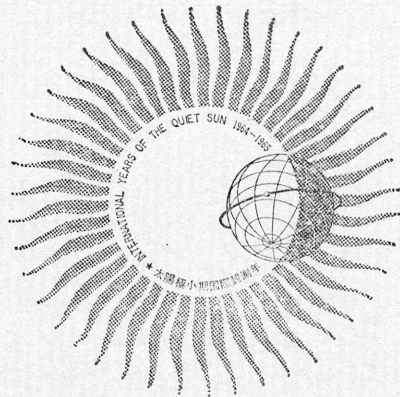


F-192

# IONOSPHERIC DATA IN JAPAN

FOR DECEMBER 1964

Vol. 16 No. 12



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Prepared by

THE RADIO RESEARCH LABORATORIES  
MINISTRY OF POSTS AND TELECOMMUNICATIONS  
KOKUBUNJI, TOKYO, JAPAN

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THE RADIO RESEARCH LABORATORIES

KOKUBUNJI, TOKYO, JAPAN

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## SITE OF THE RADIO WAVE OBSERVATORIES

Ionospheric observation is carried out at the following four observatories in Japan.

	Latitude	Longitude	Site
Wakkanai	45°23.6'N.	141°41.1'E.	Wakkanai-shi, Hokkaido
Akita	39°43.5'N.	140°08.2'E.	Tegata Nishishin-machi, Akita-shi, Akita-ken
Kokubunji	35°42.4'N.	139°29.3'E.	Koganei-shi, Tokyo-to
Yamagawa	31°12.1'N.	130°37.1'E.	Yamagawa-machi, Ibusuki-gun, Kagoshima-ken

Solar radio emission and radio propagation conditions are observed at Hiraiso Radio Wave Observatory.

	Latitude	Longitude	Site
Hiraiso	36°22.0'N.	140°37.5'E.	Isozaki-machi, Nakaminato-shi, Ibaraki-ken

## SYMBOLS AND TERMINOLOGY

### A. IONOSPHERE

All symbols and terminology in the table of ionospheric data are used in accordance with the "URSI Handbook of Ionogram Interpretation and Reduction," 1961.

#### Terminology

$f_oF2$ $f_oF1$ $f_oE$ $f_oE_s$	}	The ordinary wave critical frequency for the $F2$ , $F1$ and $E$ layers, respectively.
$f_oE_s$		The ordinary wave top frequency corresponding to highest frequency at which a mainly continuous trace is observed.
$f_oE_s$		The lowest ordinary wave frequency at which the $E_s$ layer begins to become transparent. This is usually determined from the minimum frequency at which reflections from layers at greater heights are observed.
$f$ -min		The frequency below which no echoes are observed.
$M(3000)F2$		The maximum usable frequency factor for a path of 3000 km for transmission by $F2$ layer.
$M(3000)F1$		The maximum usable frequency factor for a path of 3000 km for transmission by $F1$ layer.
$h'F2$		The minimum virtual height, $h'F2$ , refers to the highest, most stable stratification observed in the $F$ region and can only be scaled when such stratification is present.
$h'F$		The natural and most significant $F$ region virtual height parameter is that for lowest $F$ region stratification. This will be denoted by $h'F$ . Thus $h'F$ is identical with the current $h'F2$ when $F$ region stratification is absent, e.g., at night, and with the current $h'F1$ when $F1$ stratification is present.
$h'E_s$		The lowest virtual height of the trace used to give the $f_oE_s$ .
$hpF2$		The virtual height of the $F2$ layer measured on the ordinary

$ypF2$  wave branch at a frequency equal to  $0.834f_0F2$ .

The semi-thickness of the  $F2$  layer deduced from a parabolic fit to the "nose" of the electron density distribution with height and based on the observed  $h'f$  trace. (The difference between  $hpF2$  and the virtual height at  $0.969f_0F2$ ).

**a. Descriptive Letters**

The following letters are entered after or used to replace a numerical value on the monthly tabulation sheets.

- A Measurement influenced by, or impossible because of, the presence of a lower thin layer, for example  $E_s$ .
- B Measurement influenced by, or impossible because of, absorption in the vicinity of  $f$ -min.
- C Measurement influenced by, or impossible because of, any non-ionospheric reason.
- D Measurement influenced by, or impossible because of, the upper limit of the normal frequency range. Used in a qualifying sense, see below.
- E Measurement influenced by, or impossible because of, the lower limit of the normal frequency range. Used in a qualifying sense, see below.
- F Measurement influenced by, or impossible because of, the presence of spread echoes.
- G Measurement influenced or impossible because the ionization density of the layer is too small to enable it to be made accurately.
- H Measurement influenced by, or impossible because of, the presence of a stratification.
- L Measurement influenced or impossible because the trace has no sufficiently definite cusp between layers.
- M Interpretation of measurement questionable because the ordinary and extraordinary components are not distinguishable.
- N Conditions are such that the measurement cannot be interpreted.
- O Measurement refers to the ordinary component.
- R Measurement influenced by, or impossible because of, attenuation in the vicinity of a critical frequency.
- S Measurement influenced by, or impossible because of, interference or atmospherics.
- T Value determined by a sequence of observations, the actual observation being inconsistent or doubtful.
- V Forked trace which may influence the measurement.
- W Measurement influenced or impossible because the echo lies outside the height range recorded.
- X Measurement refers to the extraordinary component.
- Y Intermittent trace.
- Z Third magneto-ionic component present.

**b. Qualifying Letters**

The following letters are entered in the first column before a numerical

value on the monthly tabulation sheets.

D	greater than.
E	less than.
I	Missing value has been replaced by an interpolated value.
J	Ordinary component characteristic deduced from the extraordinary component.
O	Extraordinary component characteristic deduced from the ordinary component. (Used for x- characteristics only.)
T	Value determined by a sequence of observations, the actual observation being inconsistent or doubtful.
U	Uncertain or doubtful numerical value.
Z	Measurement deduced from the third magneto-ionic component.

**c. Description of Standard Types of  $E_s$**

The eight standard types of  $E_s$  are identified by corresponding lower case letters: *f, l, c, h, q, r, a, s*. These letters suggest the names flat, low, cusp, high, equatorial, retardation, auroral and slant, respectively. It is strongly emphasized that these names are not restrictive. The letter 'n' is used to designate any  $E_s$  trace that does not correspond to any of the eight types.

- f* An  $E_s$  trace which shows no appreciable increase of height with frequency. The trace is usually relatively solid at most latitudes. This classification may only be used at night; apparently flat  $E_s$  traces observed in the daytime are classified according to their virtual height: *h* or *l*.
- l* A flat  $E_s$  trace at or below the normal  $E$  layer minimum virtual height in the day or below the night  $E$  layer minimum virtual height at night.
- c* An  $E_s$  trace showing a relatively symmetrical cusp at or below  $f_0E$ . This is usually continuous with the normal  $E$  trace, although when the deviative absorption is large, part or all of the cusp may be missing. (Usually a daytime type.)
- h* An  $E_s$  trace showing a discontinuity in height with the normal  $E$  layer trace at or above  $f_0E$ . The cusp is not symmetrical, the low frequency end of the  $E_s$  trace lying clearly above the high frequency end of the normal  $E$  trace. (Usually a daytime type.)
- q* An  $E_s$  trace which is diffuse and non-blanketing over a wide frequency range. The spread is most pronounced at the upper edge of the trace. (This type is common in daytime in the vicinity of the magnetic equator.)
- r* An  $E_s$  trace showing an increase in virtual height at the high frequency end similar to group retardation but which is non-blanketing over part or all of its frequency range. This is distinguished from the usual group retardation (as in the case of an occulting thick  $E$  layer) by the lack of group retardation in the  $F$  layer traces at corresponding frequencies and the lack of complete blanketing.
- a* An  $E_s$  having a well defined flat or gradually rising lower edge with stratified and diffuse (spread) traces present above it. These

sometimes extend over several hundred kilometers of virtual height.

s A diffuse  $E_s$  trace which rises steadily with frequency and usually emerges from another type  $E_s$  trace. The rising trace alone is classified as 's'; the horizontal trace is classified separately. At high latitudes the slant trace usually starts to rise from a horizontal  $E_s$  trace such as  $E_s-l$  or  $E_s-f$ , at frequencies which greatly exceed the  $E$  layer critical frequency, whereas at low latitudes it usually rises from  $E_s-q$ ,  $E_s-c$ , or  $E_s-h$  at frequencies near the regular  $E$  critical frequency. Type s is never used to determine  $f_oE_s$  and  $h'E_s$ . The slant trace is sometimes observed to start at  $f_oE$  without echoes clearly identifiable as  $E_s$  echoes being seen.

n The designation 'n' is used to denote an  $E_s$  trace which cannot be classified into one of the standard types. When a trace appears to be intermediate between any two classes a choice should be made whenever possible even if it is uncertain. 'n' should be used sparingly.

#### d. Multiple Reflections from $E_s$

When the ionogram shows the presence of multiple reflections from  $E_s$  the number of traces seen should be recorded after the letter indicating the type.

### B. SOLAR RADIO EMISSION

Solar radio observations are carried out on 200 and 500 Mc/s at Hiraiso Radio Wave Observatory.

Antennas are a broadside array of  $6 \times 4$  doublets for 200 Mc/s and a parabolic reflector of 5 meter for 500 Mc/s, each having the total power receiver.

Observations are feasible almost from sunrise to sunset.

#### a. Time and Unit

The time is expressed as U.T.

The unit is  $10^{-22} \text{ W} \cdot \text{m}^{-2} \cdot (\text{c/s})^{-1}$  for both components of polarization.

#### b. Daily Data

##### *Flux density*

The three-hourly and daily mean values are given.

##### *Variability*

The three-hourly and daily mean values are given at 200 Mc/s only.

Variability is expressed in the following four grades:

0=Quiet or no burst,

1=A few bursts,

2=Many bursts,

3=Very many bursts.

The number of bursts exceeding the flux level is counted.

### c. Distinctive Events

The phenomena are picked up on the following criteria:

1. Distinct from the prevailing kind of activity,
2. Correlated with other known solar phenomena,
3. Remarkable change-over from one situation to another.

*Starting time* and *Time of maximum* are given to nearest minute in but to nearest a tenth minute for short intense occurrences or clear commencements.

*Duration* is given in minutes and to nearest a tenth minute, if short or clear.

*Descriptive type* is denoted by the following symbols:

S = Simple rise and fall of intensity;

C = Complex variation of intensity,

C + = Prolonged broad-band enhancement of radiation, generally of spectral type IV;

F = Group of bursts: multiple peaks probably belonging to the same event, but separated by relatively short period of quietness;

RF = More or less irregular rise and fall of intensity, at metric or decimetric wavelengths;

e = Sudden beginning of burst with steep rise of intensity;

E = Steep rise of intensity of continuum background;

p.i. = post-burst increase;

onset storm = clear-cut beginning of a noise storm.

*Peak intensity* is the flux density of the highest peak reached during the occurrence, measured above the pre-burst level.

*Mean intensity* is the flux density averaged over the burst's duration, measured above the pre-burst level; therefore, multiplying the duration, the total energy of the occurrence can be estimated.

## C. RADIO PROPAGATION CONDITIONS

### a. Radio Propagation Quality Figures

Radio propagation quality figures are usually expressed on the scale that ranges from one to five as follows:

1 = very poor (very disturbed)

4 = normal

2 = poor (disturbed)

5 = good

3 = rather poor (unstable)

The tabulated circuits contain London (commercial circuit), WWV (frequencies 10, 15, 20 Mc broadcast from Washington, D.C.), San Francisco (commercial circuit) and WWVH (frequencies 10, 15 Mc broadcast from Hawaii), which are received at Hiraiso Radio Wave Observatory near Tokyo.

Warnings of radio propagation broadcast from JJY station are expressed in three grades:

N=normal  
 U=unstable  
 W=disturbed

The letter W expresses disturbed condition expected to be during the following 12 hours after issue. The letter U and N means also unstable or normal conditions, respectively.

Whole day radio quality indices are the averages of the 6-hourly indices of London, WWV and S. F.

Start- and end-time of principal geomagnetic storms closely correlated to radio propagation conditions are tabulated from observations at Kakioka.

**b. Sudden Ionospheric Disturbance (S. I. D.)**

The data of short wave fade-out (SWF) are prepared from the field intensity records on following circuits received at Hiraiso. Characteristics of the phenomenon are classified as follows.

*Circuits and Drop-out intensity*

WS.....WWV 20 Mc, 15 Mc and 10 Mc (Washington)  
 S F.....Various commercial circuits (San Francisco)  
 HA.....WWVH 15 Mc and 10 Mc (Hawaii)  
 TO.....JJY 15 Mc and 10 Mc (Tokyo)  
 SH.....BPV 15 Mc and 10 Mc (Shanghai)  
 LN.....Various commercial circuits (London)

Start-time and Duration, Types and Importances are described from the data of a circuit whose Drop-out Intensity is underlined. Drop-out Intensities of 10 Mc ( ' ), 15 Mc (none) and 20 Mc ( '' ).

*Start-times and Durations*

*Types*

S : sudden drop-out and gradual recovery  
 Slow: slow drop-out taking 5 to 15 minutes and gradual recovery  
 G : gradual disturbances; fade irregular in both drop-out and recovery

*Importances*

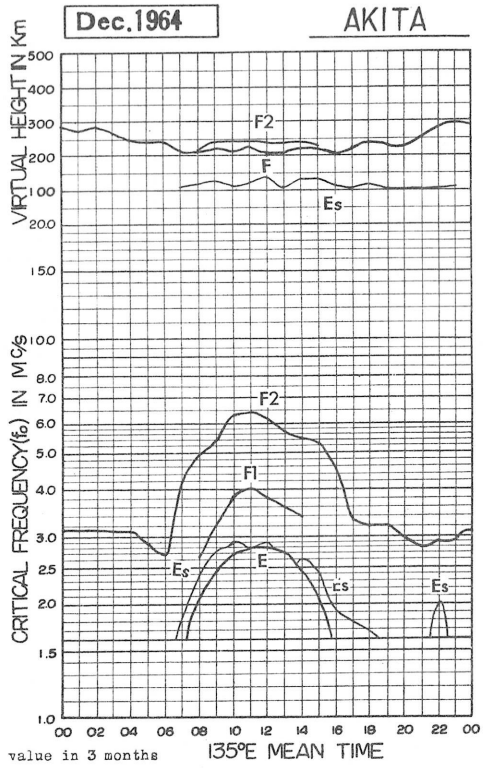
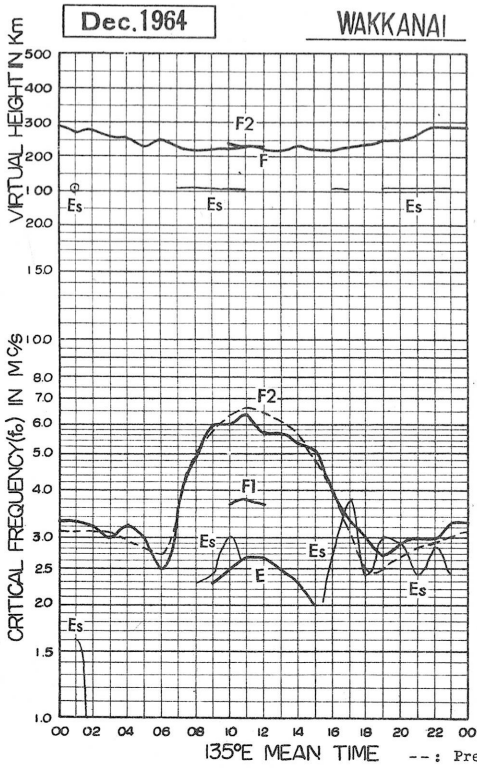
Degrees of SWF are classified into 9 grades according to the amplitude of fade-out;

1-	1	1+
2-	2	2+
3-	3	3+

Besides, the time associated phenomena of SID's, that is, solar flare, solar radio noise outburst and crochet (solar flare effect in magnetic record) are given in this table from interchange messages or measurements at Hiraiso.

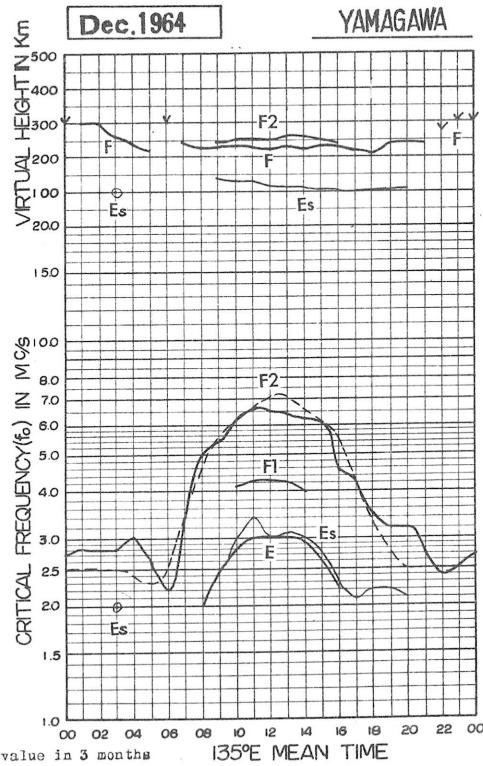
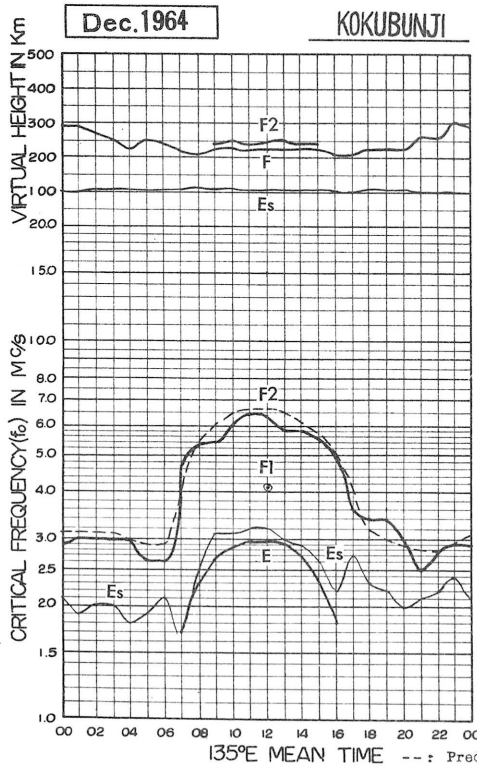


IONOSPHERIC DATA  
MONTHLY MEDIAN CHARACTERISTICS



advance by R.R.L.

IONOSPHERIC DATA  
MONTHLY MEDIAN CHARACTERISTICS



advance by R.R.L.

Lat. 45° 23.6'N

Long. 141° 41.1'E

IONOSPHERIC DATA

Wakkanai

0.1 Mc 135° E Mean Time (G. M. T. +9h)

foF2

Dec. 1944

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	033	030	033	030F	030F	SF	029S	046	033	064	056	057	061	057S	055	055	040	032	030	033	033S	SF	033F	033F
2	034F	034F	F	SF	SF	037	023	043	023	063	066	065	064	055	050	057	050	026	027	026	I031A	030	030	033
3	032	034	033	031	030	SF	SF	043F	056	053	058H	075	069	055	054	I054C	038	028	026	I026S	C	SF	SF	SF
4	SF	SF	034F	SF	SF	033F	031F	042	052	046	060	068	068	056	053	052	I040C	C	C	C	035S	U033S	035S	035S
5	035S	035F	034	035	032	030	027	047	054	065R	053H	063	063	060	056	048	040	I026S	031	030	033	035	030S	033
6	034F	SF	SF	SF	SF	SF	SF	046	059	055	075	063	I069R	063	057	044	034	029	029	026	034	031	SF	SF
7	SF	SF	SF	SF	SF	034	I025S	040	060	054	067	C	C	C	C	C	046	031S	034	026	026	026	I026S	SF
8	031	030	SF	SF	SF	030	030	036	050	055H	063	U073C	063	057	052	051	040	033	025	028	028	027	030	032
9	032	031	032	030	032	U021S	040	051	055	057	064	060	060	052	053	047H	043	I026C	024	027	025	026	I027A	SF
10	030F	030F	030F	030F	031	029	025	037	050	053	060	060	069	053H	063	050	I040S	I030A	027	033S	030F	033F	033F	SF
11	SF	SF	032F	SF	SF	SF	033	U044S	050	057	055	059	I055C	060	I053C	051	I036C	021	024	026	029	030F	SF	SF
12	032F	SF	033F	033F	032F	033	028	038	051	057F	056	057	055	056	050	059	041	024S	032	031	031	033	035	040
13	040	038	SF	SF	SF	SF	032	A	C	C	C	C	C	C	C	C	C	041	038	026	034	025F	026F	028
14	031F	034F	SF	035F	030F	F	028	037	033	052	057	057	057	057	051	I058C	063	042	I038C	031	I031C	031	030	033F
15	032F	I034C	033F	C	C	C	034	I038C	I041C	050	055	057	057	060H	054	060	053	I042A	031	I026S	S	C	C	C
16	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	I031A	C	C	C	C	032	030F
17	033S	032	029	029	037	020	020	U039S	049H	053S	067	066	057	055	053	058	034	030	I033C	U033S	024S	SF	SF	SF
18	SF	SF	029F	029F	030	038	026	034	051	063	063	C	C	C	C	C	C	043	031	026	029	I026S	029	027
19	033	033	036	SF	SF	SF	026	030	044	051H	067	054H	062	061	U070R	050	035	036	029	030	027	030	031	U033S
20	033F	030F	030F	SF	SF	SF	FS	FS	036	063	065	079	071	057	057	063	055	046	034	033	031S	SF	SF	SF
21	032F	030	030F	SF	036F	SF	SF	043	045	068	070	079	053	057	060	051	039	037	026	C	C	C	SF	033F
22	SF	SF	SF	SF	SF	031	025S	034	053	066	058	I057C	058	052	054	048	046	037	030	027	026	022S	SF	SF
23	SF	SF	SF	SF	SF	027	020	033F	048	054	058	U070S	058	053	055	053	043	033	036S	A	SF	SF	SF	SF
24	SF	SF	SF	SF	SF	SF	020	033	052	I066S	065S	060	057	057	054	045	044	030	027	025	026	I028A	032	SF
25	SF	SF	SF	SF	033F	SF	SF	028	048	U068S	060	I069S	054H	058	051	051	I044A	035	028	033	031	U036S	SF	S
26	SF	033F	030F	SF	029F	SF	020	028	047	060	057	058	057	054	051	045S	049	047	030	023	025	024F	SF	SF
27	SF	SF	SF	SF	SF	SF	SF	024F	030F	054	060	066	067	063	064	044	036	I037C	I037C	038	036	SF	SF	SF
28	SF	SF	SF	SF	SF	SF	SF	031F	045	047	068	056	053	061	050	052	039	034	030	029	SF	SF	SF	SF
29	SF	SF	SF	SF	FS	FS	FS	U035S	057	077	069	063	051	058	051	047	038	037	027	I026A	023S	A	SF	FS
30	FS	FS	032F	028F	SF	SF	025	033	048	063	061	071	053	054	C	C	C	C	C	C	C	C	C	C
31	C	C	C	C	C	C	C	C	C	C	C	C	C	054	050	073	048	036	033	030S	027	026	023	A
No.	16	15	16	12	13	13	21	28	28	28	28	26	27	27	26	26	27	29	28	26	23	19	15	13
Median	033	033	032	030	032	030	025	036	051	060	060	064	057	057	054	051	040	033	030	027	029	030	030	033
U. Q.	034	034	033	034	034	033	030	042	054	065	067	069	063	058	056	055	046	037	032	031	031	033	033	034
L. Q.	032	030	030	030	030	030	022	033	048	054	057	058	055	054	051	048	038	030	027	026	026	026	029	030
Q. R.	002	004	003	004	004	003	008	009	006	011	010	011	008	004	005	007	008	007	005	005	005	007	004	004

foF2

IONOSPHERIC DATA

Lat. 45° 23.6'N  
Long. 141° 41.1'E

Wakkanai

0.01 Mc 135° E Mean Time (G.M.T. +9h)

foF1

Dec. 1964

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													380L	350L													
2												400		380													
3													L														
4																											
5																											
6												400L	370														
7												C	C	C	C												
8												400	360														
9												380L															
10												U380L															
11												I370C	370L	C													
12											350	350															
13									C		C	C	C	C	C												
14												320															
15																											
16										C	C	C	C	C	C												
17												370															
18												C	C	C	C												
19												380L															
20												380															
21												380L	400	370													
22												360	C														
23												360L	380														
24												U350L	370	370	U360L												
25												370L	380														
26												360	360														
27												380L	390	360													
28												370	U370L	370L	380	320											
29												370	380	360	360												
30												400L	370		C												
31												C	C	C													
No.										1	12	15	13	4	1												
Median										U350	370	380	370	365	320												
U. Q.																											
L. Q.																											
Q. R.																											

