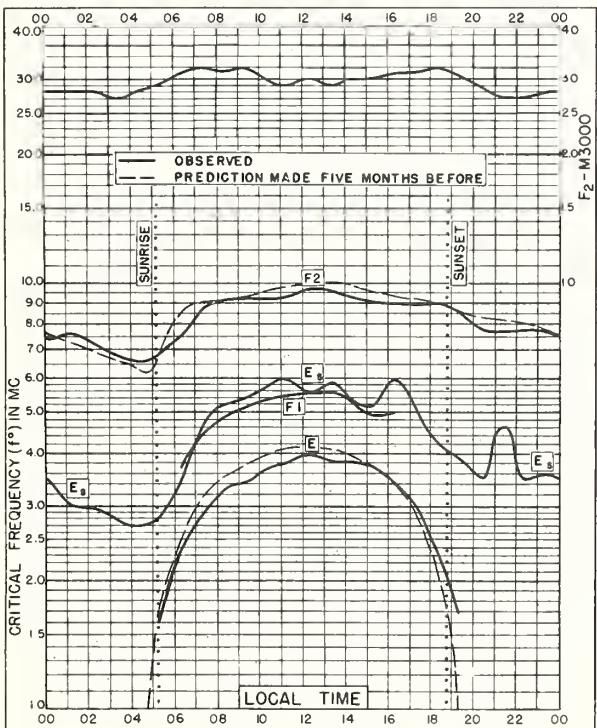


Fig. 39. SHIBATA, JAPAN
37.9°N, 139.3°E AUGUST 1948

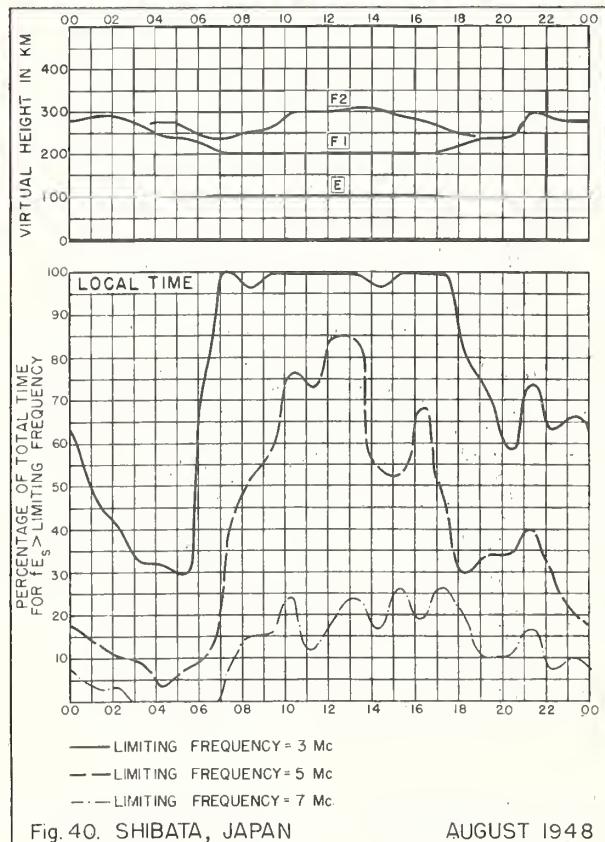


Fig. 40. SHIBATA, JAPAN AUGUST 1948

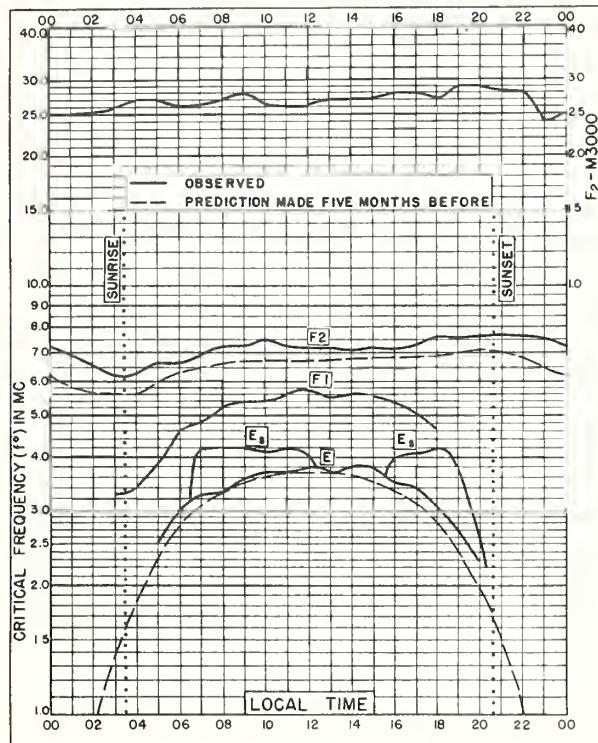