Sweep 1.0 Mc to 18.0 Mc in 40 sec in automatic operation

The Radio Research Laboratories, Japan

foF1

W 2

IONOSPHERIC DATA

Lat. 48° 23.6'N  
Long. 141° 41.1'E

Wakkanai

0.01 Mc 135° E Mean Time (G. M. T. +9h)

foE

Dec. 1964

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							S	S	S	230	250	270	260	250	215	S	S							
2							S	S	S	225	250	265	265	250	220	S	S							
3							S	S	S	230	I250R	265	255	250	230	C	S							
4							S	S	S	225	250	265	265	250	A	S	C							
5							S	S	S	240	255	265	255	250	240	B	S							
6							S	S	S	230	265	I265A	265	250	I235A	B	B							
7							S	S	B	255	B	C	C	C	C	C	B							
8							S	S	B	235	260	I265C	270	255	215	C	C	C						
9							S	S	S	235	255	270	260	260	C	C	C							
10							S	S	A	235	255	270	270	245	C	C	S							
11							S	S	A	A	A	A	I265C	255	C	C	C							
12							S	S	S	A	255	275	275	255	230	A	S							
13							S	S	C	C	C	C	C	C	C	C	S							
14							S	C	C	A	A	245	260	I250S	C	C	S							
15							A	C	C	S	225	250	I260C	I255A	250	235	C							
16							C	C	C	C	C	C	C	C	C	C	C							
17							S	A	S	215	I230A	I250A	270	245	I225C	185	S							
18							A	A	A	215	260	C	C	C	C	C	C							
19							S	S	S	C	I250C	I265C	265	255	I230A	200	S							
20							A	A	A	I230C	250	C	C	C	230	210	S							
21							S	A	A	I215R	I245A	255	260	255	230	S	S							
22							S	A	A	215	I250A	I265C	265	255	210	A	A							
23							E	E	A	A	245	I260A	265	250	235	190	A							
24							S	S	S	175	220	I255A	270	260	250	225	200	S						
25							S	S	A	215	240	265	260	240	215	S	S							
26							E	S	S	190	230	255	270	270	230	195	S							
27							S	S	S	180	230H	I240A	255	I260A	I255A	A	S							
28							S	S	A	I220A	245	I255A	255	240	230	195	S							
29							S	S	S	170	235	255	260	270	265	235	195	S						
30							S	S	A	235	240	255	270	I255A	C	C	C	C						
31							C	C	C	C	C	C	265	250	230	200	S							
No.							2	1	4	22	25	24	26	26	20	10								
Median							E	E	180	230	250	265	265	250	230	200								
U. Q.																								
L. Q.																								
Q. R.																								

IONOSPHERIC DATA

0.1 Mc 135° E Mean Time (G. M. T. + 9h)

Wakkanai

Lat. 45° 23.6'N  
Long. 141° 41.1'E

Dec. 1964

foEs

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	J030	E	E	E	E	S	S	S	S	G	G	G	G	G	025	S	S	S	S	S	S	S	S	J025	
2	S	J023	022	E	E	S	S	J023	S	021G	G	G	G	G	G	026	S	S	S	J023	034	S	S	S	023
3	S	S	S	E	E	S	S	S	S	G	G	G	G	G	G	C	S	S	S	S	C	S	S	S	S
4	S	S	E	E	E	S	S	S	S	028	031	034	G	J033	S	C	C	C	C	C	C	S	S	S	S
5	S	J025	S	014	S	S	S	S	S	G	G	G	G	G	G	B	S	S	S	S	S	S	S	S	S
6	S	S	S	S	S	S	S	S	S	G	G	033M	G	G	030	B	B	S	S	S	S	S	S	S	J026
7	S	S	E	S	E	S	S	S	B	G	B	C	C	C	C	C	B	022	J025	J030	028	S	S	S	S
8	S	S	S	E	E	S	S	S	B	G	G	C	G	030	027	C	C	C	S	S	J033	J025	J025	J025	J025
9	J025	J025	018	E	014	S	S	S	S	G	G	G	J033	G	C	C	C	C	C	S	031M	032	036M	S	S
10	S	S	E	E	E	S	S	S	033	G	G	G	G	G	C	C	C	J068	S	S	S	S	S	S	S
11	S	S	E	S	E	S	S	S	030	030	028	028	C	G	C	C	C	J023	J053	J030	J030	J024	J024	S	S
12	S	E	S	E	E	S	J024	S	S	J040	G	G	G	G	C	J026	J030	S	S	S	S	S	S	S	S
13	S	E	E	E	E	024	J040	J053	C	C	C	C	C	C	C	C	C	C	S	J063	S	S	S	J028	026
14	S	S	S	S	E	E	S	C	C	J033	J043	G	G	S	C	C	C	S	C	S	C	S	S	S	S
15	S	C	S	C	C	C	023	C	C	S	G	G	C	030	G	G	C	J063	J030	S	023	C	C	C	C
16	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	J050	C	C	C	C	C	C	019
17	014	018	E	013	015	E	J023	028	S	G	033	033	G	G	C	G	S	S	C	J030	E	S	S	S	E
18	S	E	E	013	015	E	J024	J026	030	G	029	G	C	C	C	C	C	J053	S	J029	S	S	S	S	S
19	S	E	E	E	E	S	S	S	S	C	C	C	030	G	030	G	S	S	E	S	S	S	S	S	E
20	S	015	J022	J024	015	S	E	J028	033	C	G	C	C	C	G	G	S	J053	S	J033	S	S	S	S	S
21	S	017	018	E	E	E	S	020	J043	G	030	G	029	G	G	G	S	026	S	C	C	C	C	S	E
22	S	023	E	J023	016	E	S	J023	J027	022	031	G	G	G	G	020	020	021	E	J040	S	024	S	S	S
23	S	E	E	022	E	E	023	016	030	J033	030	J044	032	J034	G	020	021	S	S	J060	J023	021	S	S	S
24	S	E	E	E	E	E	S	S	S	022	G	027	G	G	G	G	S	S	020	021	025	028	026	S	S
25	S	E	E	E	E	E	S	S	022	030	026	G	G	020G	G	021	J044	019	S	S	S	S	S	S	J033
26	J020	017	020	E	E	S	E	S	G	023	G	G	020G	G	G	G	S	S	S	S	S	024	027	024	024
27	J032	J025	J033	018	017	E	022	030	023	020G	032	033	J033	J033	029	028	023	C	C	C	J035	J021	030	023	
28	J023	020	E	E	E	E	S	S	021	027	G	036	023G	027	027	015G	J030	S	020	S	S	S	S	S	031
29	J028	J023	013	013	E	S	S	S	020	G	020G	020	G	G	G	G	J053	038	J024	J032	J040	J053	J030	S	S
30	S	E	E	E	E	E	S	S	025	G	C	030	G	027	C	C	C	C	C	C	C	C	C	C	C
31	C	C	C	C	C	C	C	C	C	C	C	C	G	G	G	024	J028	020	J030	020	S	S	S	S	J040
No.	7	20	22	24	26	12	9	10	14	25	26	22	24	25	21	15	9	11	9	12	12	10	10	14	14
Median	025	016	E	E	E	E	023	024	030	G	G	G	G	G	G	G	028	038	024	030	029	024	028	024	024
U. Q.	030	023	018	013	E	E	024	028	031	026	030	033	G	027	027	024	037	053	030	036	034	032	030	026	026
L. Q.	020	E	E	E	E	E	E	022	022	G	G	G	G	G	G	G	022	021	E	026	024	024	025	E	E
Q. R.	010							006	009							015	015	032	010	010	010	008	005	005	005

Sweep 1.0 Mc to 18.0 Mc in 40 sec in automatic operation

The Radio Research Laboratories, Japan

foEs

IONOSPHERIC DATA

f<sub>o</sub>F<sub>2</sub>

Dec. 1964

0.1 Mc 135° E Mean Time (G.M.T. +9h)

Wakkanai

Lat. 45° 23.6'N  
Long. 141° 41.1'E

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	EO20S																								
2	S	S	018	017		S	S	S	S	G				G	G	S	S	S	S	EO20S	A	S	S	EO18S	
3	S	S	S	S		S	S	S	S	S						C	S	S	S	S	020	EO20S	S	S	
4	S	S	S			S	S	S	S	G	G				026	S	C	C	C	C	C	C	S	S	
5	S	S	019	S	E	S	S	S	S	S						B	S	S	S	S	S	S	S	S	
6	S	S	S	S	S	S	S	S	S			030			026	B	B	S	S	S	S	S	S	S	
7	S	S	S	S	S	S	S	S	B	B			C	C	C	C	B	020	EO20S	EO20S	EO20S	S	S	S	
8	S	S	S	S		S	S	S	B				C	G	G	C	C	C	S	S	EO17S	020	021	020	
9	019	017	016		E	S	S	S	S				G	C	C	C	C	C	C	C	020	020	A	S	
10	S	S	S			S	S	S	025							C	C	S	A	S	S	S	S	S	
11	S	S	S	S	S	S	S	S	021	027	028	027	C	C	C	C	C	EO17S	020	019	019	018	023	S	
12	S	S	S			S	020	S	S	025						022	018	S	S	S	S	S	S	S	
13	S					EO15S	020	A	C	C	C	C	C	C	C	C	C	S	S	EO18S	S	S	020	018	
14	S	S	S	S		S	C	C	C	024	026			S	C	C	C	S	C	S	C	S	S	S	
15	S	C	S	C	C	C	012	C	C	S			C	030		C	C	A	022	S	011	C	C	C	
16	C	C	C	C	C	C	C	C	C	C	C		C	C	C	C	C	A	C	C	C	C	016		
17	E	012			E		016	018	S		027	030		C	C	S	S	C	017		S	S	S		
18	S				E		016	024	025		G	C	C	C	C	C	C	017	S	016	S	S	S	S	
19	S					S	S	S	S	C	C	C	G		026		S	S	S	S	S	S	S	S	
20	S	012	012	015	E	S	S	016	026	C	C	C	C	C		S	017	S	EO15S	S	S	S	S	S	
21	S	E	012			S	S	020	025		027		G			S	G	S	S	C	C	C	S		
22	S	012		014	E	S	S	016	022	020	027	C		020	020	014	017		018	S	EO12S	S	S	S	
23	S			E		EO14S	016	023	025	018	030	030	021	018	016	019	S	S	A	EO14S	EO15S	S	S	S	
24	S					S	S	S	015	027						S	S	015	015	017	A	015	S	S	
25	S					S	S	G	023	G	020			020	G	A	019	S	S	S	S	S	S	S	
26	EO15S	EO13S	EO12S			S		S	020	020		020				S	S	S	S	S	EO16S	018	EO15S		
27	018	E	015	E	012		EO12S	017	016	016	029	020	027	027	024	020	023	C	C	C	023	015	016	EO16S	
28	EO16S	016				S	S	S	021	024		027	017	G	G	EO16S	S	020	S	S	S	S	S	020	
29	EO15S	013	012	E		S	S	S	G	018	020					018	017	020	A	017	A	EO17S	S		
30	S					S	S	S	023			G		027	C	C	C	C	C	C	C	C	C	C	
31	C	C	C	C	C	C	C	C	C	C	C	C				G	025	016	023	016	S	S	A	A	
No.																									
Median																									
U. Q.																									
L. Q.																									
Q. R.																									

f<sub>o</sub>F<sub>2</sub>

W 5



# IONOSPHERIC DATA

**Dec. 1964**

**M(3000)F2**

0.01  
135° E Mean Time (G. M. T. + 9h)

Wakkanai

Lat. 45° 23.6'N  
Long. 141° 41.1'E

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	310	300	295	300F	325F	SF	330S	350	360	360	355	360	360	375S	350	365	375	325	365	320	335S	SF	305F	285F
2	305F	295F	F	SF	SF	360	295	365	360	355	355	360	365	380	350	350	380	320	305	335	325A	335	300	295
3	305	300	305	315	300	SF	SF	365F	355	360	330H	345	370	365	355	3360C	355	325	315	3155S	320	SF	SF	SF
4	SF	SF	330F	SF	SF	320F	340F	350	370	330	345	355	370	370	360	350	340C	C	C	C	C	315S	305S	320S
5	295S	320F	330	320	315	320	325	350	390	380R	330H	365	350	360	355	365	350	325S	325	305	325	325	305S	310
6	325F	SF	SF	325F	SF	SF	SF	355	375	380	345	330	3360R	360	370	365	355	310	340	330	325	360	SF	SF
7	SF	SF	SF	SF	345	340	340S	340	385	340	365	C	C	C	C	C	370	330S	330	330	325	320	305S	305
8	295	300	SF	SF	SF	310	335	335	380	325H	335	330C	370	370	355	375	340	310	320	330	330	335	300	290
9	315	295	300	290	295	345	310S	350	370	365	355	365	385	370	360	345H	355	335C	335	335	310	320	3305A	SF
10	310F	295F	300F	300F	300	315	335	345	340	360	355	335	375	325H	355	365	3360S	335A	305	335S	335F	325F	325F	SF
11	SF	SF	SF	SF	SF	SF	345	3365S	380	375	370	360	3350C	350	335C	370	335C	345	315	340	320	305F	SF	SF
12	310F	SF	310F	295F	295F	335	335	340	355	335F	355	360	365	355	350	375	365	335S	330	330	330	305	315	315
13	325	315	SF	SF	SF	SF	325	A	C	C	C	C	C	C	C	C	C	360	340	320	340	320F	325F	315
14	300F	315F	SF	305F	280F	295F	F	345	375	365	365	355	365	350	355	345C	370	355	3365C	325	330C	330	325	295F
15	295F	3285C	280F	C	C	C	325	3340C	335C	360	380	340	355	365H	350	365	370	3355A	340	330S	S	C	C	C
16	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C
17	285S	285	290	310	360	300	320	3355S	335H	355S	360	350	385	380	340	360	355	305	320C	C	C	C	315	290F
18	SF	SF	SF	305F	305F	300	365	345	340	350	375	C	C	C	C	C	C	350	350	335	345	330S	305	305
19	295	305	285	SF	SF	SF	SF	340	335	330H	360	350H	355	330	3345R	380	335	340	340	345	305	300	295	305S
20	280F	300F	285F	SF	SF	SF	SF	FS	360	370	355	365	380	335	365	365	335	345	335	355S	SF	SF	SF	SF
21	295F	305	300F	SF	SF	SF	SF	SF	350	355	355	350	370	375	365	360	350	330	320	C	C	C	SF	305F
22	SF	SF	SF	SF	SF	SF	325	330S	345	360	355	360	3365C	360	370	355	350	350	335	350	355	380S	SF	SF
23	SF	SF	SF	SF	SF	SF	370	345F	350	355	350	3300S	360	360	365	360	345	335	335S	A	SF	SF	SF	SF
24	SF	SF	SF	SF	SF	SF	SF	305	340	365	3360S	365S	370	370	375	380	350	360	335	360	325	315A	320	SF
25	SF	SF	SF	335F	340F	SF	SF	SF	345	345	3345S	355	3360S	340H	360	370	3355A	345	345	350	325	320S	SF	S
26	SF	305F	295F	SF	SF	SF	SF	380	350	365	370	365	355	350	335S	335	355	350	350	340	340	290F	SF	SF
27	SF	SF	SF	SF	SF	SF	SF	325F	335F	365	355	350	370	385	365	365	355	3350C	3345C	340	355	SF	SF	SF
28	SF	SF	SF	SF	SF	SF	SF	325F	335	360	370	375	375	360	360	370	365	355	335	315	SF	SF	SF	SF
29	SF	SF	SF	SF	SF	FS	FS	345S	370	340	360	380	375	365	375	405	345	350	335	3325A	315S	A	SF	FS
30	FS	FS	295F	330F	SF	SF	330	355	350	350	360	370	380	370	C	C	C	C	C	C	C	C	C	C
31	C	C	C	C	C	C	C	C	C	C	C	C	365	340	370	375	355	350	325S	345	335	310	A	A
No.	16	15	16	12	13	13	21	28	28	28	28	26	27	27	26	26	27	29	28	26	23	19	15	13
Median	300	300	300	310	310	310	330	350	360	355	360	360	365	360	360	365	355	345	335	335	330	320	305	305
U. Q.																								
L. Q.																								
Q. R.																								

Sweep 1.0 Mc to 18.0 Mc in 40 sec in automatic operation

The Radio Research Laboratories, Japan

**M(3000)F2**

W 7



Lat. 45° 23.6'N  
Long. 141° 41.1'E

Wakkanai

IONOSPHERIC DATA

135° E Mean Time (G.M.T. + 9h)

0.01

M(3000)F1

Dec. 1964

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												395	405L 395	410L											
3													L												
4																									
5																									
6													385												
7										380L	C	C	C	C	C										
8											375	395L	405												
9																									
10													U395L												
11													I395C	380L	C										
12										410	400														
13										C	C	C	C	C	C										
14											425														
15																									
16										C	C	C	C	C	C										
17												375													
18												C	C	C	C										
19											395L														
20												395													
21											380L	400	410												
22											410	C													
23											410L	395													
24										U385L	405	405	U415L												
25											400L	395													
26												410	390												
27											380L	385	410		405										
28											400	U405L	405L	390											
29											405	415	420	390											
30											375L		425		C										
31										C	C	C													
No.										1	12	15	13	4	1										
Median										U385	400	395	405	390	405										
U. Q.																									
L. Q.																									
Q. R.																									

M(3000)F1

IONOSPHERIC DATA

Lat. 45° 23.6'N  
Long. 141° 41.1'E

Wakkanai

RF2

Dec. 1964

135° E Mean Time (G. M. T. + 9h)

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												235	225												
3											250														
4																									
5																									
6																									
7										245	C	C	C	C	C										
8											255	225													
9											235														
10																									
11													230												
12											230														
13										C	C	C	C	C	C										
14												240													
15																									
16										C	C	C	C	C	C										
17												240													
18																									
19																									
20											240														
21												220													
22											240	220	225												
23											235	C													
24											245	225													
25										240	235	220	225												
26											245	220													
27												230	240												
28											240	260	250												
29											245	225	230	260											
30											225	220	225	250											
31											260	225													
No.											C	C	C												
Median										1	12	15	14	4	1										
U. Q.										240	240	230	230	250	225										
L. Q.																									
Q. R.																									

Sweep 1.0 Mc to 18.0 Mc in 40 sec in automatic operation

RF2

The Radio Research Laboratories, Japan

W 9

Lat. 45° 23.6'N  
Long. 141° 41.1'E

Wakkanai

IONOSPHERIC DATA

135° E Mean Time (G. M. T. + 9h)

k'F

Dec. 1964

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	295	290	280	275	250	250	220	220	205	220H	190H	190H	230H	220	230	225	210	240	235	250	260	260	285	305
2	295	300	300	290	260	225	8	220	215	210H	200H	200H	225	220	220	230	230	270	285	275	1260A	230	310	300
3	290	295	280	250	260	250	230	210	220	200H	230H	250	230	225H	220H	1205C	210	250	280	1290H	275	275	310	300
4	285	275	250	250	240	250	230	225	210	210H	260	245	240	220H	220	220	1235C	C	C	C	C	285	295	270
5	280	290	260	260	250	250	295	240	210	220	220H	230	245	230	235	220	210	1280H	260	250	265	250	300	275
6	265	300	285	275	250	230	275	230	220	210H	250	240	230	215	230	220	220	280	260	2275H	250	225	320	300
7	275	260	250	260	225	225	1250H	240	220	225	240	C	C	C	C	C	210	270	230	275	260	280	1290H	305
8	285	275	300	265	265	275	250	235	215	200H	230	240	225	225	230	230	220	245	1275H	280	255	275	300	310
9	295	290	295	285	275	245	2325H	230	220	200H	180H	245	225	220	230	220H	210	1265C	250	250	2300A	280	1320A	325
10	295	280	280	250	260	250	235	220	210	230	230	200H	230	220H	240	225	205	1240A	1260H	250	245	260	275	280
11	260	280	260	275	260	250	240	210	210	220	230	230H	1205C	200	1225C	220	1240C	260H	310A	265	250	275	330	300
12	275	285	285	265	260	255	245	230	215	220	200	190H	245	230	230	230	215	205	250	250	230	260	280	250
13	250	250	290	260	260	250	250	A	C	C	C	C	C	C	C	C	C	220	225	250	250	290	275	280
14	300	280	300	280	300	285	270	250	215	220	220	195	225H	230	230	1240C	215	210	1230C	250	1240C	250	250	290
15	270	1280C	295	C	C	C	250	1245C	1220C	210	220	230	240	235H	245	230	220	1235A	2250A	1250H	225	C	C	C
16	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	1260A	C	C	C	C	280	300
17	290	300	305	260	220	280	2300A	240	210H	225	220	230	230	220	205	230	220	265	1245C	225	210	275	320	300
18	270	250	270	265	280	225	235	245	225	225	230	C	C	C	C	C	C	225	235	250	230	S	295	280
19	300	300	260	250	255	225	235	200	215	215H	240	230	240	210H	245	220	225	225	240	220	250	270	260	275
20	300	275	310	315	275	220	250	225	230	230	220H	225	190H	230	240	220	215H	235	230	240	240	280	290	280
21	275	260	300	255	255	250	250	225	220	180H	235	230	210	230	240	220	220H	240	230	C	C	C	280	250
22	280	280	275	300	260	225	240	220	220	225	215	1210C	240	225	230	220	210	220	215	235	220	250	295	310
23	300	290	270	250	220	195	2300H	235	230	230	230	210H	230	230	240	225	220	230	1245A	220	250	250	260	260
24	290	255	275	250	235	200	290	230	230	235	220	200	220	240	230H	210	215	225	230	210	265	1300A	260	295
25	275	260	255	250	225	220	230H	240	225	240	225	235	200H	180H	230	225	1220A	225	225	230	250	250	280	1290A
26	290	275	290	255	235	220	210	240	215	220	230H	215	200	230	225	230	225	210	205	215	225	335	295	230
27	290	270	290	290	250	200	210	230	220	240	240	220	210	220	220	220	225	1235C	1240C	1250C	240	250	280	290
28	250	275	275	265	230	200	270	225	225	225	240	225	235	235	225	225	220	230	245	250	245	230	250	290
29	300	275	260	275	290	225	230	210	210	230H	225	210	205	215	225	210	220	225	265	1270A	270A	A	285	310
30	300	280	260	230	230	215	270	220	220	240	225	220	210	210H	C	C	C	C	C	C	C	C	C	C
31	C	C	C	C	C	C	C	C	C	C	C	C	205H	185H	230	215	225	220	220A	230	245	305	A	A
No.	29	29	29	28	28	28	25	28	28	28	28	26	27	27	26	26	27	28	26	26	26	25	28	29
Median	290	275	280	260	255	230	250	230	220	220	230	230	225	220	230	220	220	235	240	250	250	270	290	290
U. Q.																								
L. Q.																								
Q. R.																								

Sweep 1.0 Mc tot 8.0 Mc in 40 sec in automatic operation

The Radio Research Laboratories, Japan

W 10

k'F

IONOSPHERIC DATA

Lat. 45° 23.6'N  
Long. 141° 41.1'E

Wakkanai

135° E Mean Time (G.M.T. + 9h)

h'Es

Dec. 1964

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	105	E	E	E	E	S	S	S	S	G	G	G	G	160	155	S	S	S	S	S	S	S	S	110
2	S	105	105	E	E	S	S	115	S	110	G	G	G	G	G	150	S	S	S	110	105	S	S	105
3	S	S	S	E	E	S	S	S	S	G	G	G	G	G	G	C	S	S	S	S	125	120	S	S
4	S	S	E	E	E	S	S	S	S	160	150	150	G	G	125	S	C	C	C	C	C	S	S	S
5	S	105	S	105	S	S	S	S	S	G	G	G	G	G	G	B	S	S	S	S	S	S	S	S
6	S	S	S	S	S	S	S	S	S	G	G	110	G	G	105	B	B	S	S	S	S	S	S	110
7	S	S	E	S	E	S	S	S	B	G	B	C	C	C	C	C	B	100	120	115	120	S	S	S
8	S	S	S	E	E	S	S	S	B	G	G	C	G	125	120	C	C	C	S	S	110	110	110	110
9	110	110	110	E	115	S	S	S	S	G	G	G	110	G	C	C	C	C	C	S	115	115	105	S
10	S	S	E	E	E	S	S	S	110	G	G	G	G	G	C	C	S	110	S	S	S	S	S	S
11	S	S	E	S	E	S	S	S	110	105	105	105	C	G	C	C	C	115	115	110	110	110	110	S
12	S	E	S	E	E	S	115	S	S	120	G	G	G	G	G	120	110	S	S	S	S	S	S	S
13	S	E	E	E	E	110	110	105	C	C	C	C	C	C	C	C	C	S	S	100	S	S	110	105
14	S	S	S	S	E	E	S	C	C	110	110	G	G	S	C	C	C	S	C	S	C	S	S	S
15	S	C	S	C	C	C	105	C	C	S	G	G	C	105	G	G	C	110	110	S	105	C	C	C
16	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	110	C	C	C	C	C	E
17	105	105	E	125	120	E	120	110	S	G	105	105	G	G	C	G	S	S	C	115	E	S	S	E
18	S	E	E	105	105	E	120	110	110	G	160	C	C	C	C	C	C	115	S	110	S	S	S	S
19	S	E	E	E	E	S	S	S	S	C	C	C	150	G	120	G	S	S	E	S	S	S	S	E
20	S	110	110	110	110	S	E	110	110	C	G	C	C	C	G	G	S	120	S	110	S	S	S	S
21	S	105	105	E	E	E	S	110	105	G	110	G	150	G	G	S	120	S	S	C	C	C	S	E
22	S	110	E	105	105	E	S	110	110	110	105	C	G	G	G	105	105	110	E	110	S	110	S	S
23	S	E	E	110	E	E	165	150	110	105	105	100	145	105	G	105	120	S	S	105	110	105	S	S
24	S	E	E	E	E	E	S	S	150	G	115	G	G	G	G	G	S	S	110	110	110	105	110	S
25	S	E	E	E	E	E	S	115	110	110	105	G	G	105	G	135	115	115	S	S	S	S	S	105
26	105	105	100	E	E	S	E	S	G	110	G	110	G	G	G	G	S	S	S	S	S	110	110	110
27	110	110	105	105	105	E	125	110	110	110	110	110	105	105	105	105	105	C	C	C	110	110	110	110
28	105	105	E	E	E	E	S	S	115	110	G	105	110	150	125	105	115	S	115	S	S	S	S	105
29	105	105	105	105	E	S	S	S	135	G	110	105	G	G	G	G	115	110	105	110	115	110	110	S
30	S	E	E	E	E	E	S	S	110	G	G	150	G	105	C	C	C	C	C	C	C	C	C	C
31	C	C	C	C	C	C	C	C	C	C	C	C	G	G	G	135	115	115	110	105	S	S	110	105
No.	7	11	7	8	6	1	7	10	13	11	12	10	6	8	7	8	9	11	7	12	11	10	10	10
Median	105	105	105	105	110	110	120	110	110	110	110	110	130	105	120	110	115	110	110	110	110	110	110	110
U. Q.																								
L. Q.																								
Q. R.																								

Sweep 1.0 Mc to 8.0 Mc in 40 sec in automatic operation

The Radio Research Laboratories, Japan

W 11

h'Es

IONOSPHERIC DATA

Lat. 45° 23.6'N  
Long. 141° 41.1'E

Wakkanai

135° E Mean Time (G. M. T. + 9h)

Types of Es

Dec. 1964

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	f																							f
2	f	f					c			l									f		f2			f
3										h	h	h				h					f			
4										h	h	h			l									
5		f		f								l			l									f
6												l												
7																		f	f					
8													l	c	c						f	f2	f2	f
9	f	f	f									l									f	f	f	
10									l									f2						
11								l	l	l	l	l						f	f2	f2	f	f	f	
12																l								
13							c	l	l3															
14						f	l			l	l													f
15							l						l											
16																		f						
17	f	f		f	f		c	l		l	l	l	e								f			
18				f	f		f	l2	l	h	h										f			
19												h			l									
20		f	f2	f2	f		l	l	l	l	l	h	h								f			
21		f	f				l	l	l	l	l						c							
22		f		f2	f2		l	l	l	l	l	l	c	l	l	l	l	l	f					
23				f			c	h	l	h	l	l2	c	l	l	l	e	l	f2	f	f			
24								h	l	l	l													
25							e		l	h	l	l		l		c	c2	f						f3
26	f	f	f						l	l	l	l												f
27	f2	f	f2	f			e		l	h	l	h	l	l2	l2	l	l				f4	f	f2	f
28	f	f							l	l	l	l	l	h	e	l	c			f				f
29	f2	f2	f	f					c	l	l	l				c	c	f	f	f	f	f	f	
30									l			h		l										
31																e	e	f	f	f			f2	f2
No.																								
Median																								
U. Q.																								
L. Q.																								
Q. R.																								

Sweep 1.0 Mc to 18.0 Mc in 40 sec in automatic operation

The Radio Research Laboratories, Japan

W 12

Types of Es

IONOSPHERIC DATA

Dec. 1964

foF2

0.1 Mc 135° E Mean Time (G. M. T. + 9h)

Akita

Lat. 39° 43.5'N  
Long. 140° 08.2'E

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	031	032	031	032F	031	028	028	050	064	055	069	060	064	065	064	056	047	031	030	032	034	029	032	035
2	1034R	033	034F	033	033	032	030	048	063S	055	064	068	063	061	054S	049	049	033	031	036	032	032	025	027R
3	029	030	031	032R	029	029	031	051	050	055	055	075	073	055	053	051H	047	032H	029	029	028R	030R	1028R	090F
4	FS	030S	032S	031	028F	029	028	047	054	054	042	075	069	063R	053	047	047	031R	029	033	1032R	FS	F	F
5	031R	030	029S	031F	031F	027S	030S	050R	055	062	1068R	060	062	063	055	049	1044R	025H	027	034	1033R	032	028	028
6	030	030	030	030	029F	037F	031R	045	063	066	054	074	063	068	055	055	043	027	030	036	035	021R	025	026
7	029	033F	030	034S	035R	025	028	042	055	058H	061	062	075	057	051	051	053	035	032	1034R	026	026	024	027
8	031	031S	027F	F	F	029F	027	044	051	051	069	070	057	064	060	1053R	052	030	028	032	031	028	028	028
9	030	030	031	030	028	029	026	042	055	054	058	068	057	054	049H	051	045	026V	029R	024	031	025	029	028
10	031S	031	028	030	030	030	026	049R	050	052	062	062	067R	059	055	061	043	027	028	028	033R	028	027	030
11	032	030	031	031	030	030	030	049R	053	054	058	058H	056	053	055	054H	043	024H	025	031	034S	032F	FS	F
12	033F	F	F	033F	034F	031V	026F	042	052	052	057	062	055H	054H	057H	048	054	029	027	032	034	029	031	034F
13	033	033	035	033	030R	033	047	053R	051	1052R	063	055	052R	058S	050R	050R	046	033	033	030	032	030	028	035
14	036	036	037V	036	036S	033	1031R	037	050	051	060	1066C	060	057	055H	067	050	034	029	033	035	024	029	033F
15	034F	031F	033F	034	033	031	034	1050R	059	051	058R	063	062H	066	060	060	044S	036S	029	027	029	025	F	F
16	031F	031F	030	FS	031	023H	027F	040	053	1052C	065	065	061R	066R	054	060	051	035	034	034S	026	024V	030H	028H
17	028	028F	027	028	027	022	022	041	049	061	071	071S	063	055	055	055	052R	030	036	037	022	024	026	028
18	F	031	031S	F	FS	1028R	024	1042R	044H	055	073	058R	059H	066	061	060R	043	045	038	028	026	023	026	F
19	F	F	032	030	031F	FS	023	041	045	049	066	069	062H	060H	058	056	044	033	036	031	027	026	031	031
20	032F	033F	033F	F	032F	FS	F	046S	051	061	078	069	063H	052	058H	056	046	041	034S	037S	035	029H	032	F
21	032F	F	033F	031F	031	031F	029	044	1050R	051S	1072C	070	067	058	056	1055R	047	035R	038	026	025S	028	029	030
22	030	031	030F	030	031F	033	028	041	050	052	067	063	061H	058	063	050	043R	043S	039	029	021	024	F	F
23	F	F	F	F	FS	F	023F	035	046	057R	062	064	061R	057	056	055	049	036	037	1036R	024	031	030R	F
24	F	F	F	F	033	021	021	037R	050	066	075	063	056	053	059	051	040	039	033	024	025	1026R	028F	030
25	030F	F	F	F	F	028F	022F	036	044	056	073	058	055	055	050	049	049	036	032	027	FS	FS	FS	FS
26	FS	026F	F	FS	031F	027	022	031	041	051	070	057	054	053	051	048	045	046	035	024	022	024	F	F
27	FS	FS	FS	F	1030F	025	020	032	041R	060S	063	065H	065	067	053	047	040	031V	FS	FS	1038R	F	FS	FS
28	F	FS	F	F	F	F	019R	035S	048	050	055	068	052R	051R	063R	052	044	033	031	033	026F	026F	F	F
29	F	F	F	F	F	F	F	032R	042	C	C	058	053	049	053	055	040	032	041R	045	034R	F	F	FS
30	FS	FS	FS	FS	FS	FS	FS	034S	043	061R	072	070	066	055	056	053	040	034R	033	028	027S	029F	FS	FS
31	FS	F	F	029	034F	1021F	1025F	034	042	048	075R	064R	051	050	063	060	041	030	033	030	023	024F	028R	027F
No.	20	21	21	19	24	25	28	31	31	30	30	31	31	31	31	31	31	31	30	30	30	27	21	18
Median	031	031	031	031	031	029	027	042	050	054	064	064	061	057	055	053	045	033	032	032	030	026	028	029
U. Q.	032	032	033	033	033	031	030	047	054	058	071	069	064	063	059	056	049	036	035	034	034	029	030	031
L. Q.	030	030	030	030	030	026	023	036	045	051	058	062	056	053	053	050	043	030	029	028	026	024	026	028
Q. R.	002	002	003	003	003	005	007	011	009	007	013	007	008	010	006	006	006	006	006	006	008	005	004	003

Sweep 1.6 Mc to 16.0 Mc in 20 sec in automatic operation

The Radio Research Laboratories, Japan

foF2

A 1

Lat. 39° 43.5'N  
Long. 140° 08.2'E

Akita

IONOSPHERIC DATA

0.01 Mc 135° E Mean Time (G. M. T. +9h)

foF1

Dec. 1964

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									290L	L	L	LH	400L	L	350L									
2									L	350L	370L	L	L	L	L									
3									I280A	300	LH	400L	370	L	LH									
4									260	L	LH	L	L	L	LH									
5									L	L	L	380L	LH	LH	L									
6									L	L	L	400L	390L	360		L								
7										L	L	LH	L											
8										L	LH	L	370L	L	L	L								
9									270L	LH	LH	L	L	L	L	L								
10										320L	L	400L	LH	350L	350L									
11									LH	L	L	LH	350H	L	L									
12										310	LH	L	360	L		L								
13									L	350	LH	L	380L	L										
14									260	C	L	L	L	L	L	L								
15											LH	L	L	L	L	L	L							
16										C	370L	L	L	L	340L									
17										L	L	L	380L	360L	300	L								
18										320L	L	L	400L	LH	350L	L								
19											L	LH	L	L	LH									
20										L	L	L	L	LH										
21										I380C	L	LH	L	L	340L	L								
22										L	LH	L	L	L	L									
23											L	400L	400	L	L									
24										L	400L	390L	390L	360L	L	L								
25										400	390L	L	L	LH										
26										LH	L	L	L	L	L									
27										L	L	L	L	L	L	LH								
28									260	L	390L	400L	L	L	340L	L								
29										C	C	L	L	L	LH	L								
30										L	L	390L	L	L	L	L	270L							
31										360L	L	L	400L	L	L	L								
No.									6	7	6	9	12	4	7	1								
Median									265	320	385	400	385	360	340	270								
U. Q.																								
L. Q.																								
Q. R.																								

The Radio Research Laboratories, Japan

Sweep 1.6 Mc to 16.0 Mc in 20 sec in automatic operation

foF1

IONOSPHERIC DATA

Dec. 1964

foE

0.01 Mc 135° E Mean Time (G. M. T. + 9h)

Akita

Lat. 39° 43.5'N  
Long. 140° 08.2'E

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								A	A	255	275	280R	275	260	250	A	B							
2								RS	A	250	280	280	280	1265A	240	200	E							
3								E	I210A	255R	270	280R	285A	275	250	205R	E							
4								B	225H	235	250	280	280	275A	255	1210A	A							
5								A	A	240	260A	285	285	270	240A	185A	E							
6								A	A	A	270S	1280A	280	1260A	A	A	A							
7								E	225S	1250A	1275A	280	280	270	235	195	E							
8								E	A	A	A	A	A	A	250	205	E							
9								A	A	255	280	285	280	275	255	A	B							
10								E	I210A	250	275	285	290	270	235	200S	E							
11								B	210	240	265	275	275	265	245	1220A	E							
12								E	200	235	1255A	1275A	280	270	245	195	E							
13								E	210	1250A	280A	285A	285	275	250A	A	E							
14								E	200	1240C	265	280	280	270	235	200	E							
15								E	I200C	240	270	A	A	R	A	A	E							
16								E	205	I245C	275	285R	285	275	245	A	B							
17								E	A	I240A	270A	1280A	1280A	275	1240A	195S								
18								E	195	240	270	280R	280	270A	245S	200	B							
19								E	A	240	260	270	280H	1270A	250	R	E							
20								E	R	R	255	270	270	260	235	1210A	B							
21								E	A	245H	1260C	275	275	265	250	205								
22								B	A	I230A	260	280	285	270	235	210	E							
23								E	I210A	245	265	1280A	280A	275	250	A								
24								E	A	245	270	A	A	275	255	210A								
25									220A	240	1270A	1275A	275R	265	245	205								
26									215	255	280	285	280	275	245	A								
27								E	I220A	I250A	270	280	280	270	245	210								
28									195	I240R	260R	275A	280A	270	245	205A	E							
29									A	C	C	275	280	270	240	A	A							
30									A	A	A	A	A	270A	240	200								
31									A	A	A	A	1280A	1270A	245	205	A							
No.								16	16	25	27	26	27	29	29	21	14							
Median								E	210	245	270	280	280	270	245	205	E							
U. Q.																								
L. Q.																								
Q. R.																								

Sweep 1.6 Mc to 16.0 Mc in 20 sec in automatic operation

The Radio Research Laboratories, Japan

foE

A 3



Lat. 39° 43.5'N  
Long. 140° 08.2'E

Akita

IONOSPHERIC DATA

0.1 Mc 135° E Mean Time (G. M. T. + 9h.)

foEs

Dec. 1964

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	B	E	E	E	B	B	E	J028	023	G	G	G	G	032	029	028	J019	J018	J018	E	E	E	B	B
2	E	E	E	E	E	E	E	017	025	G	J023G	J026G	J029	J042	025	J028	J022	J017	J020	E	E	E	E	E
3	J017	J018	J018	E	E	E	E	J017	J044	023G	J025G	023	030	029	J027	J027	017	J017	E	E	B	E	E	
4	E	E	E	E	E	E	E	B	G	029	027	034	036	033	G	026	J026	J028	E	E	J020	J021	J023	
5	J025	J018	E	E	E	J025	E	019	025	027	028	J021G	G	020G	026	022	019	B	J025	J021	J023	E	E	
6	B	E	E	E	J025	J024	E	J024	J024	026	026G	J038	030	029	J049	J032	J032	J017	J020	E	E	E	E	
7	E	E	E	B	E	E	E	018	G	028	030	G	G	022G	G	G	E	E	E	E	E	E	E	
8	E	E	E	E	E	E	E	E	024	027	J030	J030	030	J031	G	019G	E	E	E	E	E	E	E	
9	E	J017	E	E	E	E	E	J031	J023	G	G	G	G	G	J023	019	E	E	B	J017	E	E	J025	
10	J030	J023	E	E	E	E	E	J056	J056	G	J026G	G	G	028	G	023	E	E	J018	J018	E	E	E	
11	E	E	E	E	E	E	E	J018	022	019G	023G	022G	023G	029	027	027	E	J031	E	J021	E	E	E	
12	J019	E	E	J029	E	E	J026	J021	G	J038	034	J033	028G	023G	G	J023	E	J028	J035	E	J019	J020	E	
13	E	E	E	E	E	E	E	J028	J032	J048	029	J032	032	G	026	025	E	E	E	J024	J020	B	J020	
14	E	E	J017	J017	E	E	E	J021	G	C	G	G	G	G	027	024	024M	E	J018	J018	022M	E	023M	
15	E	E	E	E	E	E	E	J020	E	C	G	028	029	G	030	024	022M	E	J020	E	E	E	E	
16	E	E	E	E	E	E	E	E	022	C	036	032	030	029	024	024	B	023M	J017	E	E	E	J017	
17	E	E	E	E	E	E	E	J019	E	023	J039	030	J034	J026G	J028	J021	020	J025	J017	J036	J017	E	J020	
18	E	E	E	E	E	E	E	E	J031	G	030	032	G	030	029	G	B	E	J025	J030	J023	J025	J020	
19	E	E	E	E	E	E	E	E	J028	G	031	G	029	029	G	024	E	J029	J027	022M	E	E	E	
20	E	E	E	E	E	E	E	E	G	028	024G	G	031	G	030	J024	J020	022M	J028	J019	J020	019M	024M	
21	E	J019	J020	J020	020M	E	J020	J025	031	C	032	G	G	G	G	023	E	E	E	E	E	E	E	
22	E	J028	E	E	E	E	E	B	026	J039	G	G	G	G	G	025	027	J026	022M	J018	022M	J020	022M	
23	J018	E	E	E	023M	E	E	022M	027	030	032	036	J045	J028	032	J034	J028	J043	J028	J032	E	J053	J028	
24	E	E	E	E	E	E	E	J018	025	028	029	J033	030	023G	020G	J025	022	J022	J019	J028	E	E	J033	
25	J020	J021	E	E	E	E	E	J023	J028	031	J031	J031	J028	G	G	G	E	J017N	E	E	E	E	E	
26	E	E	E	E	E	E	E	E	020G	J023G	020G	030	030	G	027	024	B	E	E	J020	J021	J023	E	
27	E	J020	J022	J035	E	E	E	J018	J043	029	029	019G	032	J031	G	G	B	J034	E	E	E	E	J031	
28	J029	J018	J017	J017	E	E	E	E	026	J025	J031	030	032	029	019G	024	018	E	E	J018	E	E	E	
29	E	J024	J023	J023	E	E	E	E	026	C	C	J029	G	G	G	J024	J025	J030	J018	J017	E	E	E	
30	E	E	J018	J019	J020	E	E	E	022	032	J030	J028	032	030	026	024	J030	J020	J020	E	J023	J021	J043	
31	E	E	E	E	J018	E	E	E	020	J043	J036	031	J028	030	023	020	J057	E	E	E	E	J023	J023	
No.	29	31	31	30	30	30	30	29	30	28	29	31	31	31	31	31	27	30	30	31	30	30	29	29
Median	E	E	E	E	E	E	E	E	018	024	028	029	028	G	026	024	019	018	017	E	E	E	E	E
U. Q.	E	017	017	E	E	E	E	E	022	026	031	032	031	029	029	025	024	028	020	021	020	020	024	018
L. Q.	E	E	E	E	E	E	E	E	020	G	G	G	G	G	G	023	E	E	E	E	E	E	E	E
Q. R.									006							002								

The Radio Research Laboratories, Japan

Sweep 1.6 Mc to 16.0Mc in 20 sec in automatic operation

foEs

Lat. 39° 43.5'N  
Long. 140° 08.2'E

Akita

IONOSPHERIC DATA

0.1 Mc 135° E Mean Time (G. M. T. +9h)

fbEs

Dec. 1964

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	B							025	022					030	027	027	017	917	E	017			B	B	
2								017	025		020G	024G	025	037G	017	017	018	E	E						
3	017	E	017				017	E	043	020G	021G	033	030	029	017	E	017	E			B		B		
4								B	028	026	0C34R	035	032	032		025	024	E			E	E	018	017	
5	017	017			018		019	019	025	026	028	021G	019G	026	021	021	017	B	017	E					
6	B			B	E		018	018	024	025	023G	027	030	029	020	025	021	017	E						
7								018	027	029	029	028	028	027		017G									
8									023	027	028	029	028	027		020	018	B	E	E			E	E	
9		E					020	019	022		022G			025		020	018			E	E				
10	E	E							023		022G			025		020	018			E	E				
11								017	019	018G	022G	021G	021G	023G	027	024		017		E					
12	E			E			E	E	026	028	029	022G	020G	020G		018		E	020		E	E			
13								E	020	026	G	031	031		G	024				019	017	B	E	B	
14				E			B	E							026	024	E			E		E			
15							E		C			028	028		029	023	E		E						
16									E	C	021	0032R	G	029	027	021	B	E	E		E		E	E	
17							E		023	031	036	030	034	025G	025	E	018	E	E	E			E	E	
18								E	029	029	032			030	028		B		E	E		017	017	E	
19									018		031		029	029		023		020	017	017					
20										028	021G		031	029	030	024	018	E	E	E	E	E	E	E	
21			E	017	E	E		017	024	030	C	031				022									
22			E				B	025	028							024	022	020	E	E	E	E	E	E	
23	E			E	E		018	025	028	032	032	033	032	024	030	026	025	025	022	E		026	018		
24							E	E	024	027	028	029	028	021G	017G	017	018	017	E	E					
25	E	017					E	024	031	029	029	025						E							
26									018G	018G	018G	030	030		027	023	B				E	E	E	E	
27		E	018	E			E	021	029	029	019G	032	025				B	E					E	E	
28	020	E	E	E				G	020	019	030	032	028	028	018G	024	018				E		E	E	
29		017	017	E				021	C	C	025					022	024	019	017	E					
30			E	E	E			021	031	028	027	032	029	025	023	023	021	E	E		E	E	E	E	
31					E			018	026	031	031	030	028	028	029	023	019	E	E		E	E	E	E	
No.																									
Median																									
U. Q.																									
L. Q.																									
Q. R.																									