Fig. 41. FRASERBURGH, SCOTLAND
57.6°N, 2.1°W JULY 1948

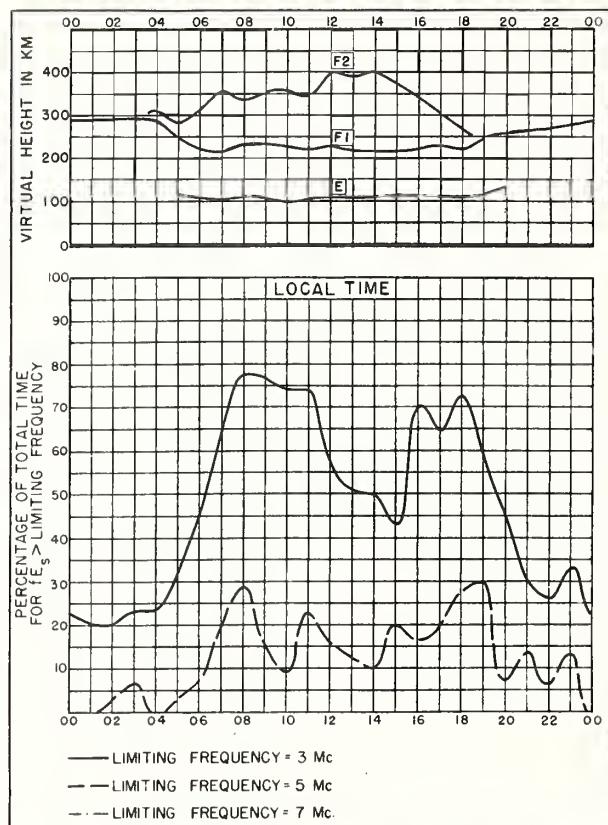


Fig. 42. FRASERBURGH, SCOTLAND JULY 1948

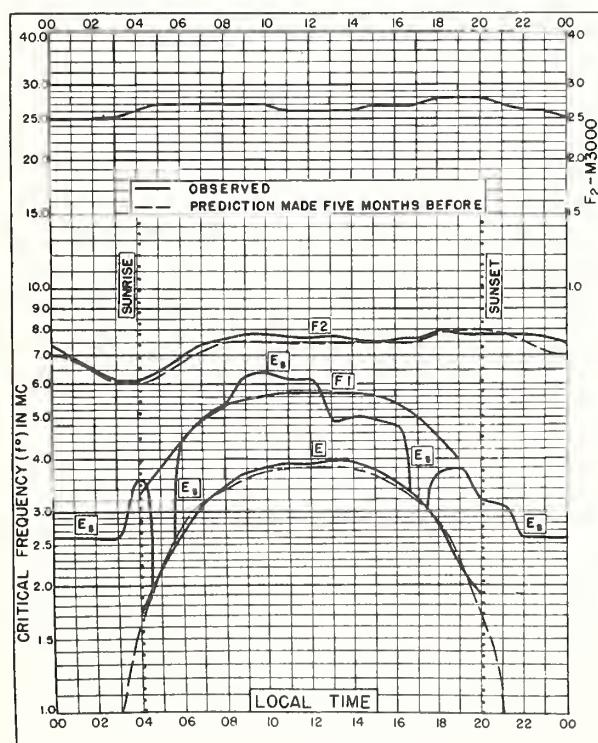


Fig. 43. SLOUGH, ENGLAND
51.5°N, 0.6°W JULY 1948