Sweep 1.6 Mc to 6.0 Mc in 20 sec in automatic operation

The Radio Research Laboratories, Japan

A 5

fbEs

IONOSPHERIC DATA

Lat. 39° 43.5'N  
Long. 140° 08.2'E

Akita

0.1 Mc 135° E Mean Time (G.M.T. +9h)

f-min

Dec. 1964

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	E 017	E	E	E	E 017	E 017	E	E	E 017	E 017	E 017	E 017	E 017	E 017	E 017	E 017	E 017	E	E	E 017	E	E 017	E 017	E 017	
2	E	E	E	E	E	E	E	E	E 017	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E
3	E	E	E	E	E	E	E	E	E	E	E	E	E	E 017	E	E	E	E	E	E	E 017	E	E 017	E	E
4	E	E	E	E	E	E	E	E 017	E	E 017	E	E 017	E 017	E	E	E 017	E	E	E	E	E	E	E	E 017	
5	E	E 017	E	E	E	E	E	E	E	E	E 017	E	E 017	E	E 017	E	E	E 017	E	E	E	E	E	E	
6	E 017	E	E	E	E	E	E	E	E 017	E 017	E 017	E 017	E 017	E	E	E	E	E 017	E	E	E	E	E	E	
7	E	E	E	E 017	E	E	E	E	E 017	E 017	E 017	E 017	E 017	E 017	E 017	E 017	E	E	E	E	E	E	E	E	
8	E	E	E	E	E	E	E	E	E 017	E 017	E 017	E 017	E 017	E 017	E 017	E	E	E	E	E	E	E	E	E	
9	E	E	E	E	E	E	E	E 017	E 017	E 017	E	E 017	E 017	E	E	E	E 017	E	E 017	E	E	E	E	E	
10	E	E	E	E	E	E	E	E	E	E 017	E	E 017	E 017	E 017	E 017	E 017	E 017	E	E	E	E	E	E	E	
11	E	E	E	E	E	E	E	E 017	E	E 017	E 017	E	E 017	E 017	E 017	E	E	E	E	E	E	E	E	E	
12	E	E	E	E	E	E	E	E	E	E 017	E 017	E 017	E	E 017	E	E	E	E	E	E	E	E	E	E	
13	E	E	E	E	E	E	E	E	E	E 017	E 017	E 017	E 017	E 017	E 017	E 017	E 017	E	E	E	E 017	E	E	E 017	
14	E	E	E 017	E	E	E	E 017	E	E 017	E 017	E 017	E 017	E 017	E 017	E 017	E 017	E 017	E	E	E	E	E	E	E	
15	E	E	E	E	E	E	E	E	E 017	E 017	E 017	E 017	E 017	E 017	E 017	E 017	E 017	E	E	E	E	E	E	E	
16	E	E	E	E	E	E	E	E	E	E	E	E	E	E 017	E 017	E 017	E 017	E	E	E	E	E	E	E	
17	E	E	E	E	E	E	E	E	E	E	E 017	E 017	E 017	E 017	E 017	E 017	E 017	E	E	E	E	E	E	E	
18	E	E	E	E	E	E	E	E	E	E	E 017	E 017	E 017	E 017	E 017	E 017	E 017	E	E	E	E	E	E	E	
19	E	E	E	E	E	E	E	E	E 017	E 017	E 017	E 017	E 017	E 017	E 017	E 017	E 017	E	E	E	E	E	E	E	
20	E	E	E	E	E	E	E	E	E 017	E 017	E 017	E 017	E 017	E 017	E 017	E 017	E 017	E	E	E	E	E	E	E	
21	E	E	E	E	E	E	E	E	E	E	E	E	E	E 017	E 017	E 017	E 017	E	E	E	E	E	E	E	
22	E	E	E	E	E	E	E	E 017	E 017	E 017	E 017	E 017	E 017	E 017	E 017	E 017	E 017	E	E	E	E	E	E	E	
23	E	E	E	E	E	E	E	E	E 017	E 017	E 017	E 017	E 017	E 017	E 017	E 017	E 017	E	E	E	E	E	E	E	
24	E	E	E	E	E	E	E	E	E	E	E	E	E	E 017	E 017	E 017	E 017	E	E	E	E	E	E	E	
25	E	E 017	E	E	E	E	E	E	E	E	E	E	E	E 017	E 017	E 017	E 017	E	E	E	E	E	E	E	
26	E	E	E	E	E	E	E	E	E	E 017	E 017	E 017	E 017	E 017	E 017	E 017	E 017	E	E	E	E	E	E	E	
27	E	E	E	E	E	E	E	E	E	E 017	E 017	E 017	E 017	E 017	E 017	E 017	E 017	E	E	E	E	E	E	E	
28	E	E	E	E	E	E	E	E	E	E	E	E	E	E 017	E 017	E 017	E 017	E	E	E	E	E	E	E	
29	E	E	E	E	E	E	E	E	E 017	E 017	E 017	E 017	E 017	E 017	E 017	E 017	E 017	E	E	E	E	E	E	E	
30	E	E	E	E	E	E	E	E	E	E 017	E 017	E 017	E 017	E 017	E 017	E 017	E 017	E	E	E	E	E	E	E	
31	E	E	E	E	E	E	E	E	E	E	E	E	E	E 017	E 017	E 017	E 017	E	E	E	E	E	E	E	
No.	31	31	31	31	31	31	31	31	30	29	29	30	31	31	31	31	31	31	31	31	31	31	31	31	31
Median	E	E	E	E	E	E	E	E	E	E 017	E 017	E 017	E 017	E 017	E 017	E 017	E 017	E	E	E	E	E	E	E	
U. Q.																									
L. Q.																									
Q. R.																									

The Radio Research Laboratories, Japan

Sweep 1.6 Mc to 16.0 Mc in 20 sec in automatic operation

f-min

IONOSPHERIC DATA

Lat. 39° 43.5'N  
Long. 140° 08.2'E

Akita

M(3000)F2 0.01 135° E Mean Time (G.M.T. +9h)

Dec. 1964

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	305	310	310	300F	315	320	330	360	390	370	350	360	340	375	375	375	370	305	315	330	330	320	310	300	
2	1310R	300	295F	300	320	320	335	360	365S	370	365	365	365	375S	370	370	370	370	320	330	345	325	295	300R	
3	295	305	305	310R	320	325	325	375	380	365	380	360	360	375	335H	350	350	275H	330	345	320R	330R	120R	305F	
4	FS	300S	315S	335	335F	325	320	355	380	380	345	350	370R	380	385	385	360	325R	325	340	U340R	FS	F	F	
5	295R	305	330S	310F	350F	320S	315S	370R	365	375	1370R	370	355	350	365	375	1360R	310H	300	325	J335R	330	320	305	
6	315	315	305	315F	360F	340R	345	365	380	370	370	355	350	355	365	365	355	340	320	345	370	355R	300	305	
7	305	320F	325	340S	370R	350	335	365	380H	340	330	350	380	360	365	380	380	330	320	1350R	325	290	295	295	
8	295	315S	305F	F	F	320F	335	350	355	355	340	365	390	360	355	J365R	355	315	340	325	350	340	320	295	
9	315	305	305	295	305	325	345	355	360	390	355	370	370	370	335H	375	360	325V	350R	290	340	315	310	320	
10	305S	325	320	320	305	315	320	365R	380	370	360	365	360R	360	345	380	395	370	305	330	310R	330	310	300	
11	295	300	295	305	315	315	350	370R	375	355	360	365H	365	365	355	345H	375	315H	320	310	355S	320F	FS	F	
12	295F	F	F	305F	305F	315V	325F	335	350	365	365	390	345H	325H	340H	355	365	345	300	345	330	335	295	315F	
13	315	305	305	325	320	315R	330	360	390R	385	1370R	365	360	365R	365S	340R	370	320	335	315	340	315	320	315	
14	305	305	295V	315	310S	310	1370R	355	380	355	350	1340C	350	360	325H	360	340	330	320	320	330	340	285	285F	
15	290F	290F	285F	295	305	295	325	1365R	385	345	350R	360	345H	360	350	355	325S	315S	330	315	340	295	F	F	
16	290F	295F	300	FS	310	310H	335F	355	370	1355C	350	350	355R	350R	365	375	360	320	330	370S	330	275V	285H	300H	
17	280	280F	295	315	345	315	315	345	370	355	355	365S	355	355	365	355	345R	290	330	365	365	290	300	280	
18	F	295	305S	F	FS	U355R	375	U355R	370H	350	365	345R	340H	365	355	355R	360	335	355	345	350	310	305	F	
19	F	295	330	320	340F	FS	330	370	380	365	355	350	340H	380H	340	370	380	320	345	355	370	300	295	295	
20	280F	295F	280F	F	320F	FS	F	345S	360	355	370	370	370H	370	335H	360	380	345	340S	360S	350	300H	300	F	
21	280F	F	295F	310F	320	305F	325	360	J365R	335S	1350C	370	375	365	375	U365R	360	345R	365	350	325S	305	315	320	
22	295	305	300F	300	310F	350	340	365	370	390	350	360	355H	360	360	380	330R	310S	370	360	380	295	F	F	
23	F	F	F	F	FS	F	325F	350	335R	330	375	370R	350	360	360	360	365	335	345	U360R	335	320	310R	F	
24	F	F	F	F	360	345	310	345R	365	350	360	365	380	360	375	375	350	330	345	325	305	U345R	305F	300	
25	285F	F	F	F	F	355F	330F	335	345	370	355	395	370	360	340	350	350	360	355	350	FS	FS	FS	FS	
26	FS	295F	F	FS	340F	335	360	360	380	355	375	370	365	360	370	355	360	335	370	375	300	300	F	F	
27	F	FS	FS	F	U335F	390	360	360	355R	335S	340	355H	370	360	380	365	365	310V	FS	FS	I360R	F	FS	FS	
28	F	FS	F	F	F	F	325R	345S	380	340	355	355	350R	375R	335R	365	365	335	355	355	340F	310F	F	F	
29	F	F	F	F	F	F	F	340R	380	C	365	360	360	370	360	365	380	305	335R	340	360R	F	F	FS	
30	FS	FS	FS	FS	FS	FS	FS	370S	335	345R	C	355	370	365	375	380	355	340R	340	355S	335S	290F	FS	FS	
31	FS	F	F	315	355F	U345F	U360F	375	365	360	360R	360R	360	360	345	385	385	315	345	365	355	215F	320R	320F	
No.	20	21	21	19	24	25	28	31	31	30	30	31	31	31	31	31	31	31	30	30	30	30	27	21	18
Median	295	305	305	310	320	320	330	355	365	360	360	360	360	360	360	365	360	325	330	345	340	315	305	300	300
U. Q.																									
L. Q.																									
Q. R.																									

The Radio Research Laboratories, Japan

Sweep 1.6 Mc to 16.0 Mc in 20 sec in automatic operation

M(3000)F2

A 7

Lat. 39° 43.5'N  
Long. 140° 08.2'E

Akita

IONOSPHERIC DATA

135° E Mean Time (G. M. T. + 9h)

M(3000)F1 0.01

Dec. 1964

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									395L	L	L	LH	375L	L	345L									
2									L	390L	395L	L	L	L	L									
3									1400A	435	LH	350L	405	L	LH									
4									435	L	LH	L	L	L	LH									
5									L	L	L	390L	LH	LH	L									
6									L	L	L	375L	375L	405		L								
7										L	L	LH	L											
8										L	LH	L	400L	L	L	L								
9									425L	LH	LH	L	L	L	L	L								
10									400L	L	L	390L	LH	395L										
11									LH	L	L	LH	415H	L	L									
12										420	LH	L	415	L		L								
13									L	430	LH	L	395L	L										
14									435	C	L	L	L	L	L	L								
15											LH	F	L	L	L	L	L							
16										C	395L	L	L	L	420L									
17										L	L	L	390L	415L	420	L								
18									LH	415L	L	L	385L	LH	345L	L								
19											L	LH	L	L	LH									
20										L	L	L	L	L	L									
21											L380C	L	LH	L	380L	L								
22										L	LH	L	L	L	L									
23											L	375L	380	L	L									
24										L	355L	380	385L	395L	L	L								
25											375	390L	L	L	LH									
26										LH	L	L	L	L	L									
27										L	L	L	L	L	L	LH								
28										L	365L	355L	L	L	420L	L								
29										C	C	L	L	L	LH	L								
30										L	L	375L	L	L	L	415L								
31										395L	L	L	380L	L	L	L								
No.									6	7	6	9	12	4	7	1								
Median									420	415	380	375	390	400	395	415								
U. Q.																								
L. Q.																								
Q. R.																								

The Radio Research Laboratories, Japan

Sweep 1.6 Mc to 16.9Mc in 20 sec in automatic operation

M(3000)F1

# IONOSPHERIC DATA

Lat. 39° 43.5'N  
Long. 140° 08.2'E

Akita

135° E Mean Time (G. M. T. +9h)

R'F2

Dec. 1964

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									240	225	230	245	250	240	250										
2									220	230	240	235	240	245	225										
3									245A	235	230	250	250	230	225										
4									220	230H	265	255	240	240	245										
5									225	235	225	240	250	255	240										
6									235	240	225	250	245	245	245	245									
7										230	250	245H	260												
8										240	265	235	240	250	250	225									
9									230	225	255	250	235	235	235	240									
10										220	255	240	230	235	245										
11									220	235	245	250	245	240	240										
12										235	245	240	245	230H		230									
13									215	230	250L	250	250	240											
14									225	240	255	250	260	245	230	245									
15										245	245	255	260	250	250	245	210								
16										12400	255	250	245	245	240										
17										250	245	240	250	220	245	230									
18									195H	230	240	230	250	245	250	215									
19										250	245	245	230H	240H	245										
20										250	245	245	230	230											
21										12600	240	240	235	245	235	230									
22										245	250	245	245	245	250										
23										255	230	240	240	245	240										
24										240	245	230	240	245	240	225									
25										250	215	240	240	245	235H										
26										240	240	235	245	240	240										
27										250	250	285H	245	245	230	235									
28									220	250	265	255	230	240	280	235									
29										C	C	250	245	230	260	230									
30										235	240	250	245	230	225	230									
31										245	245	240	250L	250	250	225									
No.									12	24	30	31	31	30	26	15									
Median									220	240	245	245	245	240	240	230	210								
U. Q.																									
L. Q.																									
Q. R.																									

R'F2

Lat. 39° 43.5'N  
Long. 140° 08.2'E

Akita

IONOSPHERIC DATA

135° E Mean Time (G.M.T. + 9h)

R'F

Dec. 1964

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	255	270	265	285	250	250	250	220	200	220	215	205H	220	250	225	220	205	225	245	250	230	245	270	275
2	265	300	300	300	270	250	240	225	220	200	200H	225	230	I240A	235	225	215	225	290	240	230	230	300	290
3	300	280	290	250	250	250	250	210	I215A	200	190H	245	200	205	220	220	205	225	245	225	250	250	250	290
4	285	285	255	245	245	245	230	230	200	230	190H	270	250	240	195H	220	220	205	250	245	240	300	280	300
5	290	270	250	270	240	305	250	215	225	230	210	195H	200H	200H	215	215	205	225H	300	250	255	240	255	295
6	270	260	290	270	285	215	250	230	235	225	205	250	210	200	240	240	230	230	255	230	210	235	300	300
7	275	250	255	250	215	235	240	210	230	215	200	195H	180H	230	230	220	210	215	230	205	220	255	250	295
8	270	245	260	270	255	245	240	235	235	220	200H	230	200	250	225	230	220	240	235	250	230	225	250	255
9	265	265	295	295	280	255	255S	220	200	195H	200H	230	245	225	200	200	220	230	215	265	240	285	280	270
10	290	250	280	270	280	250	250	230	200H	195H	215H	215	200H	195	200	230	205	245	270	245	245	245	260	295
11	280	290	300	290	260	255	235	215	200H	220	195H	195H	200	205	210	220	200	I220A	240	250	205	245	290	300
12	270	280	295	255	250	240	240	230	235	200	200	205	195	200	245	215	210	210	I255A	240	245	240	290	255
13	245	275	275	250	270	260	250	215	210	195	200H	230	205	205H	240	215	205	250	250	265	245	225	255	255
14	265	255	295	255	280	250	250	200H	190	I190C	245	245	225	200H	215	245	210	220	225	245	220	230	295	295
15	290	295	295	270	255	280	240	230	215	230	195H	245	205H	195H	230	200	200	210	220	250	245	270	265	300
16	300	300	290	255	250	200	240	220	190H	I220C	210	230	195	235	200	245	230	245	245	210	220	345	320	290
17	330	335	300	280	230	295	E280E	220	220	245	I240A	210	225A	195	195	230	205	245	245	210	210	315	255	315
18	285	285	270	295	280	210	230	235	200H	220	245	230	200	235H	205	210	210	240	215	230	220	E300E	290	305
19	290	295	250	250	245	250	260	210	205	230	245	195H	200	205	200H	220	205	245	220	220	210	260	255	290
20	305	290	295	255	245	220	255	235	230	225	235	200	245	210H	250	230	210	245	210	225	210	255	295	290
21	305	285	280	260	250	255	255	220	215	220	I220C	230	190H	245	200	205	215	210	230	225	E250E	295	250	255
22	300	290	305	290	275	225	250	205	210	205	185H	245	185H	195H	245	220	225	210	205	210	220	280	300	305
23	300	280	295	245	210	225	245	230	240	225	240	230	210	230	230	220	220	240	250	205	E250E	I290A	300	300
24	300	290	290	275	230	250	300	225	230	235	225	200	210	195	225	225	215	235	210	245	280	240	295	295
25	300	250	265	270	230	230	260	230	220	240	225	200	200	215	195H	230	220	210	215	230	210	300	325	305
26	300	305	300	290	240	240	245	225	205	190H	250	225	225	225	230	230	230	235	205	220	E275E	305	335	250
27	255	235	285	290	255	205	245	215	225	245	245	200	245	225	220	200H	210H	245	240	230	205	250	290	305
28	I290A	305	320	285	235	E280E	E300E	220	200	240	225	225	220	215	200	215	215	220	240	230	235	270	265	310
29	300	295	295	300	240	235	235	200	220	C	C	220	195H	200	190H	240	205	260	250	220	200	265	230	250
30	250	250	250	200	205	195	240	215	225	240	225	200	245	205	205	200	215	210	220	215	250	300	270	295
31	290	300	275	270	230	E250E	225	205	210	190H	245	225	200	200H	250	230	200	225	240	220	225	280	270	280
No.	31	31	31	31	31	29	29	31	31	30	30	31	31	31	31	31	31	31	31	31	28	30	31	31
Median	290	280	290	270	250	245	245	220	215	220	215	225	205	205	220	220	210	225	240	230	230	260	280	295
U. Q.																								
L. Q.																								
Q. R.																								

The Radio Research Laboratories, Japan

A 10

Sweep 1.6 Mc to 16.0 Mc in 20 sec in automatic operation

R'F

IONOSPHERIC DATA

Lat. 39° 43.5'N  
Long. 140° 08.2'E

Akita

135° E Mean Time (G. M. T. +9h)

f<sub>o</sub>F<sub>2</sub>

Dec. 1964

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	B	E	E	E	B	B	E	105	150	G	G	G	G	150	150	135	100	100	120	115	E	E	B	B
2	E	E	E	E	E	E	E	110	150	G	100	100	100	100	100	100	100	100	120	E	E	E	E	E
3	100	100	100	E	E	E	110	110	105	105	100	150	150	145	100	100	160	100	E	E	B	E	E	E
4	E	E	E	E	E	E	E	B	G	165	140	155	150	140	G	150	120	105	E	E	105	115	105	105
5	100	100	E	E	E	110	E	150	150	150	140	105	G	100	140	130	150	B	105	115	135	E	E	E
6	B	E	E	E	105	115	E	115	110	110	110	105	155	155	100	100	100	100	120	E	E	E	E	E
7	E	E	E	E	E	E	E	155	G	130	130	G	G	105	G	G	E	E	E	E	E	E	E	E
8	E	E	E	E	E	E	E	E	155	120	120	120	115	110	G	105	E	E	E	E	E	E	E	E
9	E	105	E	E	E	E	115	100	115	G	G	G	G	G	G	100	155	E	B	120	E	E	E	110
10	105	105	E	E	E	E	E	E	105	G	105	G	G	105	G	150	E	E	E	115	105	E	E	E
11	E	E	E	E	E	E	E	115	110	105	105	105	105	105	150	145	E	105	E	100	E	E	E	E
12	105	E	E	E	E	E	100	110	G	135	135	130	105	105	G	105	E	120	105	E	100	100	E	E
13	E	E	E	E	E	E	E	100	105	105	150	130	135	G	125	150	E	E	E	105	100	B	100	B
14	E	E	100	100	E	E	B	120	G	C	G	G	G	G	150	150	105	E	E	115	100	E	E	120
15	E	E	E	E	E	E	105	E	C	G	G	G	120	120	G	145	110	E	105	E	E	E	E	E
16	E	E	E	E	E	E	E	E	105	C	100	155	155	155	145	140	B	110	105	E	110	E	105	110
17	E	E	E	E	E	E	120	E	120	145	140	130	105	100	100	100	105	100	100	120	130	E	115	E
18	E	E	E	E	E	E	E	105	G	155	175	G	G	160	130	G	B	E	120	115	115	105	105	105
19	E	E	E	E	E	E	E	E	105	G	150	G	E150G	135	G	165	E	100	120	100	E	E	E	E
20	E	E	E	E	E	E	E	E	G	150	105	G	160	G	170	140	140	125	110	105	100	100	100	100
21	E	E	120	105	110	105	E	110	105	150	C	155	G	G	G	155	E	E	E	E	E	E	E	E
22	E	E	130	E	E	E	E	B	150	105	G	G	G	G	G	150	110	105	105	105	105	105	105	100
23	100	E	E	E	100	120	E	105	150	150	150	135	130	100	130	100	120	115	110	100	E	105	100	100
24	E	E	E	E	E	E	E	E	125	150	160	105	130	100	100	100	110	110	110	105	E	E	105	100
25	100	100	E	E	E	E	E	110	105	145	100	100	100	G	G	G	E	N	E	E	E	E	E	E
26	E	E	E	E	E	E	E	E	110	110	105	155	150	G	150	140	B	E	E	E	110	105	100	E
27	E	110	105	100	E	E	E	110	105	150	150	105	155	105	G	G	B	100	E	E	E	E	105	100
28	100	105	105	105	E	E	E	E	120	110	110	E170G	150	155	105	150	145	E	E	E	105	E	E	E
29	E	100	100	100	E	E	E	E	150	C	C	110	G	G	G	100	100	105	100	100	100	E	E	E
30	E	E	100	100	100	100	E	E	140	130	125	125	165	150	155	150	100	100	100	E	100	110	110	E
31	E	E	E	E	E	E	E	E	125	115	110	165	150	120	170	150	105	120	E	E	E	110	105	105
No.	7	8	8	7	5	4	5	17	24	22	24	21	20	21	19	27	18	18	16	15	15	9	15	9
Median	100	100	100	100	105	110	110	110	120	130	120	125	140	110	140	140	110	105	110	105	105	105	105	105
U. Q.																								
L. Q.																								
Q. R.																								

The Radio Research Laboratories, Japan

in automatic operation

Sweep 1.6 Mc to 16.0Mc in 20 sec

A 11

f<sub>o</sub>F<sub>2</sub>



Lat. 39° 43.5'N  
Long. 140° 08.2'E

Akita

IONOSPHERIC DATA

135° E Mean Time (G. M. T. +9h)

Types of Es

Dec. 1964

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								13	h 1					h 12	h2 1	h3 1	12	f	f	f2					
2								1	h2 12		13	12	12	13	1	1	1	1	f	f					
3	f	f2	f2					1	17	13	12	h2 12	h 1	h 1	1	1	h	c4 12			f	f2	f3	f2	
4									h	h	h2	h2	h2	h2		h	h								
5	f2	f				f2		h	h2	h 1	h	12	12	12	h	h2	h		f2	f	f2				
6					f	f		13	14	12	12	12	h 12	h 12	12 h	12 h2	12								
7								h	h	h	h	h	1	1		12									
8									h h	c2	c	h2	c2	12		12				f					
9		f						1	c							12	h2			f			f2	f	
10	f2	f						1	1 h		1		1	1	h	h				f	f				
11								1	12	12	12	12	1	12	h2	h2		f2							
12	f			f			f	c	h	h	h 1	h 1	12	12	h	12		f	f2		f				
13								f	12	12	h 1	h	h	h	h	h2 c2				f2					
14			f2	f				c					h	h	h	h2 12	1			f					
15											h	h	h	h	h 1	h	1		f						
16								1	1	12 h	h 12	h 1	h 1	h 1	h 1	h		f	f2		f			f	
17						f		h	h c	h2	h	h	12	12	12	1	f	f	f	f	f				
18								1	12 h	h	h	h	h	h	h	h				f2		f			
19									12 h	h	h	h	h	h2	h	h	h			f	f	f			
20									h	h	1		h	h	h	h	h			f	f	f			
21			f	f4	f	f		1	13	h		h				h2									
22			f					h2 1	h2 1	12 h						h2	c2 12	f2	f	f	f			f2	
23	f2				f	f		1 h	h3	h2 1	h2	h2	h 1	12	h4 12	12 h	f3 f2	f3 f2	f5	f	f2			f2	
24								h	h2 1	h	h 1	1	h	12	1	1 h	f	f2	f	f2				f2	
25	f	f2						f	12 h	h2 13	12 h	13	1	1				f							
26									12	12	1	h	h 1	h 1	h 1	h 1				f	f			f2	
27			f2	f2				1	13 h3	h3 c	h	1	12 h	h2 12	h	h	h				f2			f f	
28	f2	f	f	f				h 1	h 1	12	12 h	h 12	h2 12	h	1	h	h				f				
29		f2	f2	f2				h2	h2	h2	h	12	h	14	12	12				f2	f				
30			f2	f				h2	h2	h	h	h	h 1	h 1	h	h 1	f2	f	f	f	f2			f2	
31					f	f		h2	h2	12	12 h	h 12	h h	h	h2	h	12	f	f	f	f			f	
No.																									
Median:																									
U. Q.																									
L. Q.																									
Q. R.																									