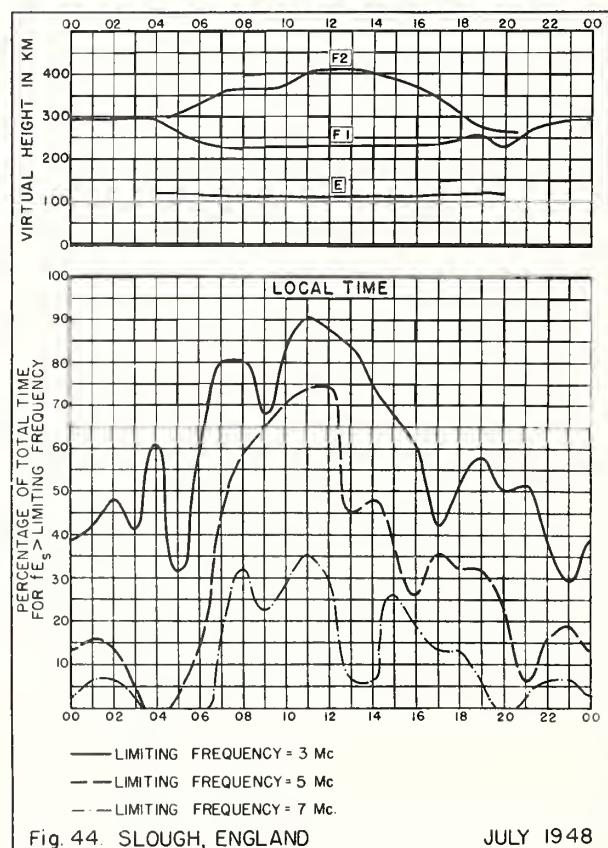


Fig. 44. SLOUGH, ENGLAND JULY 1948

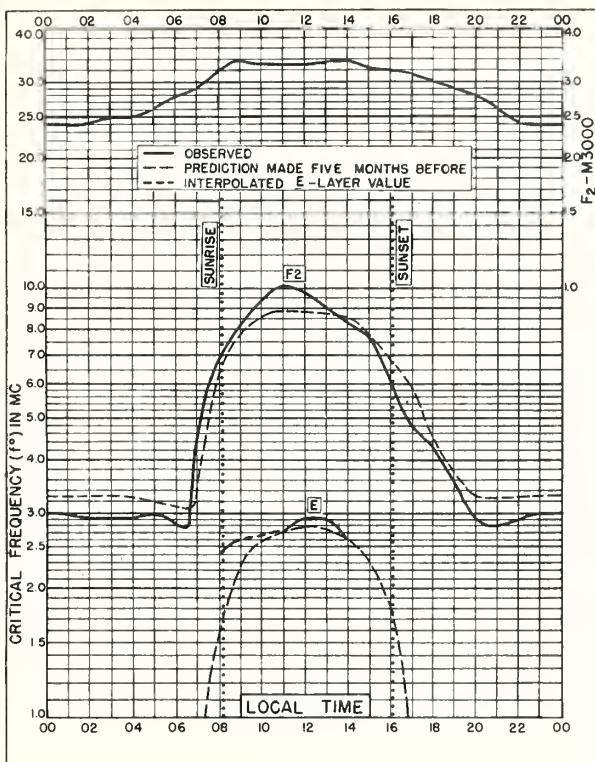


Fig. 45. FALKLAND IS.

51°S, 57.8°W

JULY 1948

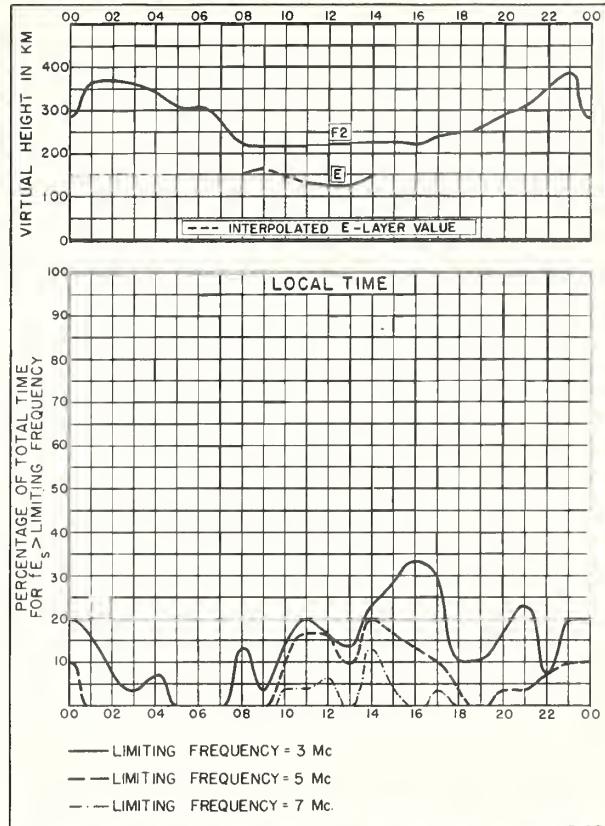


Fig. 46. FALKLAND IS.