Types of Es

Sweep 1.6 Mc to 16.0 Mc in 20 sec in automatic operation

The Radio Research Laboratories, Japan

# IONOSPHERIC DATA

Lat. 35° 42.4'N  
Long. 139° 29.3'E

Kokubunji Tokyo

foF2 135° E Mean Time (G. M. T. + 9h)

foF2

Dec. 1964

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	030	032	031	031	032	026	028	051	062	066	061	066	065	064	065	059V	048	032	034	035	035	030	033	033	
2	030	032	032	032	033	029	030	050	060	071	057V	062	064	064	060	052	046	044	039	042S	032	028	027	028	
3	028	029	030	030	030	026	028	055	060	062	065	065	066	066	059	050	052	037	034	029	029	027	029	029	
4	030F	031	032	033	031	025	025	050	059	057	059	060	072	072	058	056	041	040S	028	035	036	027	F	030F	
5	029	030	030	029	026	025	028	045	058	065	072	068	058V	059	064	057	052	033	029	035	035	030	028	029	
6	029	030	030	030	030	029	026	048	062S	072	068	082	069	072	059	054R	046	032	028	036	030	024	024	027	
7	028	030F	032F	032F	035F	022	025	045	056	058	061	072	062V	069	056	057	046	042	029	037	026	024	026	028	
8	031	031	029	030	030	029	025	049	054	053	067	072	056	059	066	058	053	035	029	033	035	026	028	026	
9	029	029	029	029	030	029	032	049	054R	058	055	061	072	053	053	051	054	036	027	025	030	024	027	030	
10	029	030	030	031	032	029	029	052R	053	056	056	075	059	060	055	063	055R	027	028R	029	033S	024	028	029F	
11	029	030	030	031	031	028	029	032	054	060	060	066V	058	060	061	060	050	027	028R	029	033S	024	028	029F	
12	030F	030	030	032	033	027	027F	046	054	059	055	060	059V	057	061	055	055	034	025	032	034	F	030	032F	
13	034	033	031F	034	036F	028F	033	054R	054	054	055R	059	055	059	059	051	049	036	038	034	034	029	026	030	
14	034	032F	F	032F	036F	F	038	045	054	058	059	068	067	061	057	060	060	044	030	032	038	025	025	030	
15	032	030	030	032	033	032	034	055R	053	053	066	062	064	070	061	061	057	038	032S	028	034	025	028F	F	
16	028F	028F	029F	033F	031F	026	026	047	053	053	058	070	073	059	057	058H	058	038	040	036S	029	022	027V	028F	
17	029	029	030R	030	030	027	027	047	057	057	081	G	G	G	G	G	G	G	G	G	G	G	G	027	
18	029	031	032F	029F	034F	027F	025F	051	056	053R	070R	067	066	057	064R	066	049	037	043	031	026	024	024	029F	
19	028F	030	030F	031	032	F	026	049R	049	049	058	077R	068	056	062	067	052	035	040	034	028	024	027	029	
20	029	030	030F	030F	030F	F	025F	048	057	051	071	070	061	058	051	061V	062	029	042	035F	031F	F	029F	030F	
21	031F	029F	F	029F	034F	029F	030F	049	056	059	065	074	073	054	061	052	050	036	035	029	027	027	029	028	
22	029	030	030	029	029F	030	028	049	048	056	065	068	060	057	063	057	049	046	046	030	022	023	024	025F	
23	028F	028F	030F	027F	029F	023	025	038	046	052	059	061	066	061	066	054	048	045	035	029F	023	028F	028F	028F	
24	028F	F	029F	029	028F	024	023	042	053	058	075S	064	065	053R	058	054	046	037	036	026	A	A	028	029	
25	029	029F	030	028F	030	F	025	043	054	054	074	060	057	057	055	053	050	053	034	034	029	025F	025	025	
26	029F	F	028F	031F	029F	020F	024	044R	044	045	061	066	062R	056	054	054	045	046	042	029	024	022F	028F	F	
27	029F	F	F	029F	F	024F	025	036	043	050	073	058V	070	060	053	052R	043	032	033	033	033F	026F	F	F	
28	026F	028F	024F	F	028F	018	020	038	049	051	050	064	064	057	051R	056	046	036	032	036	030F	020	024	027F	
29	024	026	026	025F	028F	026F	024	036	040	051	061	061	055	052	057	058	047	032	035	035	034	024F	028R	F	
30	F	F	0445F	F	F	F	F	027F	042	045	052R	074	065	053R	066	052	050	042	039	038	035	025	026	029F	034F
31	029F	029F	030F	032F	030	022	024	040	047	051	071	059	066	057V	057	062	048	035	033	032	027	024	028	029	
No.	30	27	28	29	29	26	31	31	31	31	31	30	30	30	30	30	30	30	30	30	29	27	28	27	
Median	029	030	030	030	030	026	026	047	054	054	061	065	064	059	058	056	049	036	034	034	030	025	028	029	
U. Q.	030	031	030	032	033	029	029	050	057	058	071	068	067	064	061	060	053	040	038	035	034	027	028	030	
L. Q.	028	029	030	029	029	024	025	043	049	051	058	060	059	057	055	053	046	033	029	029	027	024	026	028	
Q. R.	002	002	000	003	004	005	004	007	008	007	013	008	008	007	006	007	007	007	009	006	007	003	002	002	

Sweep 1.0 Mc to 20.0 Mc in 20 sec in automatic operation

The Radio Research Laboratories, Japan

foF2

K 1

Lat. 35° 42.4'N  
Long. 139° 29.3'E

Kokubunji Tokyo

IONOSPHERIC DATA

foF1 0.01 Mc 135° E Mean Time (G. M. T. +9h)

foF1

Dec. 1964

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										L	LH	L	L	L	L									
2										L	L	L	L	L	L									
3										L	L	L	L	L	L									
4										L	L	L	L	L	L									
5										L	L	L	L	L	L									
6										L	L	L	L	L	L									
7										L	L	L	U410L	L	L									
8										L	LH	L	L	L	L	L								
9										L	L	L	400L	L	L	L								
10									L	L	L	U410L	L	L	L									
11										L	L	L	L	L	L									
12										L	L	L	L	L	L	L								
13										L	L	L	L	L	L	L								
14										L	L	L	L	L	L	L								
15										370E	LH	LH	L	L	L	L								
16										L	A	L	420L	L	L	L								
17								L	U300L	L	L	C	C	C	C	C	C							
18								L	L	L	L	L	L	L	L	L								
19								L	U330L	L	L	L	L	L	L	L								
20										L	L	L	L	L	L	L								
21										L	L	L	LH	L	L	L								
22										L	L	L	L	L	L	L								
23										L	A	L	L	L	A	L								
24										L	L	L	L	L	L	L								
25										L	390L	L	L	L	L	L								
26										L	L	L	410L	L	L	L								
27										L	L	L	U410L	L	L	L	L							
28										L	L	L	390L	L	L	L	L							
29										L	U400L	L	A	L	L	L								
30								L	LH	A	U400L	LH	L	L	L	L	L							
31									U350L	L	L	L	L	L	L	L								
No.								1	3	2	2	2	6											
Median								U300	U350	U395	U405	410												
U. Q.																								
L. Q.																								
Q. R.																								

foF1

Sweep 1.0 Mc to 20.0 Mc in 20 sec in automatic operation

The Radio Research Laboratories, Japan

K 2

Lat. 35° 42.4'N  
Long. 139° 29.3'E

Kokubunji Tokyo

IONOSPHERIC DATA

0.01 Mc 135° E Mean Time (G.M.T. +9h)

foE

Dec. 1964

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								B	235	275	280	290	295	280	270	225	S							
3								B	230	270	290	295	315	295	A	A	A							
4								180	250	260	310	300	295	I280A	I260A	240	185							
5								I175B	230	260	280	305	310	295	I270A	225	A							
6								180	235	275	I300A	305	300	290	275	230	A							
7								A	A	270	280	290	I290A	I290A	280	245	I180A							
8								180	230	I270A	290	300	295	280	260	235	B							
9								165B	240	260	I270A	I285A	300	290	I270A	240	A							
10								150	A	A	290	300	300	290	260	220	190							
11								A	240	270	280	300	295	295	270	225	A							
12								190	225	270	285	290	295	280	270	240	175							
13								165	230	260	285	I300A	290	295	265	220	160							
14								180	240	260	290	300	300	295	265	A	A							
15								B	220	260	285	295	295	285	255	230	150							
16								S	240	I265A	A	A	A	290	I275A	I225A	175				J012B			
17								I160B	240	I270A	300	300	305	295	265	230	A							
18								145	235	265	300	C	C	C	C	C	C							
19								160	I225A	260	285	295	295	285	I275A	245	185							
20								B	220	I260A	290	290	285	280	255	230	180							
21								A	215	265	280	300	295	290	265	250	A							
22								165	210	265	290	I295A	300	285	270	230	A							
23								B	210	260	280	295	295	290	275	235	170							
24								B	210	265	285	285	295	295	275	230	A							
25								B	220	260	285	300	300	300	280	235	A							
26								175	240	270	280	300	290	280	270	235	190							
27								A	240	275	295	295	300	300	285	250	195							
28								B	A	260	290	295R	295	I290A	280	240	170							
29								A	215	A	285	A	A	A	A	230	170							
30								B	180	A	A	A	I290A	285	260	245	190							
31								B	I230A	260	I290A	290	I285A	280	265	240	170							
								B	215	A	A	290	295	290	280	250	A							
No.								14	28	27	28	27	28	29	28	28	16							
Median								170	230	265	285	295	295	290	270	235	180							
U. Q.																								
L. Q.																								
Q. R.																								

The Radio Research Laboratories, Japan

Sweep 1.0 Mc to 20.0 Mc in 20 sec in automatic operation

foE

K 3

Lat. 35° 42.4'N  
Long. 139° 29.3'E

Kokubunji Tokyo

IONOSPHERIC DATA

0.1 Mc 135° E Mean Time (G. M. T. + 9h)

foEs

Dec. 1964

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	S	B	E	B	B	B	J018	G	019G	020G	019G	G	G	035	032	J029	025	J028	S	023M	B	018	S	S
2	B	B	B	E	E	B	S	G	G	033	033	017G	037	J053	J044	J044	J044	028	023	022M	024	019	B	024
3	020	B	110Y	023	019	019	J018	J032	032	036	037	035	J040	037	J027	G	G	025	022	S	E	S	S	B
4	E	E	B	B	J017	E	S	G	024G	032	033	J030G	036	032	J029	025	J033	J028	J031	033	019	019	018	023
5	022	020	E	B	J025	J025	G	G	J024G	034	J031	019G	J042	024G	032	J032	019	025	024M	031	032M	J030	024	023
6	S	E	B	018	B	B	J024	J031	J026	J027G	J028G	J031	J038	J053	J053	J030	035M	J036	J034	J029	021	S	S	S
7	S	B	E	E	E	S	S	G	J021G	036	032	G	027G	J026G	G	019G	G	S	J015G	S	S	018	S	S
8	E	E	E	021	E	E	E	G	G	031	033	J040	036	J030G	032M	020G	J024	J031	J029	J029	020	019	E	S
9	E	B	B	B	022	019	B	G	J029	J030	J030	034	025G	J029G	G	031	024	S	J016	J013	024	019	B	S
10	E	J025	J034	J027	J019	018	021	J025	027	J031	G	J030	J031G	J029G	G	018G	J029	J026	J019	019	E	024	E	J025E
11	J024	B	E	020	020M	J025	021	G	018G	G	J028G	J029G	J032	035	J033	J030	J025	032M	025	019	022M	019	J024	J019
12	B	E	017	024	E	E	J023	J033	G	G	035	J036	035	J029G	G	022G	024	023	J019	J030	034	J029	J028	J029
13	024	J025	020	E	B	E	024Y	024	G	018G	G	034	G	G	G	024	022	B	018	017	J032	J027	E	J024
14	B	B	049M	E	J018	B	S	J020	G	G	020G	G	G	G	G	G	G	G	019	B	E	B	S	019H
15	B	J030	019	018	E	025M	032M	021	049M	J028	J030	032	031G	G	J030	025	G	S	E	G	E	B	E	028M
16	E	B	E	017	E	J028	E	G	J028	038	038	J051	J063	037	025G	023G	G	B	024M	E	E	J025	019	J021
17	S	018	J026	019	J021	024	021	J014S	J029	033	036	C	C	C	C	C	C	C	G	C	C	C	C	023
18	023M	E	E	J018	E	018	B	J019	025	G	G	G	G	032	033	G	025	S	025	S	J025	021	S	J030
19	B	B	B	J020	J032	E	S	B	G	035	034	034	033	033	032	J026	021	J024	S	022	E	J027	S	B
20	S	B	018	B	E	E	017	023	036	032	026G	020G	G	G	G	G	J023	049	S	B	S	J027	022	S
21	E	E	E	020	020	019	028	J016G	J024G	025G	G	043	025G	034	033	028	032M	J024	018	018	E	E	E	S
22	020	B	B	B	018	E	B	024	032	034	036	034	037	025G	G	029	G	J023	J019	B	S	E	022	J030
23	020	019	B	E	017	B	B	019	025	G	034	J043	018G	037	J040	035M	J030	J029	049M	J026	017	022M	021M	J039
24	J027	J024	J030	B	019M	019	021M	G	029	033	J026G	J030	035M	J027G	J029	J027	J023	030M	J026	J034	J042	J042	035M	031M
25	J027	029	020	023	E	B	J014	J023	035	J032	J029G	032M	018G	031	018G	J026G	G	B	J053	018	024	020	024	034M
26	025	019	022	019	019	019	024	J019	J030	025G	019G	032	020G	J025G	J025G	J028	G	B	B	J027	023M	021	024	031M
27	J028	J029	020	J031	J029	J029	022	021	J029	032	J034	032	033	J040	G	G	G	B	J023	020	020	022	020M	020
28	S	B	B	B	021	021	020	024	J021G	027	J030	034	034	J029	J030	024	019	B	B	B	E	J016	032	J023
29	024	J017	019	J024	019	B	B	G	G	030	036	J041	046M	025G	030	032	J022	025	023M	J057	J030	018	J015	019
30	019	019	024	024	022F	J018	E	G	025	033	J063	J030	035M	033	024G	020G	019G	B	J013	S	019	J028	J053	J036
31	J024	021	021	J032	J029	022	024	022	G	029	035	033	J026G	035	018G	J029	034M	J026	022	J030	J028	S	S	J031
No.	20	19	23	25	28	23	21	30	31	31	31	30	30	30	30	30	30	18	25	22	26	25	20	22
Median	021	019	020	020	018	019	021	G	025	031	031	032	032	030	029	026	022	027	023	022	020	021	022	024
U. Q.	024	025	024	024	020	024	024	022	029	033	035	034	036	035	032	029	025	031	026	030	025	027	024	031
L. Q.	E	E	E	E	E	E	018	G	G	G	029G	G	031G	029G	G	G	G	025	018	018	E	018	E	023
Q. R.							006	006	005	006	006	006	006	006	006	006	006	006	008	012	009	008	008	

The Radio Research Laboratories, Japan

Sweep 1.0 Mc to 20.0 Mc in 20 sec in automatic operation

foEs

IONOSPHERIC DATA

Lat. 35° 42.4'N  
Long. 139° 29.3'E

Kokubunji Tokyo

0.1 Mc 135° E Mean Time (G. M. T. + 9h)

fbEs

Dec. 1964

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	S	B	B	B	B	B	S		017G	020G	018G			035	030	028	023	017	S	S	B	S	S	S
2	B	B	B			B	S			030	033	017G	037	023	033	028	027	020	019	E	015	S	B	017
3	S	B	E	E	E	S	S	015	022	027	035	035	034	034	033	022		S	S	S	S	S	S	B
4			B	B	E	S	S		018G	031	026	026G	G	032	027	025	022	018	015	015	S	E	S	S
5	S	E	B	B	014	014	S		017	030	031R	019G	025	023G	029	026	018	016	016	016	020	016	S	S
6	S	B	B	015	B	B	B	016	022	026	026G	025	029	030	026	027	020	021	016	021	E	S	S	S
7	S	B				S	S		018G	029	032		026G	023G		017G		S	E	S	S	S	S	S
8			E							028	030	034	G	025G	028	017G	015	022	015	E	S	S	S	S
9		B	B	E	015	E	B		024G	028	025	033	023G	022G		028	023	S	E	E	S	E	B	S
10		012	013	E	E	E	E	018	023	023		027	027G	027G		017G	021	S	S	E		E	E	E
11	S	B	E	E	E	E	S		017G	023G	026G	025	025	033	025	027	G	015	S	S	017	S	S	015
12	B	B	E	E	E	S	S			033	033	034	022G		020G	021	S	E	015	017	S	016	S	S
13	S	E	E		B		S	016		017G		032			023	020	B	E	E	S	S	E	E	E
14	B	B	E		E	B	S	G			019G						B	S	S	B	B	S	S	S
15	B	016	E	E		016	017	S	G	027	029	030	030G		029	025		S			B	B	S	014
16		B	B	E	E	E			020	025	035	041	027	036	025G	020G			015			E	E	S
17	S	E	E	E	E	E	E	G	G	032	033	C	C	C	C	C	C	C	C	C	C	C	C	S
18	E		E	E	E	E	B	G	022					031	028		016	S	S	S	015	E	S	E
19	B	B	B	E	014		S		027	033	033	032	032	032	030	019	G	S	S	014		018	S	B
20	S	B	E	B			S	016	017	030G	023G	020G					021	015	S	B	S	E	E	S
21		E	B	B	E	E	E	G	G	023G		033	022G	022	032	026	021	015	015	S				S
22	E	B	B	B	E	E	B	018	028	033	034	G	034	025G	028		017	S	B	S		E	016	
23	S	E	E	B	E	B	B	019	025	033	040	016G	035	036	028	025	025	025	E	E	015	S	S	S
24	017	E	E	B	E	E	E		027	028	022G	020	024	020G	021	023	020	016	022	015	A	A	021	018
25	E	016	E	E	E	B	E	015	019	029	026G	023	018G	023	016G	017G	B	016	015	017	E	015	017	
26	018	E	E	E	E	E	E	017	G	022G	017G	032	020G	022G	023G	019		B	B	017	016	S	S	015
27	017	017	E	015	018	015	E	G	025	032	023	031	032	031			B	016	S	016	017	S	016	
28	S	B	B	B	E	015	E	015	020G	027	028	031	028	029	027	024	019	B	B	B	012	E	012	
29	E	E	014	014	E	B	B		027	032	033	040	022G	029	031	017	015	017	028	S	S	E	S	E
30	S	015	E	E	E	E	E		025	030	044	025	029	032	023G	017G	016G	B	E	S	S	S	E	015
31	S	E	E	014	022	015	E	G	027	034	026	023G	032	032	017G	020	021	014	S	017	015	S	S	017

No.																									
Median																									
U. Q.																									
L. Q.																									
Q. R.																									

Sweep 1.0 Mc to 20.0 Mc in 20 sec in automatic operation The Radio Research Laboratories, Japan

fbEs

K 5

Lat. 35° 42.4'N  
Long. 139° 29.3'E

Kokubunji Tokyo

IONOSPHERIC DAIA

0.1 Mc 135° E Mean Time (G. M. T. + 9h)

f-min

Dec. 1964

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	E0148	012	010	014	012	014	E0158	015	014	015	014	014	014	016	014	013	E0158	E0158	E0148	E0148	012	E0148	E0158	E0148
2	013	013	014	010	010	013	E0148	015	014	014	014	014	014	014	012	012	010	E0148	E0158	013	010	E0158	013	011
3	E0148	014	013	014	011	E0158	E0158	014	014	014	014	014	013	011	013	013	014	E0158	E0158	E0148	010	E0158	E0148	013
4	010	010	015	014	011	010	E0148	014	014	014	014	014	015	015	015	012	012	E0158	E0158	010	012	E0158	E0148	013
5	E0148	010	010	014	010	010	E0158	014	014	014	015	014	015	015	015	014	014	012	011	011	011	E0158	E0158	E0158
6	E0158	010	014	011	014	014	014	011	013	014	015	014	014	014	014	014	011	011	013	E0158	013	E0168	E0158	E0158
7	E0158	014	010	010	010	E0148	E0148	015	013	014	015	014	015	014	014	014	016	E0148	011	E0158	E0148	E0148	E0158	E0148
8	011	010	010	010	010	010	010	012	014	014	015	014	016	016	014	013	012	012	011	013	E0158	E0148	010	E0158
9	010	014	013	013	010	010	010	012	014	014	014	014	014	014	014	015	014	E0158	E0158	013	012	E0158	011	013
10	010	010	E	014	010	E	012	012	013	015	014	015	013	015	015	014	012	E0148	E0148	012	010	013	011	013
11	E0158	013	010	013	011	010	E0148	014	014	014	014	014	014	014	014	012	010	012	012	E0158	012	E0158	E0158	012
12	014	010	011	013	010	E0148	E0158	012	013	014	014	014	014	014	014	012	013	E0148	011	011	E0148	E0158	E0158	E0148
13	E0158	013	013	010	013	011	E0148	013	014	014	015	014	015	016	015	014	014	014	015	013	012	E0158	012	010
14	014	015	010	011	010	012	E0158	015	013	014	015	015	015	014	015	014	013	012	012	E0158	013	010	014	E0158
15	013	010	014	011	010	010	E0158	E0168	015	012	016	015	014	016	016	014	014	E0148	010	014	010	013	010	010
16	010	014	010	010	010	014	010	014	013	014	015	014	016	014	014	014	014	013	010	010	010	012	013	E0148
17	E0158	010	014	E	010	013	013	012	014	014	015	C	C	C	C	C	C	C	C	C	C	C	C	E0158
18	012	010	010	010	010	013	013	013	013	014	016	015	015	015	016	014	014	E0158	E0158	013	012	E0148	E0158	013
19	014	013	014	011	010	010	E0148	015	014	015	017	015	015	013	013	013	016	E0148	E0148	010	010	E0148	E0158	013
20	E0158	015	015	012	010	010	E0148	013	012	016	015	015	017	016	016	014	012	013	E0148	013	E0158	013	013	E0148
21	010	010	010	010	012	014	E0158	014	014	014	014	014	015	012	014	011	010	013	011	011	E0158	010	010	E0158
22	012	014	014	013	014	011	014	014	013	014	014	016	014	015	015	015	014	014	013	E0148	013	E0158	010	012
23	E0158	015	015	010	010	014	014	010	014	015	016	016	014	014	012	013	012	013	013	013	011	010	E0158	E0148
24	010	011	010	013	011	013	013	015	014	015	015	015	014	015	014	014	014	011	010	012	011	012	012	012
25	011	012	014	014	010	013	013	011	014	015	014	014	014	013	012	013	015	014	014	E0158	013	E0158	013	011
26	013	012	014	014	013	015	014	011	014	013	015	014	015	014	014	013	016	014	014	013	E0148	E0148	011	011
27	E0148	011	014	013	013	013	013	015	013	014	015	015	016	014	016	015	015	014	014	014	E0158	E0148	013	E0158
28	E0158	015	014	013	010	011	013	011	015	013	014	014	014	015	014	015	013	015	014	012	011	011	011	011
29	013	014	013	012	012	013	012	013	012	014	014	015	014	014	014	015	012	012	011	013	E0158	012	E0158	011
30	E0158	014	011	011	014	011	010	014	014	015	014	015	016	015	015	015	014	014	010	010	E0158	E0158	E0158	E0148
31	E0158	013	011	011	012	013	013	014	014	014	015	014	014	014	014	014	014	012	E0148	012	012	E0158	E0158	E0158
No.	17	31	31	31	31	28	17	30	31	31	31	30	31	31	31	30	29	19	18	21	16	30	30	31
Median	012	013	013	012	010	012	013	014	014	014	015	014	014	014	014	014	014	014	013	011	012	010	E014	E014
U. Q.																								
L. Q.																								
Q. R.																								

f-min

# IONOSPHERIC DATA

**Dec. 1964**

**M(3000)F2** 0.01

135° E Mean Time (G. M. T. + 9h)

Kokubunji Tokyo

Lat. 35° 42.4'N  
Long. 139° 29.3'E

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	300	310	325	320	325	310	320	350	355	380	345	380	350	350	370	370V	355	355	325	315	344	330	300	300
2	315	280	280	295	335	315	345	345	360	365	360V	355	360	340	380	360	335	335	330	350S	345	280	320	285
3	295	295	300	325	355	305	310	360	365	365	355	355	360	360	360	360	345	345	325	310	340	305	305	300
4	300F	310	315	335	350	360	310	350	360	350	370	330	345	360	360	375	345	345S	340	325	335	280	F	280F
5	305	305	330	310	330	310	305	360	345	355	350	370	360V	325	375	370	365	360	310	315	330	315	305	310
6	310	320	300	305	305	355	340	360S	340	370	370	355	350	340	375	J360R	365	330	320	340	365	330	290	285
7	305	330F	J320F	345F	J370F	370	310	350	345	360	345	360	340V	355	365	355	345	355	345	310	310	295	310	275
8	320	325	315	295	315	345	300	330	370	360	325	365	355	305	360	360	360	345	330	305	345	325	330	285
9	305	310	295	295	300	295	350	345	J350R	340	325	355	345	345	355	350	365	370	310	320	315	335	305	295
10	305	335	300	315	310	300	305	J355R	375	355	360	360	370	380	365	350	J360R	335	310	325	330	315	290	295F
11	310	300	315	305	330	310	340	360	370	355	380	370V	345	350	360	355	380	335	J340R	345	335S	340	295	290F
12	290F	300	310	315	335	350	315F	345	370	370	350	350	320V	350	360	360	360	355	355	315	295	F	315	320F
13	295	325	320F	305	330F	305F	325	J365R	360	360	J360R	355	365	345	355	355	365	330	345	345	330	330	295	305
14	320	310F	F	290F	305F	F	345	345	350	360	355	335	340	345	355	320	335	340	325	315	345	315	290	285
15	310	300	295	310	320	310	325	J350R	365	360	345	355	360	360	345	360	370	350	370S	320	325	335	295F	F
16	280F	280F	295F	J325F	355F	320	335	350	375	335	345	345	355	370	350	315H	370	330	340	355S	345	295	290V	305F
17	270	290	J285R	325	325	305	295	345	370	320	370	C	C	C	C	C	C	C	C	C	C	C	C	290
18	310	280	J305F	295F	320F	305F	320F	350	395	J360R	345R	360	350	365	J335R	350	390	305	345	350	350	305	310	290F
19	280F	300	330F	350	345	F	340	J345R	365	365	330	J350R	355	370	340	365	360	340	330	355	360	275	295	285
20	295	305	300F	295F	285F	F	325F	355	335	330	340	345	360	360	355	345V	370	350	340	340F	355F	F	305F	J305F
21	J290F	U305F	F	U330F	340F	305F	330F	365	390	340	335	355	370	355	360	345	360	345	325	345	315	285	305	305
22	290	295	300	295	295F	330	340	360	355	360	340	355	355	350	345	355	355	345	370	365	360	305	295	295F
23	U285F	U285F	J320F	320F	375F	325	320	365	365	330	335	360	380	345	365	350	355	365	340	345F	305	305F	U325F	305F
24	U305F	F	310F	355F	315	320	350	340	340	345	355S	360	355	J360R	345	365	350	325	360	350	A	A	295	295
25	300	305F	330	285F	U355F	F	320	345	365	315	355	350	350	350	345	345	360	360	360	355	325	280F	275	280
26	U280F	F	285F	J285F	345F	300F	325	J345R	365	375	345	365	J355R	370	350	365	355	335	335	325	350	280F	J270F	F
27	U310F	F	F	U275F	F	315F	355	365	350	320	355	345V	330	350	360	J365R	365	355	330	350	335F	F	F	F
28	U310F	305F	315F	F	355F	280	330	365	365	370	340	375	360	360	370R	335	330	345	370	340	305F	300	300	295F
29	290	290	300	300F	295F	305F	330	350	375	330	350	385	345	315	355	345	360	345	310	355	355	290F	J310R	F
30	F	F	J325F	F	F	F	U315F	355	355	J310R	340	370	J325R	365	365	360	365	330	345	355	320	285	285F	350F
31	280F	295F	295F	345F	365	315	335	370	365	370	350	330	370	350V	350	370	370	360	335	355	335	330	290	290
No.	30	27	28	29	29	26	31	31	31	31	31	30	30	30	30	30	30	30	30	30	29	27	28	27
Median	300	305	310	310	330	310	320	330	365	355	350	355	350	350	360	360	360	345	335	345	335	305	300	295
U. Q.																								
L. Q.																								
Q. R.																								



IONOSPHERIC DATA

Lat. 35° 42.4'N  
Long. 139° 29.3'E

Kokubunji Tokyo

135° E Mean Time (G. M. T. + 9h)

0.01

M(3000)F1

Dec. 1964

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										L	LH	L	L	L	L									
2										L	L	L	L	L	L									
3										L	L	L	L	L	L									
4										L	L	L	L	L	L									
5										L	L	L	L	L	L									
6										L	L	L	L	L	L									
7										L	L	L	U380L	L	L									
8										L	LH	L	L	L	L									
9										L	L	L	395L	L	L									
10									L	L	L	U370L	L	L	L									
11										L	L	L	L	L	L									
12										L	L	L	L	L	L									
13										L	L	L	L	L	L									
14										L	L	L	L	L	L									
15										400E	LH	LH	L	L	L									
16										L	A	A	365L	L	L									
17									L	U395L	L	L	C	C	C	C	C	C	C	C				
18									L	L	L	L	L	L	L									
19									L	U440L	L	L	L	L	L									
20										L	L	L	L	L	L									
21										L	L	L	LH	L	L									
22										L	L	L	L	L	L									
23										L	A	L	L	L	A									
24										L	L	L	L	L	L	L								
25										L	385L	L	L	L	L									
26										L	L	L	365L	L	L									
27										L	L	L	U370L	L	L									
28										L	L	L	390L	L	L	L								
29										L	U370L	L	A	A	L									
30										LH	A	U385L	LH	L	L	L								
31										U420L	L	L	L	L	L									
No.									1	3	2	2	6											
Median									U395	U430	U380	U380	375											
U. Q.																								
L. Q.																								
Q. R.																								

Sweep 1.0 Mc to 20.0Mc in 20 sec in automatic operation The Radio Research Laboratories, Japan K 8

IONOSPHERIC DATA

Lat. 35° 42.4'N  
Long. 139° 29.3'E

Kokubunji Tokyo

135° E Mean Time (G. M. T. + 9h)

R'FZ

Dec. 1964

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										220	240	230	260	255	235									
2										230	240	240	250	250	230									
3										240	250	240	245	255										
4										240	250	280	245	250	240									
5										250	250	240	245	250	240									
6										260	230		255	255	240									
7										250	260	240	250	250	250									
8										250	290	225	240		240	225								
9										250	275	245	250		250									
10									210	250	250	245	245	225	240									
11										240	230	240	255	250	250									
12										220		250	255	255		230								
13										240		250	240	255	255	230								
14										240	270	280	255	250	240	275								
15										240	275	240	250	255	250	245								
16											250	255	250	225	250									
17								230	225	280	240	G	G	G	G	G	G	G						
18									205	225	260	250	255	230	260									
19									225	225		245	255	225	250									
20											240	245	245	240	230	245								
21										255	260	250	225	240										
22											260	240	240	245		240								
23											250	240	240	280	240									
24											245	245	250	245	245	240								
25										290L	240	260	250	250	250									
26											270	245	260	240		240								
27											255	240	260	245	245		210							
28										245		260	250	245	235	240								
29							230				260	240	250	255										
30										280	270	230	290	240	240	225								
31										230	250	250	250	260	240									
No.								2	4	23	27	29	30	27	25	11								
Median								230	220	240	250	245	250	250	240	240								
U. Q.																								
L. Q.																								
Q. R.																								

Sweep 1.0 Mc to 20.0 Mc in 20 sec in automatic operation

The Radio Research Laboratories, Japan

K 9

R'FZ

Kokubunji Tokyo

IONOSPHERIC DATA

135° E Mean Time (G.M.T. + 9h)

km

Dec. 1964

k'F

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	275	260	250	260	240	E250B	245	220	240	205	190H	240	230	245	240	210	210	210	240	255	225	225	270	290	
2	255	300	300	270	240	240	245	225	220	210	210	205	245	200	220	210	220	225	250	225	205	295	250	300	
3	300	300	290	250	210	245	265	230	210	205	245	210	210	210	230	230	225	210	240	210	225	250	260	260	
4	280	255	255	245	210	210	E260S	230	225	230	245	225	245	240	230	230	205	205	260	250	225	255	340	300	
5	290	255	240	255	230	280	245	205	245	225	240	230	220	225	220	240	210	205	290	250	255	255	290	260	
6	275	250	275	290	255	210	260	220	230	230	230	205	180	205	220	205	205	220	250	220	210	E360S	E300S	E300S	
7	290	250	250	215	205	E240S	255	210	230	230	220	205	210	210	200	230	210	200	210	210	225	270	255	300	
8	255	245	250	275	260	205	255	230	230	230	200H	225	200	205	225	225	225	205	250	250	205	250	210	300	
9	270	250	300	290	290	260	225	210	225	200	200	210	205	225	200	230	230	200	260	220	255	255	255	300	
10	260	240	275	270	250	255	250	220	205	200	210	200	220	205	195	230	205	200	275	230	220	255	255	300	
11	290	265	270	275	240	245	225	220	205	210	230	240	180	230	200	230	205	205	210	230	250	205	250	345	
12	300	295	280	250	220	210	250	210	220	200	240	225	225	195	230	210	225	195	205	260	290	260	255	250	
13	255	250	270	255	250	240	245	220	210	200	230	210	205	205	225	200	210	205	225	210	240	220	E280E	270	
14	255	280	295	260	270	225	210	220	220	240	230	225	225	225	200	225	205	205	225	245	220	220	E310S	300	
15	290	300	310	270	250	255	255	225	220	180H	190H	180H	245	245	225	220	220	210	200	255	220	220	290	290	
16	310	310	280	250	210	255	210	210	210	230	230	1215A	240	230	200	205H	210	210	220	220	205	210	260	305	300
17	330	310	300	250	225	250	260	220	200	230	250A	G	G	G	G	G	G	G	G	G	C	C	C	300	300
18	290	300	260	290	230	250	245	240	210	200	180	245	230	220	230	230	205	240	210	225	205	280	260	290	
19	305	285	250	225	210	E300E	225	210	205	180	240	245	205	205	180	235	210	205	240	205	205	E390A	290	275	
20	300	300	260	280	255	240	255	205	205	240	220	220	200	220	215	205	225	200	225	220	200	270	260	260	
21	300	300	260	240	225	260	270	205	210	245	225	220	200H	220	240	220	210	205	220	210	240	295	275	260	
22	280	300	300	295	290	250	220	210	210	240	245	240	240	240	230	230	220	240	205	205	210	275	255	340	
23	310	300	260	245	200	260	245	220	210	230	225	1240A	255	225	1235A	230	220	210	240	200	260	255	225	300	
24	290	270	260	255	205	280	255	225	240	225	220	220	205	205	200	225	210	220	210	225	A	A	E310A	300	
25	290	300	255	225	205	245	250	220	220	220	225	195	205	200	205	240	220	205	210	225	210	345	355	E350A	
26	320	300	300	255	200	310	250	210	205	220	220	245	220	230	225	220	225	210	225	210	225	225	305	290	290
27	250	290	300	290	225	255	225	210	205	230	260	220	225	210	205	225	205	205	250	210	210	260	290	310	310
28	260	280	295	250	200	E360B	250	210	220	225	210	235	190	220	215	210	220	215	220	215	210	295	265	270	
29	315	300	295	265	275	255	215	200	210	210	240	210	1215A	225	205	240	230	220	270	290	205	260	255	230	
30	255	255	230	200	205	250	225	210	225	210H	1220A	205	180H	225	200	205	205	230	210	205	245	310	300	250	
31	300	305	290	225	210	E295A	245	205	210	185	240	205	250	220	200	225	205	210	220	220	250	255	295	310	
No.	31	31	31	31	31	28	30	31	31	31	31	30	30	30	30	30	30	30	30	30	29	27	26	30	
Median	290	290	275	255	225	250	245	220	210	220	225	220	220	220	220	225	210	210	225	220	220	260	260	300	
U. Q.																									
L. Q.																									
Q. R.																									

Sweep 1.0 Mc to 20.0 Mc in 20 sec. in automatic operation

k'F

The Radio Research Laboratories, Japan

K 10

IONOSPHERIC DATA

Dec. 1964

f<sub>o</sub>F<sub>2</sub>

135° E Mean Time (G. M. T. + 9h)

Kokubunji Tokyo

Lat. 35° 42.4'N  
Long. 139° 29.3'E

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	S	B	E	B	B	B	100	G	105	105	G	G	G	150	140	140	125	120	S	145	B	100	S	S
2	B	B	B	E	E	B	S	G	G	180	155	100	175	100	100	100	100	100	100	130	115	125	B	110
3	110	B	110	110	110	110	110	105	105	E180G	150	100	130	100	100	100	G	100	100	S	E	S	S	B
4	E	E	B	B	115	E	S	G	110	155	110	110	160	150	105	160	100	105	105	110	105	105	105	110
5	105	100	E	B	110	105	110	G	105	155	105	105	100	100	140	115	110	105	100	100	100	100	100	100
6	S	E	B	125	B	B	115	110	110	110	110	110	105	100	100	100	100	100	100	095	100	S	S	S
7	S	B	E	E	E	S	S	G	110	110	150	G	G	105	105	G	G	S	S	S	S	100	S	S
8	E	E	105	E	E	E	E	G	G	120	110	110	110	110	105	105	105	100	100	100	100	100	E	S
9	E	B	B	110	100	100	B	G	110	110	110	E185G	100	100	G	180	150	S	S	S	110	110	B	S
10	E	110	105	105	100	105	105	100	110	110	G	105	105	105	G	G	105	105	100	110	110	E	100	E
11	100	B	E	100	100	110	110	G	105	G	105	105	105	105	105	105	105	100	105	100	100	100	130	110
12	B	E	115	105	E	105	105	G	G	155	105	140	105	G	G	110	160	105	100	105	100	100	100	100
13	100	100	100	E	B	E	110	110	G	105	G	100	G	G	G	115	160	B	105	100	105	100	E	100
14	B	B	115	E	110	E	S	110	G	G	100	G	G	G	G	G	G	B	100	B	E	B	S	115
15	B	105	105	105	E	100	100	105	110	115	115	110	110	G	105	145	G	S	E	G	E	B	E	110
16	E	B	E	130	E	110	E	G	115	110	140	125	110	130	110	105	G	B	100	E	E	105	105	100
17	S	100	115	105	105	105	100	S	100	150	130	C	C	C	C	C	C	C	C	C	C	C	C	110
18	110	E	E	115	E	105	B	100	120	G	G	G	G	150	115	G	125	S	125	S	110	110	S	105
19	B	B	B	100	110	E	S	B	G	105	175	155	145	125	120	100	100	100	S	105	E	100	S	B
20	S	B	130	B	E	E	105	105	100	160	100	100	G	G	G	G	115	110	S	B	S	100	100	S
21	E	E	E	105	105	105	105	105	105	110	G	100	100	100	160	145	100	100	130	110	110	E	E	S
22	105	B	B	B	100	E	B	135	150	150	155	170	155	105	G	150	G	105	105	B	S	E	100	100
23	100	100	B	E	125	B	150	155	G	145	130	100	130	125	100	100	100	110	105	105	150	140	130	100
24	100	100	100	B	100	100	155	G	155	130	100	100	100	100	100	110	110	105	105	105	105	105	100	100
25	100	100	100	110	E	B	S	110	105	105	110	105	100	100	100	100	G	B	105	105	100	100	100	100
26	100	100	100	100	100	100	105	105	100	100	160	100	100	100	100	100	G	B	B	105	105	105	100	100
27	100	100	100	105	105	105	105	105	120	170	100	150	155	100	G	G	G	B	100	100	100	100	100	100
28	S	B	B	110	E	105	105	100	115	110	110	110	110	110	110	160	150	B	B	B	E	105	105	105
29	100	105	105	100	105	B	B	G	G	110	105	105	105	105	150	125	100	100	105	105	105	100	S	100
30	100	100	105	105	100	155	E	G	125	130	115	105	105	105	105	105	110	B	110	S	110	105	105	105
31	105	105	105	105	100	100	105	100	G	110	105	105	105	140	100	100	100	100	105	105	105	S	S	105
No.	14	13	16	19	18	17	17	16	24	26	26	25	25	26	22	26	21	18	22	19	18	23	14	22
Median	100	100	105	105	105	105	105	105	110	110	110	105	105	105	105	105	105	105	100	105	105	100	100	100
U. Q.																								
L. Q.																								
Q. R.																								

Sweep 1.0 Mc to 20.0 Mc in 20 sec in automatic operation

The Radio Research Laboratories, Japan

f<sub>o</sub>F<sub>2</sub>

K 11

IONOSPHERIC DATA

Types of Es

Dec. 1964

Kokubunji Tokyo

Lat. 35° 42.4'N  
Long. 139° 29.3'E

135° E Mean Time (G. M. T. + 9h)

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							f		L2	L2	L2			h	h2	h21	e3	f3	f			f		
2									b212	h1	L	h12	h12	L2	L3h	L4	L3	f4	f2		f			f2
3	f		f2	f	f	f	f2	1	L2	h1	h212	h12	h1	L3h	L3	L2		f2						
4									L2	h1	h4	L	h1	h1	L2	h13	h4h2	f2	f3	f3	f	f2	f2	f2
5	f2	f			f2	f2			L2	h212	L2	L	L2	L	h212	e21	e212	f3	f2	f4	f2f	f2	f	f
6							f	L3	L3	L	L2	L2	L2	L3	L2	L2h	L5	f3	f2	f2	f			
7									L2	L2	h21	L	L	L2	L	L			f					
8									h	e2	e2	e2	e2	L	L	L	L	f3	f2	f2	f	f		
9					f2	f			L2	L	L	h1	L2	L2	L	h212	h2	f	f	f	f2	f		
10			f2	f3	f	f	f	L2	L2	L	L2	L2	L	L	L	L	h2	f2	f	f	f			
11	f2				f	f2	f		L	L2	L2	L2	L2	Lh	L2	L3h	L	f2	f	f	f2	f		
12					f	f2	f			h	L	L	h	L	L	L	h3	f	f2	f2	f2	f2	f	
13	f2	f				f	f	L	L	L	Lh	Lh				e2	h12	f	f	f	f2	f		
14								L		L	L								f					
15			f2	f2	f	f4	f2	L	L	e1	e21	L2	L2		L2h	h21								f3
16					f	f		L	L	L	hc	b2	L	h2	L2	L2					f	f		f2
17					f	f2	f	L	L	L	h2	h212							ff			f		
18	f					f		L	L2	L2	h	h	h1	h	e	L	L	f	f	f	f	f3		
19					f	f		L	L2	h1	L	L		h21	e212	L3	L2h	f4	f	f		f		
20									L2	L2	L	L										f		
21					f2	f	f2	L	L	L2	L	L3	L2	L2	h1	h12	L2h2	f	f2f	f			f	
22	f				f			h3	h21	h21	h212	h	h1	L2	h			f2	f					
23	f	f			f			h2	h2	h	h3	L	L	h21	h312	L2c	L2	f4	f4	f	f	f	f	f2
24	f	f	f		f	f			h1	L	L	L	L	L	L	Lc2	L2	f4f	f3	f3	f4	f4	f4	f3
25	f2	f	f		f	f		L	L3	Lh	L	L2	L	L3	L	L		f2	f	f	f	f	f2	f2
26	f	f	f		f	f	f2	L3	L2	L2	L	h1	L	L	L2	L			f2	f2	f2	f2	f2	f2
27	f2	f2	f		f2	f2	f2	L	L3	h21	L	h	h	L2	L				f	f	f	f2	f2	f2
28								L	L	L2	c	L	L	L	L	h	h1					f2	f2	f2
29	f3	f2	f		f	f			L2	L3	L2	L3	L	L	h1	h2	L3	f3	f	f4	f	f	f	f2
30	f2	f	f2		f	f			h2	h2	e2	L	L	h1	L	L	L	f	f	f	f	f2	f2	f2
31	f2	f	f		f3	f2	f2	L	L	L	L2h	L	L	h2	L	L2	L2	f2	f	f3	f2	f2	f	f
No.																								
Median																								
U. Q.																								
L. Q.																								
Q. R.																								

Sweep 1.0 Mc to 20.0Mc in 20 sec in automatic operation

Types of Es

The Radio Research Laboratories, Japan

K 12

# IONOSPHERIC DATA

Lat. 35° 42.4'N  
Long. 139° 29.3'E

Kokubunji Tokyo

135° E Mean Time (G. M. T. + 9h)

km  
**fpF2**

**Dec. 1964**

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	325	310	295	300	295	305	295	255	250	240	255	240	260	260	250	240V	245	260	290	300	255	290	310	340	
2	310	355	355	340	280	290	290	255	250	250	255V	250	250	260	245	230	265	260	290	260S	240	350	300	350	
3	350	345	340	300	250	295	305	250	250	245	250	250	255	255	250	250	250	250	290	295	275	305	310	310	
4	310F	300	300	270	250	240	305	250	250	245	250	300	255	250	250	245	240	245S	300	290	260	340	F	355F	
5	310	305	290	310	280	310	300	220	270	255	255	250	250V	300	250	245	230	240	300	290	275	300	310	310	
6	305	295	310	310	305	250	305	250	250S	275	250	235	255	260	245	J240R	230	250	300	250	250	290	335	340	
7	340	300F	J300F	250F	J240F	240	300	250	255	255	260	250	260V	255	250	250	250	245	250	250	320	315	305	350	
8	300	290	300	340	305	250	315	255	250	255	300	245	250	320	250	245	255	240	300	300	245	290	250	360	
9	320	300	340	330	310	315	245	245	J250R	260	290	250	255	250	250	250	250	220	315	290	300	295	310	340	
10	310	280	320	300	305	310	310	J245R	240	255	250	250	250	245	245	260	J220R	250	315	280	270	305	340	345F	
11	310	310	300	305	280	290	255	245	240	250	245	250V	260	255	255	250	225	260	J255R	260	I270S	250	310	380F	
12	345F	340	310	295	260	250	305F	250	240	240	250	250	285V	260	250	250	250	225	240	300	330	F	300	300F	
13	310	310	315F	310	290F	310F	290	J245R	250	250	J240R	255	250	260	255	250	245	255	255	250	265	260	330	310	
14	300	325F	F	315F	310F	F	250	250	255	250	290	295	260	260	250	300	250	250	280	300	255	300	355	350	
15	330	345	350	325	300	305	290	J255R	240	250	280	250	255	255	260	255	250	250	U220S	300	270	265	340F	F	
16	360F	365F	325F	J300F	245F	300	270	245	220	270	270	260	255	245	255	290H	245	270	260	240S	250	330	350V	350F	
17	380	370	J350R	300	280	310	310	250	245	300	250	G	C	C	C	C	C	C	C	C	C	C	C	330	
18	310	350	J310F	340F	290F	300F	300F	250	205	J250R	285R	250	255	245	J280R	250	205	290	250	250	240	305	310	325F	
19	365F	320	290F	250	255	F	270	J230R	240	230	280	J250R	255	245	260	250	240	245	280	245	240	405	340	345	
20	345	310	325F	330F	340F	F	290F	245	260	260	255	250	250	250	245	260V	250	245	260	260F	240F	F	315F	J315F	
21	J345F	U345F	F	U290F	260F	325F	300F	240	225	275	290	250	230	250	250	260	235	250	280	250	305	350	310	305	
22	345	345	340	340	345F	295	250	240	240	250	280	250	250	250	270	250	245	255	220	240	240	340	300	355F	
23	U360F	U355F	J300F	290F	240F	300	290	240	230	260	260	250	245	290	250	255	250	240	245	240F	310	300F	U290F	350F	
24	U350F	F	310F	295	245F	310	290	250	255	260	250S	250	250	J250R	255	250	245	260	220	260	A	A	330	340	
25	320	340F	300	290F	U250F	F	295	250	250	300	250	260	250	250	255	260	250	240	280	250	270	390F	390	390	
26	U380F	F	350F	J340F	250F	340F	290	J250R	220	220	280	250	J260R	250	260	250	250	260	275	280	250	360F	J365F	F	
27	U305F	F	F	U360F	F	305F	260	220	240	300	260	260V	285	250	250	J290R	225	240	290	250	255F	300F	F	F	
28	U300F	325F	315F	F	225F	310	290	240	250	240	270	240	255	245	240R	285	275	270	240	250	245F	315	325	340F	
29	360	345	340	330F	310F	305F	260	245	230	275	260	245	250	290	260	250	250	250	305	255	235	325F	J300R	F	
30	F	F	J280F	F	F	F	U300F	250	250	J330R	285	245	J290R	250	250	290	240	290	255	240	290	360	355F	260F	
31	355F	345F	325F	255F	230	310	290	225	225	245	250	275	250	260V	250	240	220	240	260	250	290	290	340	355	
No.	30	27	28	29	29	26	31	31	31	31	31	30	30	30	30	30	30	30	30	30	29	27	28	27	
Median	330	325	310	305	280	305	290	250	250	255	260	250	255	250	250	250	245	250	280	260	260	305	310	340	
U. Q.																									
L. Q.																									
Q. R.																									