JULY 1948

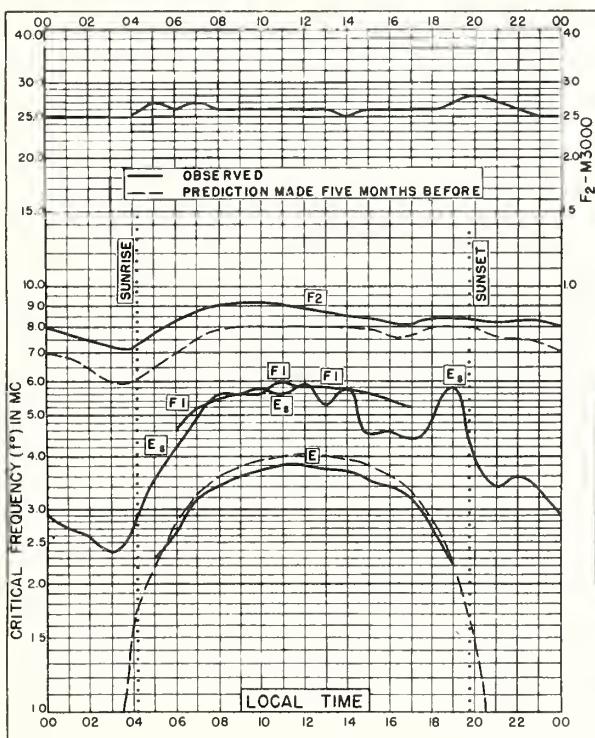


Fig. 47 FRIBOURG, GERMANY

48.1°N, 7.8°E

JUNE 1948

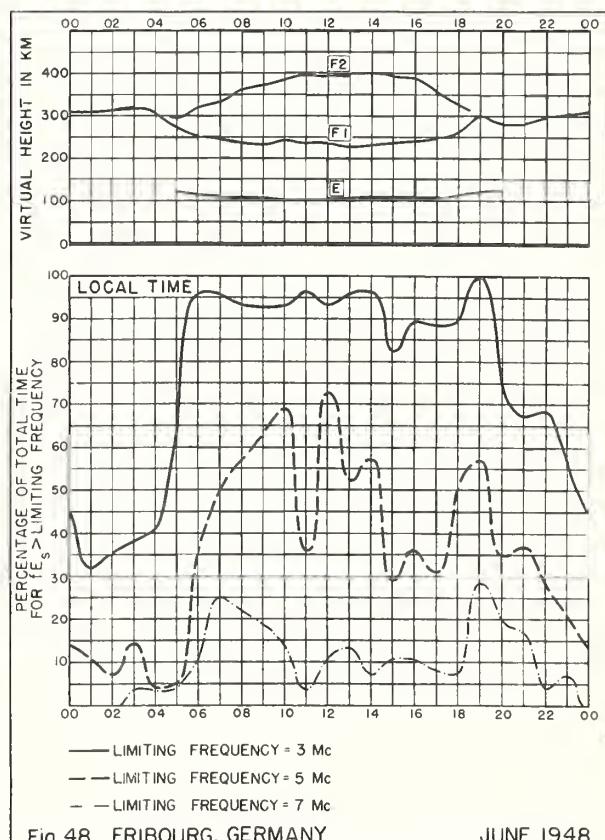


Fig. 48 FRIBOURG, GERMANY

JUNE 1948

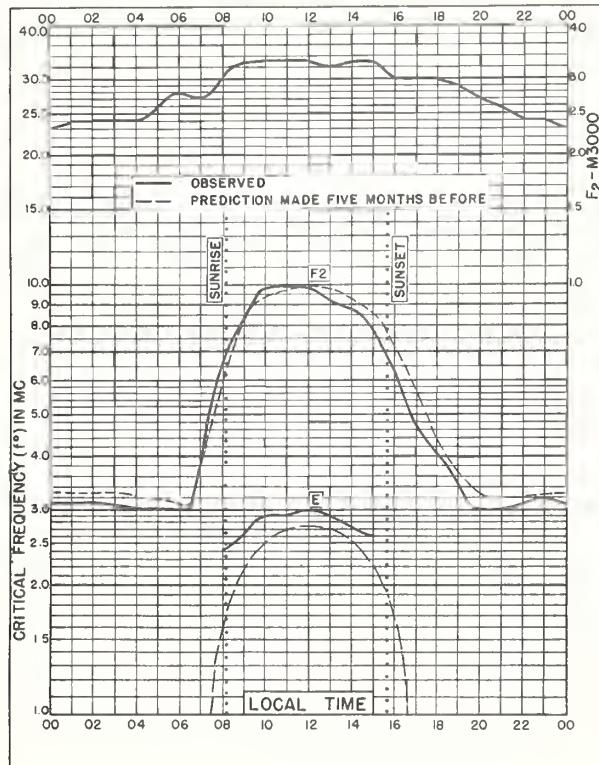


Fig. 49. FALKLAND IS.
51.7°S, 57.8°W JUNE 1948

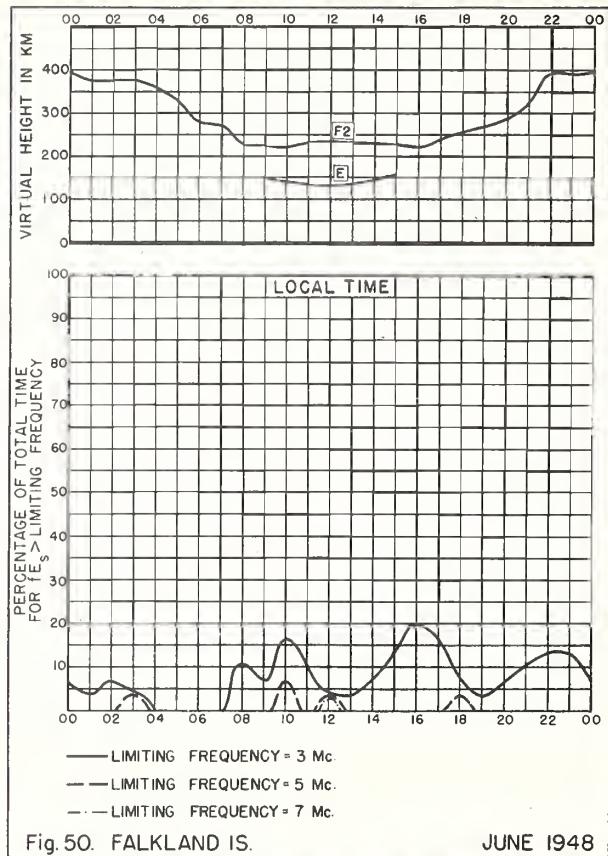


Fig. 50. FALKLAND IS. JUNE 1948

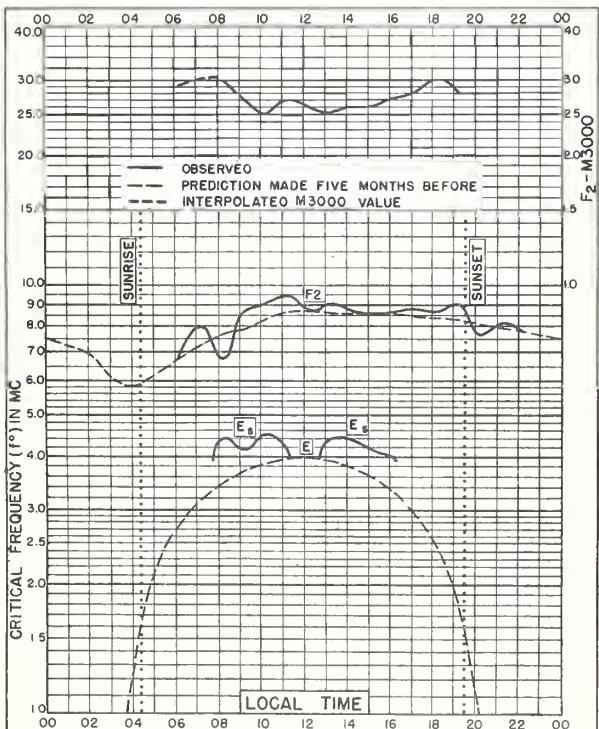


Fig. 51. BAGNEUX, FRANCE
48.8°N, 2.3°E MAY 1948

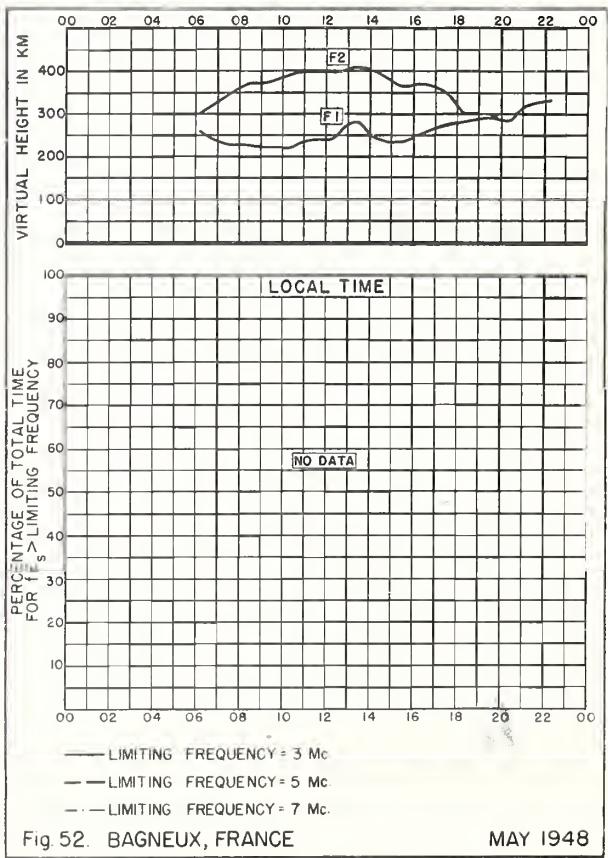


Fig. 52. BAGNEUX, FRANCE MAY 1948

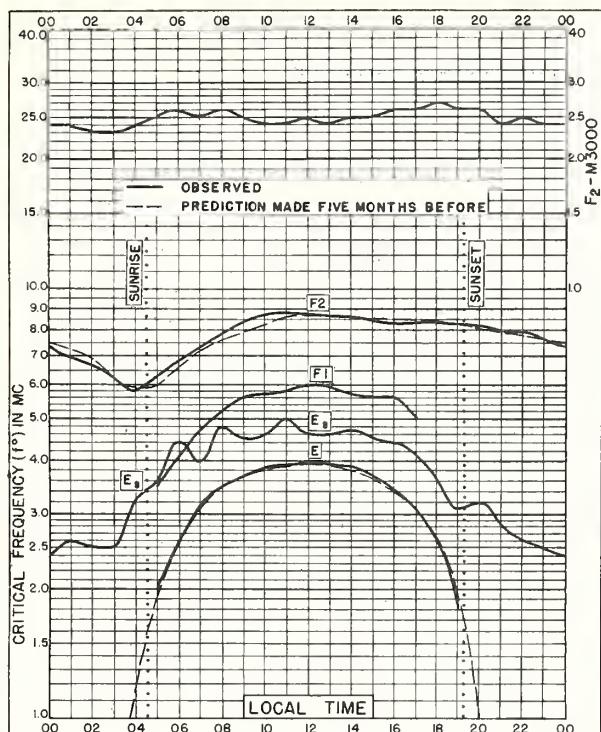


Fig. 53. FRIBOURG, GERMANY
48.1°N, 7.8°E

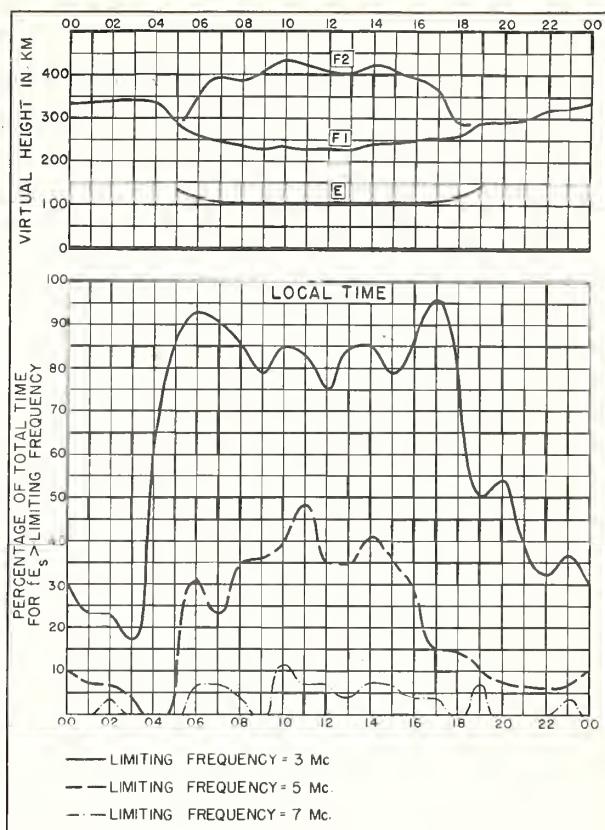


Fig. 54. FRIBOURG, GERMANY

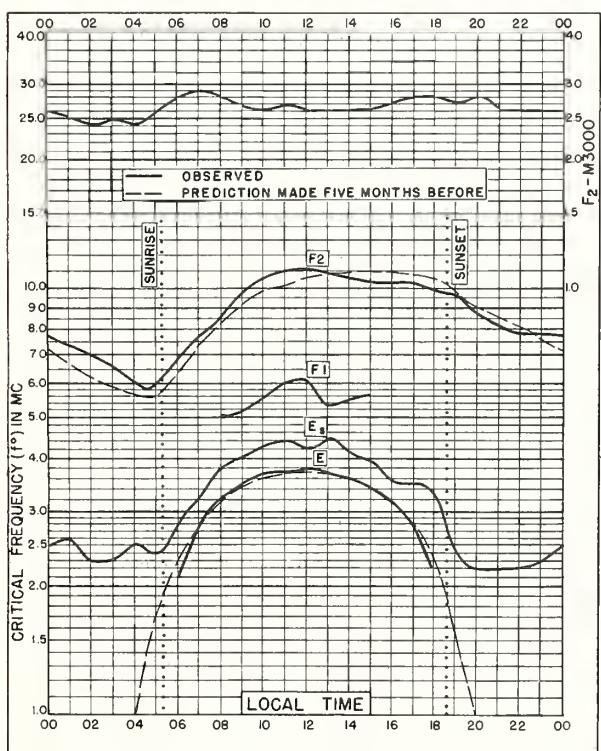


Fig. 55. FRIBOURG, GERMANY
48.1°N, 7.8°E

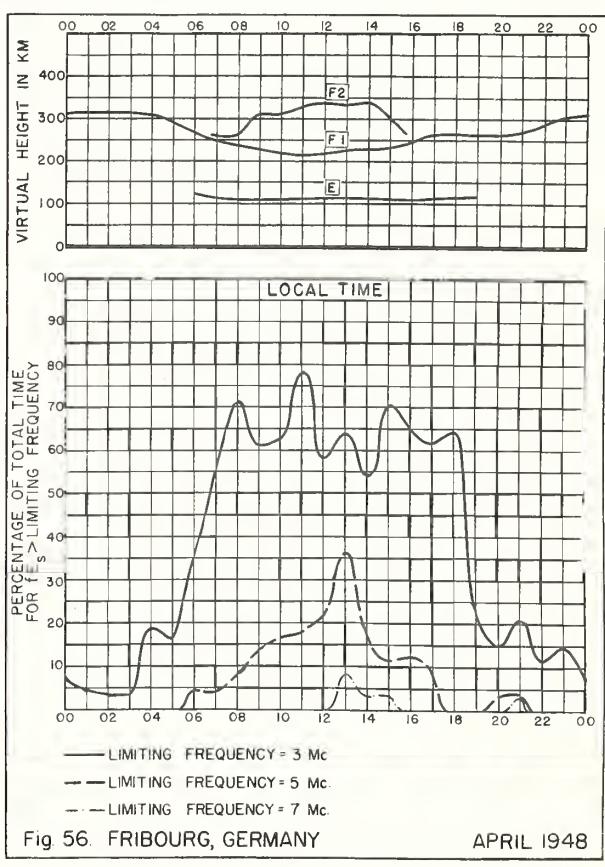


Fig. 56. FRIBOURG, GERMANY

Index of Tables and Graphs of Ionospheric Data
in CRPL-F53

	<u>Table page</u>	<u>Figure page</u>
Bagneux, France		
May 1948	23	56
Baton Rouge, Louisiana		
November 1948	18	46
Boston, Massachusetts		
November 1948	17	44
Brisbane, Australia		
September 1948	20	51
Canberra, Australia		
September 1948	21	52
Capetown, Union of S. Africa		
October 1948	20	51
Falkland Is.		
July 1948	22	55
June 1948	23	56
Fraserburgh, Scotland		
August 1948	21	52
July 1948	22	54
Fribourg, Germany		