Sweep 1.0 Mc to 20.0 Mc in 20 sec in automatic operation

The Radio Research Laboratories, Japan

**fpF2**

K 13

Lat. 35° 42.4'N  
Long. 139° 29.3'E

Kokubunji Tokyo

IONOSPHERIC DATA

135° E Mean Time (G. M. T. + 9h)

km  
yPF2

Dec. 1964

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	070	085	090	060	055	090	055	045	045	020	055	020	040	040	030	050V	030	050	055	050	090	055	085	055	
2	085	060	055	060	040	070	065	045	050	040	045V	055	040	055	025	030	060	060	055	045S	055	065	055	060	
3	090	055	060	050	045	065	065	040	030	030	040	040	040	035	040	045	055	050	050	075	070	085	085	085	
4	080F	060	060	090	050	055	090	055	040	025	030	045	045	040	030	025	050	050S	045	050	045	070	F	060F	
5	075	090	055	050	065	050	045	060	035	035	040	020	040V	050	030	030	040	050	055	055	035	055	085	085	
6	085	055	085	085	055	045	090	050	040S	035	025	070	045	050	035	J055R	060	090	095	090	045	060	075	070	
7	065	050F	J055F	055F	J040F	040	060	045	055	030	045	045	060V	040	030	045	090	055	055	045	080	085	090	070	
8	060	055	055	060	045	060	085	055	030	040	040	035	045	080	030	045	040	060	050	060	055	060	050	085	
9	075	060	060	065	085	080	055	055	J045R	045	065	040	050	055	055	045	040	040	085	085	060	050	090	065	
10	085	060	080	060	065	080	075	J065R	040	035	045	045	030	030	040	040	J060R	060	075	065	075	050	060	055F	
11	060	090	060	055	060	070	045	055	040	045	025	025V	045	040	030	045	050	080	J050R	055	J070S	055	090	065F	
12	055F	055	050	060	065	050	090F	050	030	050	050	050	075V	040	045	040	040	065	060	060	065	F	060	055F	
13	080	080	075F	050	050F	080F	055	J035R	045	045	J060R	045	040	045	045	045	050	055	055	055	045	080	070	085	
14	090	065F	F	085F	050F	F	060	045	045	030	030	035	035	050	045	060	075	075	075	060	050	070	070	060	
15	060	055	050	055	050	065	055	J045R	055	040	025	050	045	035	040	035	030	055	J075S	055	075	075	065F	F	
16	090F	080F	075F	J055F	050F	050	075	045	040	075	040	055	035	030	040	065R	025	075	055	040S	050	075	060V	055F	
17	070	070	J050R	055	060	095	100	035	020	050	035	C	C	C	C	C	C	C	C	C	C	C	C	070	
18	085	055	J090F	060F	060F	045F	060F	050	045	J045R	035R	030	045	025	050	J060R	050	060	070	050	040	060	085	085	
19	085F	080	060F	050	045	F	075	J070R	045	065	060	J035R	045	025	060	030	055	055	060	050	055	095	060	100	
20	055	090	060F	050	065F	F	050F	045	060A	090	045	050	040	030	060	060V	030	055	045	080F	060F	F	080F	J080F	
21	J055F	055F	F	060F	045F	075F	055F	040	045	065	035	040	050	030	045	045	060	050	040	055	090	060	090	090	
22	055	060	060	065	060F	060	050	050	050	045	040	045	055	055	040	045	045	045	040	055	055	055	095	050F	
23	090F	0070F	J050F	070F	050F	070	060	055	045	095	080	040	020	040	045	045	050	040	055	060F	080	090F	060F	045F	
24	050F	F	085F	060	055F	070	060	050	050	045	030S	050	050	J045R	045	030	055	065	050	050	A	A	070	065	
25	075	060F	050	060F	050F	F	055	050	045	060	045	045	045	050	045	045	045	050	070	050	085	060F	060	060	
26	085F	F	055F	J060F	050F	060F	060	J055R	070	040	040	030	J040R	030	040	045	040	060	050	065	055	085F	J055F	F	
27	090F	F	F	090F	F	065F	050	050	080	060	040	050V	060	050	040	J040R	070	060	050	055	065F	055F	F	F	
28	055F	080F	080F	F	075F	090	060	050	050	050	055	045	045	055	050R	035	050	030	045	045	050F	045	075	055F	
29	050	060	060	065F	075F	080F	085	055	055	065	045	030	060	070	040	055	030	050	055	040	055	080F	J050R	F	
30	F	F	J040F	F	F	F	095F	040	040	J060R	030	035	J070R	030	045	065	050	060	050	050	065	065	055F	050F	
31	090F	060F	075F	050F	070	090	055	065	070	045	045	070	020	040V	050	030	055	050	065	050	060	065	070	055	
No.	30	27	28	29	29	26	31	31	31	31	31	30	30	30	30	30	30	30	30	30	30	29	27	28	27
Median	070	060	060	060	055	070	060	050	045	045	040	045	045	040	040	045	050	055	055	055	055	055	065	070	065
U. Q.																									
L. Q.																									
Q. R.																									

yPF2

Sweep 1.0 Mc to 20.0 Mc in 20 sec in automatic operation

The Radio Research Laboratories, Japan

K 14

IONOSPHERIC DATA

Yamagawa

Lat. 31° 12.1'N  
Long. 130° 37.1'E

Dec. 1964

foF2

0.1 Mc 135° E Mean Time (G. M. T. + 9h)

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	U031S	033	033S	031	031	030	022	036	029S	066	068	065S	061	064S	070	063	057H	048	032	036	I033S	033	030	030S
2	031	J032S	031	033S	041S	021	022S	036S	065H	068S	I072S	068	057	060	064S	061	J050S	052	J051S	I038S	027	025S	I028S	029S
3	030	031	U032S	033	042S	031S	022	036S	S	057H	065S	I061S	062	065	073S	061H	052	055	036H	031S	030S	030S	029	030S
4	029	029	I030S	031	I033S	J027S	020	035	051	U069S	064	U062S	I085S	I085S	080	082	S	U060H	039	I038S	037	035	I031S	026
5	028	029	034	023	026	022	022	035	056	062S	I078S	J097S	J100S	I068S	068S	068S	056	055	034S	031	034	031	027	028
6	027	027	028	028	030	030	023	036	058	062S	I074S	J072S	059	I068S	I069S	062	J062S	055	033S	026	029	027	026	028
7	031	033	J034S	I030S	030	023	021	034	049	054H	062	067S	066	058H	061S	067	055	045	I034C	030S	J034S	025S	026	025
8	028	030	030	027S	028	032S	021	032	050H	057	U064S	071S	J065S	052	065	064	056	054	035	028	034	030S	022	026
9	025	026	028	U029S	031S	029	025	038	056	058	063S	058	065	058	J067S	055	064S	057	I038A	J027S	033	032	023S	026S
10	027	028	030	028	029S	027	026	040	041S	057	058	070S	062S	J064S	062S	I061C	C	C	030	I030C	I035C	028	029	I028C
11	I030C	030	030S	031S	032	032S	025S	037S	051	059	J061S	058H	054	I058S	I063C	I067C	063	053S	033	U026S	I033S	029S	022	025
12	027	I029S	028	028	I031S	027	023	I037S	J052S	061S	057	063	J061S	J064S	058	054	054H	054	SH	025	031	I033S	027	024
13	I027S	028	028	J026S	028	030	025	J038S	055	053	I058S	058	063	058	070	I057H	I055H	052	J049S	I031S	032	J027S	025	023
14	026S	027	028S	027	026	J033S	020	038	050	054H	057	061S	066	068	068	064	060	054S	I042S	I033S	028S	029S	I024S	025S
15	027	I028S	I028S	027	033	027S	026S	I041S	056H	C	C	C	C	C	C	C	C	C	C	C	C	C	I023C	I023C
16	I027C	027	026C	030C	I036C	024	022	I034C	I048C	052H	057	070S	I096S	067	072S	070S	U071H	061	040	040	030	024V	024	025
17	027	028	031	032S	036	022	023	033S	051	055H	061	079	I01S	064	J063S	061H	059	056	036	036	025	022S	I026S	026
18	025S	027	028	027	024S	023	022	034	055H	052	J063S	064	065	064	063S	063	I073S	053S	037	038	032	026	021	024
19	024	026	026	028	032	024S	021	036	J048S	051H	050	064S	083	J068S	059S	J062H	J079S	J052S	I036A	033	033	028	022	025
20	028S	026	027	027	028	027	025	035	050H	054H	066	066	065	J062S	056	057	J063H	051S	030S	I036S	J027S	025S	021	I026A
21	028	028	029S	I033S	I039S	I025S	022	036S	I047H	054S	062S	081	I02S	J065S	058	061S	067S	054	031	036	030	034S	026S	030
22	030	028	030	033S	I028S	026	027	I034S	043	J048S	067	071S	J075S	066S	068	063	056	J048S	037	030S	I026S	S	S	S
23	026S	024S	025	I027S	I030S	I019S	020	027	J047S	J049H	J050S	I070S	066	064S	J061S	J063S	056S	052S	034	I026S	I025S	023S	A	S
24	026S	028S	028	028S	028S	024	024S	032S	057	057H	U060S	066S	069	063	059	063S	061H	055	I033S	030	028	I023S	023	023S
25	022S	026S	028	027S	019	J017S	021	027	I042S	053	057	I074S	068	058S	052	060	057	052	J049S	036	031	025	023	024S
26	026	I026S	026	030	032S	I023S	J017S	029	042S	044	057	062S	I076S	063	059	057	053	047	034	035S	J036S	022S	021S	I022S
27	I023S	F	023F	J025S	022	I019S	J019S	027	043	046H	064	I067S	068	070S	052	058	049S	045	032	025	029	031	021	022S
28	025S	025S	028S	028	023	020	J017S	024	045	J049S	056	056	058	057	058	051	054	J051S	038S	027	I028S	023S	020	022S
29	023S	024S	F	026S	026	023	023	027	049H	J050H	C	C	055	055	054	057	056	044	033	I038S	I042S	024	022	022S
30	I026S	I033S	I039S	042	030	I030S	S	S	J051S	I051C	U050S	058	082	062	060	051S	I048S	042	032	035	040	024	027	033S
31	U030S	026	I031S	037	035S	S	S	028	C	C	C	C	C	C	C	C	056	046	I033S	I035S	I033A	I026S	022	022
No.	31	30	30	31	31	30	29	30	29	29	28	28	29	29	29	28	29	29	29	30	30	29	29	29
Median	027	028	028	028	026	022	035	022	035	050	054	062	066	065	064	062	061	056	052	034	032	027	024	025
U. Q.	029	029	031	031	033	030	024	036	055	058	064	070	076	066	068	063	062	054	038	036	034	030	026	028
L. Q.	026	026	028	027	028	023	021	032	047	051	057	062	061	058	058	057	054	048	033	028	028	024	022	023
Q. R.	003	003	003	004	005	007	003	004	008	007	007	008	015	008	010	006	008	006	005	008	006	006	004	005

The Radio Research Laboratories, Japan

Y 1

Sweep 0.55 Mc to 17.0Mc in 20 sec in automatic operation

foF2



Lat. 31° 12' 1" N  
 Long. 130° 37' 1" E

Yamagawa

IONOSPHERIC DATA

0.01 Mc 135° E Mean Time (G. M. T. + 9h)

foF1

Dec. 1964

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										L	410	L	L	L	L	410L	A								
2										L	420	L	420L	L	L	360L									
3											420	L	L	L	420H										
4											L	L	L	440	L	L									
5										L	L	420L	430H	L	LH	LH									
6										L	L	420	420	420	L	L									
7											L	410L	L	430L	460H	LH									
8										L	L	L	420	410L	400	L	260								
9											410L	L	L	LH	400	S									
10											L	420L	420	410L		C	C	C							
11											L	L	L	L	C	C									
12											L	L	L	L	LH	LH									
13											L	L	440	L	L										
14											LH	440L	430	430	400	L	L								
15											C	C	C	C	C	C	C	C							
16											C	LH	450L	420	420	L	L								
17											L	410	LH	L	L	420H									
18											L	LH	L	L	L	LH									
19												440	430	430	L										
20											L	L	L	L	430	L	L								
21											440	430	430	420L	420	LH									
22											L	L	420	L	420	L	L								
23											L	L	430	420L	410L	L									
24											L	430	430	420	L	400L									
25										L	410	LH	420	410	L	L									
26											L	L	LH	400	400	L	L								
27											L	400	420	L	L	L	L								
28											L	420	420	410H	400L	L									
29											C	C	420	390	370L	LH									
30											C	L	L	420H	420	400	L								
31											C	C	C	C	C	C	260								
No.											5	13	18	17	14	3	2								
Median											410	420	420	420	400	370	260								
U. Q.																									
L. Q.																									
Q. R.																									

Sweep 0.55 Mc to 17.0 Mc in 20 sec in automatic operation

foF1

The Radio Research Laboratories, Japan

Y 2

Dec. 1964

foE

0.01 Mc 135° E Mean Time (G. M. T. +9h)

## IONOSPHERIC DATA

Yamagawa

Lat. 31° 12.1'N  
Long. 130° 37.1'E

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								S	210H	255	270	I290R	300	U300R	275	250H	220	S						
2								S	210H	250	280	300	300	300	280	240	200	S						
3								S	210	260	270	300R	I290R	I290A	280	250	A	S						
4								S	200	250	280	310	310R	A	A	A	A	S						
5								S	220	280	I290R	305	I310R	310	290	A	A	S						
6								S	I210A	255	275	A	A	I295A	300	270	220	S						
7								S	210	250	280	295	300	300	290	260	A	S						
8								S	210	250	290	295	A	A	A	A	220	S						
9								S	205	260	I290S	I300S	I300S	300	290	I260S	A	S						
10								S	200	260	A	S	S	S	S	C	C	C						
11								S	S	250	A	I300A	I305S	300S	C	C	230	S						
12								S	200	250	I275A	I285R	300	I305A	290	255	200	S						
13								S	200	270	280	280	305	305	285	255	215H	S						
14								S	200	260	280	300	300	I295R	280	U250S	210	S						
15								S	200	G	G	G	G	G	G	C	C	C						
16								C	G	I250G	270	290	300	I290A	I280A	250	210	S						
17								S	S	260	280	I290A	I295A	295	280	260	210	S						
18								S	190	240	275	I295R	I300R	300	290	265	230	S						
19								S	190	250	270	300	300	290	270	I260A	A	S						
20								S	S	240	290	300	300	320	300	260	230	S						
21								S	S	270	A	A	R	A	A	260	210	S						
22								S	S	250	275	300	300	295	280	260	A	S						
23								S	S	240	265	305	305	310	290	250	220	S						
24								S	190	260	I280A	300	310	I300A	290	270	A	A						
25								S	190	250	290	300	310	300	290	260	210	S						
26								S	200	230	290	305	I295A	I295R	A	A	A	S						
27								S	195	250	280	300	I300A	I290A	290	A	A	S						
28								S	190	250	270	280	290	300	290	I265A	230	S						
29								S	S	225H	G	G	A	300	290	270	230	S						
30								S	195	I250G	275	300	300	300	280	270	220	S						
31								S	G	G	G	G	G	G	G	G	225	S						
No.									22	29	25	25	24	25	23	22	19							
Median									200	250	280	300	300	300	290	260	220							
U. Q.																								
L. Q.																								
Q. R.																								

foE

Sweep 0.55 Mc to 17.0 Mc in 20 sec in automatic operation

The Radio Research Laboratories, Japan

Y 3

IONOSPHERIC DATA

foEs

Yamagawa

Lat. 31° 12.1'N  
Long. 130° 37.1'E

0.1 Mc 135° E Mean Time (G. M. T. +9h)

Dec. 1964

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	S	S	B	B	S	S	S	S	G	G	G	G	G	G	G	G	G	G	G	J015S	024	J021	S	S
2	S	S	B	B	S	S	S	S	G	G	G	G	G	G	G	G	G	G	G	J015S	J014S	S	J018S	S
3	S	J016S	J017	J014	B	S	S	S	G	G	G	G	G	G	G	G	G	G	G	J016S	S	S	J030	J020
4	S	S	S	B	J015	S	S	S	G	G	G	G	G	G	G	G	G	G	G	J022	J022	J026	J022	S
5	S	S	S	B	B	J015	J014S	S	G	G	G	G	G	G	G	G	G	G	G	J032	S	S	S	S
6	S	S	S	B	S	S	S	S	G	G	G	G	G	G	G	G	G	G	G	J015S	022	S	S	S
7	024	022	B	S	B	S	S	G	G	G	G	G	G	G	G	G	G	G	G	020	S	S	S	S
8	S	S	021	021	021	S	021	S	G	G	G	G	G	G	G	G	G	G	G	J022	S	S	S	S
9	S	S	S	S	S	S	S	S	G	G	G	G	G	G	G	G	G	G	G	J051	S	S	S	S
10	S	S	S	S	S	S	S	S	G	G	G	G	G	G	G	G	G	G	G	022	C	C	S	C
11	C	S	S	S	S	S	S	J016S	024	030	028	038M	G	G	G	G	G	G	G	S	S	S	S	S
12	021M	022M	025M	021M	021M	021M	021M	S	023	029	029	028G	028G	038	027G	G	J021	020	S	S	S	S	S	S
13	S	S	S	S	S	S	S	S	026	G	032	031	G	G	G	G	G	G	G	021	S	S	S	S
14	S	S	S	S	B	S	S	S	G	J024G	032	G	G	021G	G	G	G	G	G	S	S	S	S	S
15	S	S	S	S	S	S	S	S	G	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C
16	C	C	C	C	C	C	C	C	C	C	G	035	G	032	037	031	026	S	S	S	S	S	S	S
17	S	S	S	S	S	S	S	S	G	G	038	J037	030	G	G	029	G	G	G	J020	021	S	S	S
18	036M	J021	S	B	B	S	S	S	G	G	029	029G	030	026G	031	028	018G	021	S	S	S	S	S	S
19	S	S	S	J015S	J015	J017	S	S	G	G	G	033	034	033	030	026	027	021	060M	J030	021	S	S	S
20	S	S	S	S	S	S	S	S	G	G	033	G	G	G	G	G	G	G	J019	S	021	S	021	037M
21	021	021	S	S	B	S	S	S	G	031	030	031	037	032	028	022G	019G	J022	S	S	S	S	S	S
22	S	S	S	S	S	S	S	S	G	032	034	035	036	036	037	031	J025	021	021	020	S	S	S	S
23	S	S	S	S	B	S	S	S	G	026	033	042	036	037	033	029	G	S	J020	S	J014S	S	036M	020
24	S	J016S	J015S	021	J019	S	S	J015S	022	027	028	G	028G	J035	039	029	023	030	J030	J020	J016S	021	021	J021
25	S	J018	S	S	S	S	S	S	023	030	030	J032	021G	031	028G	G	023	J021	J018S	S	S	S	J016S	S
26	S	S	J020	J020	022	021	021	021	022	030	029	G	J035	J029G	J032	J032	027	J022	S	J021	J021	021	020	S
27	S	S	S	S	B	S	S	S	G	028	036	035	J045	J044	031	027	027	S	S	S	021M	S	S	S
28	S	S	S	B	B	B	J018S	S	G	022G	G	034	036	029G	030	J031	021G	S	S	S	S	S	S	S
29	S	020M	S	025M	021M	S	S	S	G	G	G	C	034	028G	021G	021G	J022G	022	027M	022	J021	021	S	S
30	S	S	S	J014	J015	S	J015S	S	G	C	032	035	034	G	G	025G	030	057M	028M	J032	021M	S	S	S
31	J026	023M	J022	J019	J020	021M	022M	S	C	C	C	C	C	C	C	G	G	J020	J031	J032	J051	S	S	J021
No.	5	9	7	10	9	6	7	6	29	27	28	28	29	29	28	27	29	22	18	14	14	5	8	5
Median	024	021	020	020	020	021	021	018	G	G	030	034	030	031	030	027	023	021	022	022	021	021	021	021
U. Q.	031	022	022	021	021	021	021	021	G	029	033	035	036	036	034	031	026	023	030	024	022	024	026	029
L. Q.	021	017	015	015	016	018	015	015	G	G	G	G	G	G	G	G	G	020	019	020	021	021	019	020
Q. R.	010	005	007	006	005	003	006	006	G	G	G	G	G	G	G	G	003	003	011	004	001	003	007	009

Sweep 0.55 Mc to 17.0 Mc in 20 sec in automatic operation

The Radio Research Laboratories, Japan

foEs

Y 4

Dec. 1964

f<sub>o</sub>F<sub>2</sub>

0.1 Mc

135° E Mean Time (G. M. T. +9h)

Yamagawa

Lat. 31° 12.1'N  
Long. 130° 37.1'E

IONOSPHERIC DATA

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	S	S	B	B	S	S	S	S	022	036	G	035	G	035	G	035	025	S	S	E024S	E025S	E020	S	S	
2	S	S	B	S	B	S	S	019	020G	033	G	033	022G	019G	G	G	024	S	S	S	S	S	S	S	
3	S	S	016	010	B	S	S	S		035	036	E034R	025G	019G	024	024	024	018	S	S	S	S	018	S	
4	S	S	S	B	011	S	S	S	030	032	033	033	040	032	033	031	024	029	E033S	021	020	E026S	019	S	
5	S	S	S	B	B	E	S	S	034	G					026	032	032	023	020	S	S	S	S	S	
6	S	S	S	B	S	S	S	S	021	G	G	031	E030R	030	024	031			S	020	S	S	S	S	
7	E	E	B	S	B	S	S	S	032	034	034	036	037	036		021G	024	G	C	E	S	S	S	S	
8	S	S	E	016	010	S	E	S		034		034	036	033	031	030	S	S	020	S	S	S	S	S	
9	S	S	S	S	S	S	S	S									032	023	A	S	S	S	S	S	
10	S	S	S	S	S	S	S	S									C	C	021	C	C	C	C	C	
11	C	S	S	S	S	S	S	S	024	G	E034S	E030S	E028S		037	C	G		S	S	022	S	S	S	
12	E	E	E	E	S	018	018	S	023	029	E029R	022G	024G	033	022G		G	019	S	S	S	S	S	S	
13	S	S	S	S	S	S	S	S	024		032	E031R						020	S	S	S	S	S	S	
14	S	S	S	S	B	S	S	S	023G	032				G					S	S	S	S	S	S	
15	S	S	S	S	S	S	S	S	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	
16	C	C	C	C	C	C	C	C	C	C	035		032	035	031	031	G	S	S	S	S	S	S	S	
17	S	S	S	S	S	S	S	S	033	032	E030R				018		G	S	E	019	E	S	S	S	
18	020	018	S	B	B	S	S	S	029	E029R	E030R	026G	026G	033	G	027	017G	G	S	S	S	S	S	S	
19	S	S	S	E015S	017	S	S	S	G				033	032	E030R	026	023	019	A	024	E	S	S	S	
20	S	S	S	S	B	S	S	S	G									S	E	S	E	S	E	A	
21	019	018	S	E	B	S	S	S	G	G	E032R	E028R	022G			018G	E022S	S	S	S	S	S	S	S	
22	S	S	S	S	S	S	S	S	032	034	034	035	035	035	030	024	G	E	E	E	S	S	S	S	
23	S	S	S	S	B	S	E	S	E026R	032	039	035	036	031	029			S	020	S	S	S	A	019	
24	S	S	S	019	018	S	S	S	G	025	028		022G	033	024	023	023	023	025	018	S	E021S	E	020	
25	S	018	S	S	S	E	S	S	023	029	024	024	021G	024	026G		G	018	S	S	S	S	S	S	
26	S	S	E	019	017	E021S	E021S	018	G	030	025	034	E029R	032	032	032	024	020	S	018	018	E	E	S	
27	S	S	S	S	B	S	S	S	026	032	034	040	041	031	E027R	024	S	S	S	S	E	S	S	S	
28	S	S	S	S	B	B	S	019	022G			033	028G	026	028	019G		S	S	S	S	S	S	S	
29	S	018	S	018	E	S	S	S	C	G	034	024G	019G			019G	022	026	020	E021S	E	S	S	S	
30	S	S	S	E014S	014	S	S	S	C	031	032	034				023G	G	040	022	E032S	019	S	S	S	
31	019	E	019	016	017	E021S	E022S	S	C	C	C	C	C	C	C	C		G	E031S	E032S	A	S	S	S	
No.																									
Median																									
U. Q.																									
L. Q.																									
Q. R.																									