June 1948	22	55
May 1948	23	57
April 1948	23	57
Guam I.		
November 1948	19	48
Huancayo, Peru		
November 1948	19	49
Johannesburg, Union of S. Africa		
October 1948	20	50
Lindau/Harz, Germany		
October 1948	20	50
Maui, Hawaii		
November 1948	18	47
Palmyra I.		
November 1948	19	49
San Francisco, California		
November 1948	17	45
San Juan, Puerto Rico		
November 1948	18	47
Shibata, Japan		
August 1948	21	53
Slough, England		
August 1948	21	53
July 1948	22	54
Trinidad, Brit. West Indies		
November 1948	19	48
Washington, D. C.		
December 1948	17	44
White Sands, New Mexico		
November 1948	17	45
Wuchang, China		
November 1948	18	46

CRPL and IRPL Reports

Daily:

Radio disturbance warnings, every half hour from broadcast station WWV of the National Bureau of Standards.
Telephoned and telegraphed reports of ionospheric, solar, geomagnetic, and radio propagation data.

Weekly:

CRPL-J. Radio Propagation Forecast (of days most likely to be disturbed during following month).

Semimonthly:

CRPL-Ja. Semimonthly Frequency Revision Factors for CRPL Basic Radio Propagation Prediction Reports.

Monthly:

CRPL-D. Basic Radio Propagation Predictions—Three months in advance. (Dept. of the Army, TB 11-499-monthly supplements to TM 11-499; Dept. of the Navy, DNC-13-1 (), monthly supplements to DNC-13-1.)

CRPL-F. Ionospheric Data.

Quarterly:

*IRPL-A. Recommended Frequency Bands for Ships and Aircraft in the Atlantic and Pacific.

*IRPL-H. Frequency Guide for Operating Personnel.

Nonscheduled reports:

CRPL-1-1. Prediction of Annual Sunspot Numbers.

CRPL-1-2, 3-1. High Frequency Radio Propagation Charts for Sunspot Minimum and Sunspot Maximum.

CRPL-1-2, 3-1, A. Supplement to Report CRPL-1-2, 3-1.

CRPL-1-3. Some Methods for General Prediction of Sudden Ionospheric Disturbances.

CRPL-1-4. Observations of the Solar Corona at Climax, 1944-46.

CRPL-1-5. Comparison of Predictions of Radio Noise with Observed Noise Levels.

CRPL-1-6. The Variability of Sky-Wave Field Intensities at Medium and High Frequencies.

CRPL-7-1. Preliminary Instructions for Obtaining and Reducing Manual Ionospheric Records.

NBS Circular 462. Ionospheric Radio Propagation.

NBS Circular 465. Instructions for the Use of Basic Radio Propagation Predictions.

Reports issued in past:

IRPL-C61. Report of the International Radio Propagation Conference, 17 April to 5 May 1944.

IRPL-G1 through G12. Correlation of D. F. Errors With Ionospheric Conditions.

IRPL-R. Nonscheduled reports:

R4. Methods Used by IRPL for the Prediction of Ionosphere Characteristics and Maximum Usable Frequencies.

R5. Criteria for Ionospheric Storminess.

R6. Experimental Studies of Ionospheric Propagation as Applied to the Loran System.

R7. Second Report on Experimental Studies of Ionospheric Propagation as Applied to the Loran System.

R9. An Automatic Instantaneous Indicator of Skip Distance and MUF.

R10. A Proposal for the Use of Rockets for the Study of the Ionosphere.

R11. A Nomographic Method for Both Prediction and Observation Correlation of Ionosphere Characteristics.

R12. Short Time Variations in Ionospheric Characteristics.

R14. A Graphical Method for Calculating Ground Reflection Coefficients.

R15. Predicted Limits for F2-layer Radio Transmission Throughout the Solar Cycle.

R16. Predicted F2-layer Frequencies Throughout the Solar Cycle, for Summer, Winter, and Equinox Season.

R17. Japanese Ionospheric Data—1943.

R18. Comparison of Geomagnetic Records and North Atlantic Radio Propagation Quality Figures—October 1943 Through May 1945.

R19. Nomographic Predictions of F2-layer Frequencies Throughout the Solar Cycle, for June.

R20. Nomographic Predictions of F2-layer Frequencies Throughout the Solar Cycle, for September.

R21. Notes on the Preparation of Skip-Distance and MUF Charts for Use by Direction-Finder Stations. (For distances out to 4000 km.)

R22. Nomographic Predictions of F2-layer Frequencies Throughout the Solar Cycle, for December.

R23. Solar-Cycle Data for Correlation with Radio Propagation Phenomena.

R24. Relations Between Band Width, Pulse Shape and Usefulness of Pulses in the Loran System.

R25. The Prediction of Solar Activity as a Basis for the Prediction of Radio Propagation Phenomena.

R26. The Ionosphere as a Measure of Solar Activity.

R27. Relationships Between Radio Propagation Disturbance and Central Meridian Passage of Sunspots Grouped by Distance From Center of Disc.

R28. Nomographic Predictions of F2-layer Frequencies Throughout the Solar Cycle, for January.

R30. Disturbance Rating in Values of IRPL Quality-Figure Scale from A. T. & T. Co. Transmission Disturbance Reports to Replace T. D. Figures as Reported.

R31. North Atlantic Radio Propagation Disturbances, October 1943 Through October 1945.

R32. Nomographic Predictions of F2-layer Frequencies Throughout the Solar Cycle, for February.

R33. Ionospheric Data on File at IRPL.

R34. The Interpretation of Recorded Values of fEs.

R35. Comparison of Percentage of Total Time of Second-Multiple Es Reflections and That of fEs in Excess of 3 Mc.

IRPL-T. Reports on tropospheric propagation:

T1. Radar operation and weather. (Superseded by JANP 101.)

T2. Radar coverage and weather. (Superseded by JANP 102.)

CRPL-T3. Tropospheric Propagation and Radio-Meteorology. (Reissue of Columbia Wave Propagation Group WPG-5.)

*Items bearing this symbol are distributed only by U. S. Navy. They are issued under one cover as the DNC-14 series.