Sweep 0.55 Mc to 17.0 Mc in 20 sec in automatic operation

The Radio Research Laboratories, Japan

f<sub>o</sub>F<sub>2</sub>

Y 5

Lat. 31° 12' N  
Long. 130° 37' E

Yamagawa

IONOSPHERIC DATA

0.1 Mc 135° E Mean Time (G.M.T. +9h)

f-min

Dec. 1964

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	E0175	E0175	O11	O09	E0175	E0175	E0175	E0175	O17	O16	O17	O18	O16	O18	O17	O16	O17	E016S	E017S	E018S	E017S	E018S	E017S	E018S
2	E018S	E018S	O11	E017S	O10	E018S	E017S	E018S	O16	O17	O17	O17	O16	O17	O18	O16	O16	E018S	E018S	E016S	E018S	E017S	E019S	E018S
3	E018S	E017S	O11	O07	O11	E018S	E018S	E018S	O18	O18	O17	O17	O18	O17	O17	O16	O16	E017S	E018S	E016S	E019S	E017S	E017S	E018S
4	E017S	E017S	E018S	O10	O09	E018S	E016S	E016S	O18	O17	O17	O17	O17	O17	O16	O17	O16	E017S	E017S	E016S	E016S	E016S	E016S	E018S
5	E017S	E017S	E017S	O11	O11	E017S	E017S	E016S	O16	O16	O16	O16	O16	O16	O18	O16	O16	E016S	E016S	E018S	E017S	E017S	E016S	E017S
6	E017S	E017S	E017S	O11	E017S	E018S	E017S	E017S	O16	O16	O16	O16	O16	O16	O16	O16	O16	E016S	E016S	E016S	E017S	E016S	E016S	E016S
7	E016S	E016S	O11	E017S	O09	E017S	E017S	E016S	O16	O16	O16	O16	O16	O16	O16	O16	O16	E018S	C	E016S	E017S	E016S	E016S	E017S
8	E017S	E018S	E016S	E	O08	E017S	E016S	E017S	O16	O17	O17	O18	O18	O19	O18	O18	O18	E018S	E016S	E016S	E017S	E017S	E016S	E017S
9	E016S	E018S	E016S	E018S	E017S	E017S	E017S	E018S	E019S	O19	O18	O18	O18	O18	O18	O18	O16	E017S	E019S	E016S	E016S	E016S	E016S	E018S
10	E017S	E016S	E017S	E018S	E018S	E016S	E018S	E018S	E018S	O18	O18	O18	E020S	O18	O18	C	C	C	E017S	C	C	E017S	E017S	C
11	C	E017S	E018S	E017S	E017S	E018S	E018S	E018S	E017S	O16	O18	O19	O18	O19	C	C	O17	E017S	E017S	E018S	E017S	E017S	E018S	E017S
12	E017S	E018S	E017S	O11	O09	E017S	E017S	E018S	O17	O18	O17	O18	O17	O18	O17	O16	O17	E017S	E018S	E018S	E017S	E018S	E018S	E019S
13	E017S	E018S	E018S	E018S	E016S	E018S	E018S	E019S	O17	O17	O17	O17	O18	O18	O17	O17	O17	E018S	E018S	E018S	E019S	E017S	E018S	E018S
14	E018S	E018S	E018S	E018S	O09	E017S	E017S	E018S	O17	O17	O19	O18	O18	O18	O19	O18	O19	O17	E018S	E017S	E017S	E018S	E017S	E018S
15	E017S	E018S	E018S	E018S	E018S	E018S	E019S	E018S	O17	C	C	C	C	C	C	C	C	C	C	C	C	C	E019C	C
16	E019C	E019C	E019C	E018C	E021C	E018C	E020C	E019C	E019C	E033C	O17	O16	O16	O17	O18	O17	O16	E018S	E017S	E018S	E018S	E017S	E017S	E018S
17	E017S	E017S	E017S	E017S	E017S	E017S	E017S	E017S	O17	O17	O17	O17	O18	O17	O17	O16	O17	E018S	E018S	E018S	E018S	E019S	E019S	E017S
18	E016S	E016S	E019S	O09	O10	E016S	E016S	E016S	O17	O16	O16	O18	O19	O17	O17	O16	O16	E017S	E017S	E018S	E017S	E018S	E017S	E017S
19	E018S	E017S	E016S	O11	O06	E016S	E017S	E017S	O17	O16	O17	O18	O17	O18	O18	O17	O17	E017S	E017S	E016S	E017S	E018S	E017S	E017S
20	E017S	E017S	E018S	E018S	O10	E017S	E017S	E017S	O17	O16	O17	O16	O19	O18	O18	O17	O17	E019S	E018S	E017S	E017S	E017S	E016S	E017S
21	E017S	E017S	E017S	E016S	O11	E018S	E017S	E018S	O17	O16	O17	O17	O17	O17	O16	O17	O16	E017S	E017S	E018S	E018S	E018S	E018S	E018S
22	E017S	E019S	E017S	E018S	E018S	E017S	E018S	E017S	O17	O16	O17	O17	O17	O16	O16	O17	O17	E018S	E018S	E017S	E018S	E019S	E018S	E017S
23	E018S	E016S	E017S	E017S	O09	E017S	E017S	E017S	O17	O18	O17	O17	O17	O17	O17	O17	O17	E019S	E016S	E017S	E018S	E017S	E017S	E017S
24	E017S	E017S	E017S	E017S	O09	E017S	E019S	E017S	E018S	O17	O18	O17	O17	O16	O17	O16	O16	O16	O16	E017S	E017S	E017S	E017S	E017S
25	E017S	E017S	E017S	E016S	E016S	E016S	E017S	E017S	O18	O17	O17	O17	O17	O17	O16	O17	O17	E016S	E017S	E017S	E018S	E017S	E018S	E019S
26	E018S	E018S	E017S	E017S	O09	E017S	E017S	E017S	O17	O17	O17	O18	O17	O16	O17	O17	O17	E017S	E017S	E016S	E017S	E017S	E018S	E018S
27	E019S	E017S	E017S	E016S	O11	E018S	E018S	E017S	O18	O18	O17	O17	O17	O17	O18	O19	O17	E019S	E018S	E016S	E018S	E017S	E017S	E018S
28	E017S	E019S	E018S	O10	O11	E017S	E019S	E018S	O17	O17	O17	O18	O17	O18	O17	O17	O17	E019S	E017S	E019S	E018S	E018S	E018S	E018S
29	E018S	E017S	E018S	O10	E017S	E017S	E017S	E018S	O18	O18	C	C	O18	O18	O17	O16	O16	E016S	E017S	E017S	E018S	E017S	E018S	E018S
30	E019S	E018S	E018S	O09	O09	E017S	E017S	E018S	O17	C	O17	O17	O17	O17	O17	O17	O17	O17	E017S	E017S	E018S	E018S	E018S	E019S
31	E017S	E017S	E017S	O08	O09	E017S	E018S	E017S	C	C	C	C	C	C	C	C	C	O16	E017S	E016S	E017S	E017S	E018S	E017S
No.	30	31	31	31	19	31	31	31	26	27	28	28	28	29	28	27	29	29	29	29	29	29	31	29
Median	E017	E017	E016		O09	E017	E017	E017	O17	O17	O17	O17	O17	O17	O17	O17	O17	E017	E017	E017	E017	E017	E017	E017
U. Q.																								
L. Q.																								
Q. R.																								

The Radio Research Laboratories, Japan  
Sweep 0.55 Mc to 17.0 Mc in 20 sec in automatic operation

f-min

Y 6



Lat. 31° 12.1'N  
Long. 130° 37.1'E

Yamagawa

IONOSPHERIC DATA

135° E Mean Time (G. M. T. + 9h)

M(3000)F1 0.01

Dec. 1964

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										L	385	L	L	L	L	370L	A							
2									L	L	L	370	395L	L	L	415L								
3											360	L	L	L	380	L								
4											L	L	L	L	L	LH	LH							
5									L	L	L	380L	375H	L	LH	LH								
6									L	L	L	380	400	380	L	L								
7									L	L	L	375L	L	395L	335H	LH								
8									L	L	L	L	380	390L	360	L	405							
9											370L	L	L	LH	375	S								
10									L	L	L	380L	415	390L		C	G	G						
11									L	L	L	L	L	L	C	C								
12									L	L	L	L	L	L	LH	LH								
13									L	L	L	L	370	L	L									
14									LH	365L	370	365	380	L	L	L								
15									C	C	C	C	C	C	C	C	G	G						
16									C	LH	335L	355	390	L	L	L								
17									L	L	390	LH	L	L	380H	LH								
18									L	L	LH	L	L	L	L	LH								
19											360	350	355	L	L									
20									L	L	L	L	L	L	L	L								
21										350	370	370	380L	360	LH									
22									L	L	L	365	L	360	L									
23											L	360	365L	365L	L									
24										L	350	355	380	L	350L									
25									L	365	LH	375	380	L	L									
26									L	L	L	LH	375	375	L	L	L							
27									L	L	375	A	L	L	L	L								
28									L	L	380	365	375H	370L	L									
29										G	C	380	360	390	370L	LH								
30									G	L	L	L	360H	370	375	L								
31									C	C	C	C	C	C	C	C	375							
No.									5	13	17	17	14	3	2									
Median									365	375	370	380	370	370	390									
U. Q.																								
L. Q.																								
Q. R.																								

The Radio Research Laboratories, Japan

Sweep 0.55 Mc to 17.0 Mc in 20 sec in automatic operation

M(3000)F1

# IONOSPHERIC DATA

Lat. 31° 12.1'N  
Long. 130° 37.1'E

Yamagawa

135° E Mean Time (G. M. T. +9h)

K'F2

Dec. 1964

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										240	245	240	275	260	250	245									
2										250	230	240	255	265	250	240									
3											295	240	275	260	270										
4											250	245	250	295	250	250									
5										240	255	245	245	250	240	250									
6										240	250	245	245	290	240	260									
7											250	250	270	250H	290	250									
8									300	300	270	240	250	250	275	250	240								
9											250	250	250	290	250	250									
10											310	240	250	250											
11											230	245H	250	290	I270G	I265G									
12											250	255	255	280	260	260									
13											250	250	285	250	260										
14											250	295	275	250	275	245	220								
15											G	G	G	G	G	G	G	G	G	G	G	G	G	G	G
16											G	275L	290	250	245	265	250								
17											250	255	245	250	285										
18											275	250	270	250	285	250									
19												290	260	245	250										
20											250	250	250	255	250	245									
21											245	290	250	245	265	250									
22											245	255	255	255	250	250									
23											245	260	265	265	255	250									
24											250	270	260	265	260	270									
25										245	265	290	250	275	260	275									
26											300	275	250	250	250	250	240								
27											265	250	250	250	250	245									
28											250	300	265	265	255	250									
29											G	G	G	G	G	240									
30											G	250	275	250	250	230									
31											G	G	G	G	G	G	220								
No.										6	26	28	29	29	27	25	6								
Median										240	250	250	255	255	255	250	240								
U. Q.																									
L. Q.																									
Q. R.																									

The Radio Research Laboratories, Japan

Sweep 0.55 Mc to 17.0 Mc in 20 sec in automatic operation

K'F2





IONOSPHERIC DATA

Lat. 31° 12' N  
Long. 130° 37' E

Yamagawa

135° E Mean Time (G. M. T. + 9h)

K'Es

Dec. 1964

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	S	S	B	B	S	S	S	S	G	150	G	G	170	170	150	140	150	G	S	145	120	110	S	S	
2	S	S	B	S	E	S	S	S 105	G	105	175	150	100	100	120	115	G	S	S	S	S	S	S	S	
3	S	S	S 105	105	B	S	S	S	G	G	G	150	120	110	100	155*	100	100	100	S	S	S	110	110	
4	S	S	S	B	110	S	S	S	G	175	155	150	130	110	105	105	105	105	105	100	100	100	100	S	
5	S	S	S	B	B	100	S	S	G	G	150	145	G	G	G	100	100	100	100	S	S	S	S	S	
6	S	S	S	B	S	S	S	S	110	110	105	105	100	100	100	140	G	G	S	140	S	S	S	S	
7	115	110	B	S	B	S	S	G	G	G	175	150	145	140	G	105	100	100	C	100	S	S	S	S	
8	S	S	S 105	105	100	S	100	S	G	G	G	125	110	110	110	105	G	S	100	S	S	S	S	S	
9	S	S	S	S	S	S	S	S	G	G	G	G	G	G	G	G	150	145	125	S	S	S	S	S	
10	S	S	S	S	S	S	S	S	G	G	G	110	105	G	170	C	C	C	110	C	C	C	S	C	
11	C	S	S	S	S	S	S	S	150	175	105	100	G	G	C	C	180	G	S	S	120	S	S	S	
12	110	120	110	110	105	105	105	S	155	175	110	105	110	110	110	G	100	150	S	S	S	S	S	S	
13	S	S	S	S	S	S	S	S	150	G	130	130	G	G	G	G	G	150	S	S	S	S	S	S	
14	S	S	S	S	B	S	S	S	G	105	175	G	G	100	G	G	G	G	S	S	S	S	S	S	
15	S	S	S	S	S	S	S	S	G	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	
16	C	C	C	C	C	C	C	C	C	C	G	160	G	105	105	170	150	S	S	S	S	S	S	S	
17	S	S	S	S	S	S	S	S	G	G	125	110	100	G	G	100	G	G	100	100	100	S	S	S	
18	100	100	S	B	B	S	S	S	G	G	150G	110	110	105	145	E140G	100	100	S	S	S	S	S	S	
19	S	S	S	100	100	S	S	S	G	G	150	140	140	130	130	110	115	150	105	105	105	105	S	S	
20	S	S	S	S	B	S	S	S	G	G	170	G	G	G	G	G	G	S	115	S	110	S	115	105	
21	105	105	S	105	B	S	S	S	G	170	110	110	150	105	105	105	105	100	S	S	S	S	S	S	
22	S	S	S	S	S	S	S	S	G	170	150	160	155	150	140	145	100	100	100	100	100	S	S	S	
23	S	S	S	S	B	S	100	S	G	E175G	155	130	135	145	130	120	G	S	105	S	S	S	100	100	
24	S	S	S	S	100	S	S	S	150	110	105	G	105	105	105	105	105	105	105	105	105	S	105	100	
25	S	100	S	S	S	105	S	S	150	125	105	105	100	100	100	G	145	100	S	S	S	S	S	S	
26	S	S	100	100	100	100	100	100	140	120	110	G	100	100	100	100	100	100	S	100	100	100	100	S	
27	S	S	S	S	B	S	S	S	G	150	125	125	120	120	130	115	110	S	S	S	105	S	S	S	
28	S	S	S	B	B	S	S	S 100	G	115	G	120	115	110	110	105	110	S	S	S	S	S	S	S	
29	S	100	S	100	100	S	S	S	G	G	C	C	150	100	100	100	100	100	100	100	100	100	S	S	
30	S	S	S	100	100	S	S	S	G	G	170	150	125	G	G	105	130	100	100	105	105	S	S	S	
31	100	100	100	100	100	100	100	S	C	C	C	C	C	C	C	C	G	100	100	100	100	S	S	100	
No.	5	7	5	10	9	5	5	3	7	14	20	22	22	21	20	20	20	17	15	12	11	5	6	5	
Median	105	100	105	100	100	100	100	100	150	140	130	130	120	110	110	105	105	100	100	100	100	105	100	100	
U. Q.																									
L. Q.																									
Q. R.																									

The Radio Research Laboratories, Japan

Sweep 0.55 Mc to 17.0 Mc in 20 sec in automatic operation

K'Es

Y 11

# IONOSPHERIC DATA

Lat. 31° 12.1'N  
Long. 130° 37.1'E

Yamagawa

135° E Mean Time (G. M. T. +9h)

Types of Es

Dec. 1964

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										b21	h	h	h	h	h2	h	h		f	f	f2f2	f2			
2							12			1	h 1	h	12	1	c	c			f	f	f		f		
3		f	f	f2						b2	h	h	e3	12	13	h 1	1	12	f	f	f2		f	f	
4					f						h	h	h	1	12	14	12	13	f2	f2	f2	f2	f2		
5						f					h	h	h		12	12	12	12	f2	f2					
6									12	1	1	1	1	12	12	h 1			f	f2					
7	f	f								h	h	h	b2	b2	1	1	12	1	f						
8			f	f3	f2			f		c		c	12	1	1		h 1	b2	f2f						
9																		b2	f2						
10										1	1	1	1	h				f2							
11							h		b31	h	1	1				h					f2				
12	f	f	f	f2	f	f	f2		b3	h	12	1	1	12	12		1	h							
13									b2		h	h		1				b2							
14										12	h 1														
15																									
16										h		h	1	12	h	h 1					f	f			
17										h	1	1	1		1				f	f	f				
18	f2	f								h	h	1	1	h 1	h 1	1	1	1							
19			f	f	f					h	h	h	h	h	1	1	1	b2	f3	f3	f				
20										h		h						f			f		f	f	
21	f2	f2		f						h 13	12	1	h 1	1	1	1	1	12							
22										h	h	h	h 12	h 12	b21	h 1	12	1 h	f						
23										h	h	h 12	h	b2	h	e2		f			f		f2	f	
24		f	f	f	f			1	b2	1	1	12	12	12	12	12	1	12	f4	f	f	f2	f	f2	
25		f				f			b2	e2	12	1	1	1	1		h	1	f		f				
26			f	f	f	f		1	h	e2	1	12	1	1	1	1	12	12		f	f	f	f	f	
27										b2	c	c	e212	e	1	1	1				f				
28						f		1		1		c	1	12	12	1									
29		f		f	f					h 1	1	1	h 1	1	1	1	12	f3	f2	f2	f				
30			f	f	f					h	h	h	h		1	1	h 12	12	f2	f	f				
31	f2	f	f	f	f	f											1	f2	f	f	f			f	
No.																									
Median																									
U. Q.																									
L. Q.																									
Q. R.																									

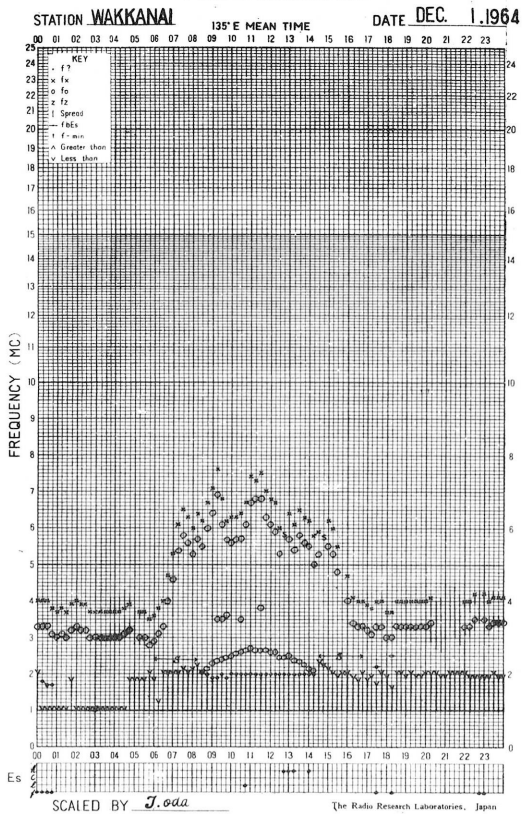
Sweep 0.55 Mc to 17.0 Mc in 20 sec in automatic operation

The Radio Research Laboratories, Japan

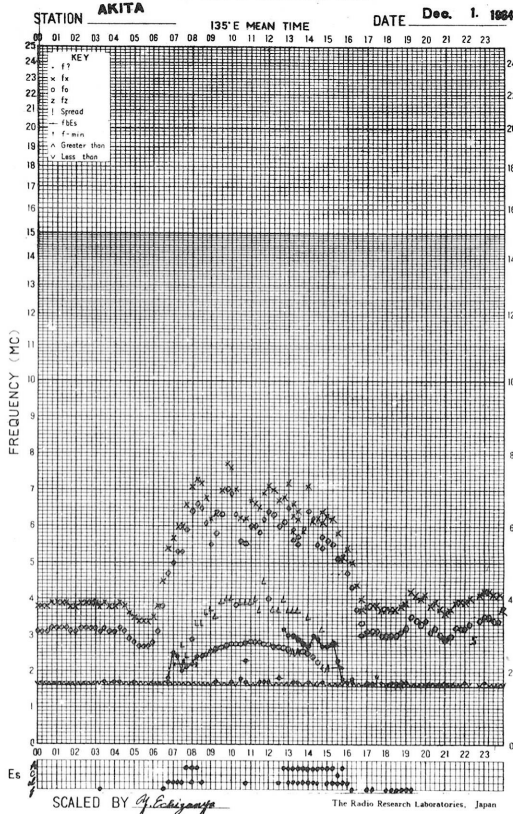
Y 12

Types of Es

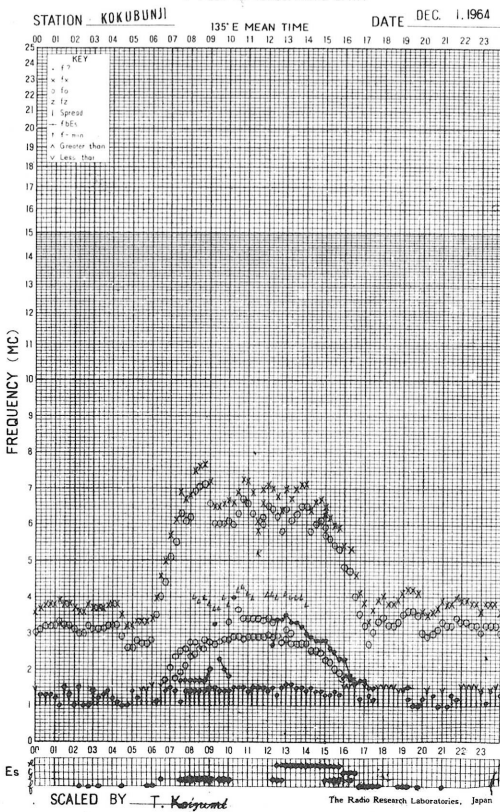
f-PLOT OF IONOSPHERIC DATA



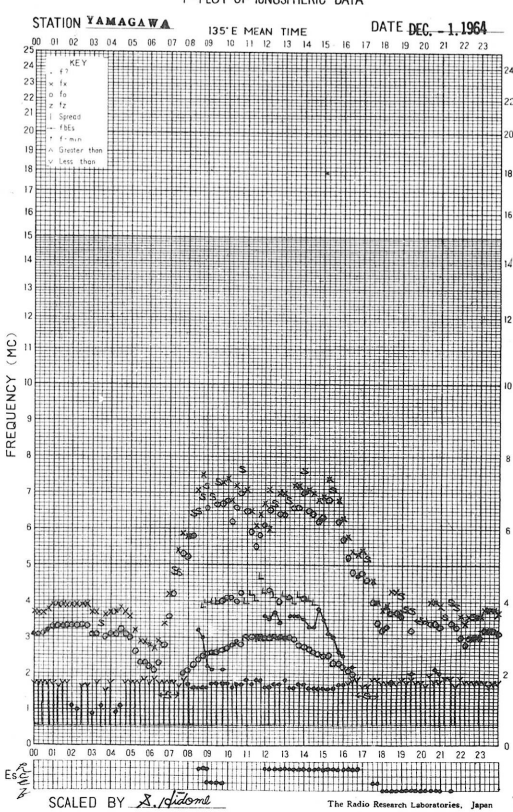
f-PLOT OF IONOSPHERIC DATA



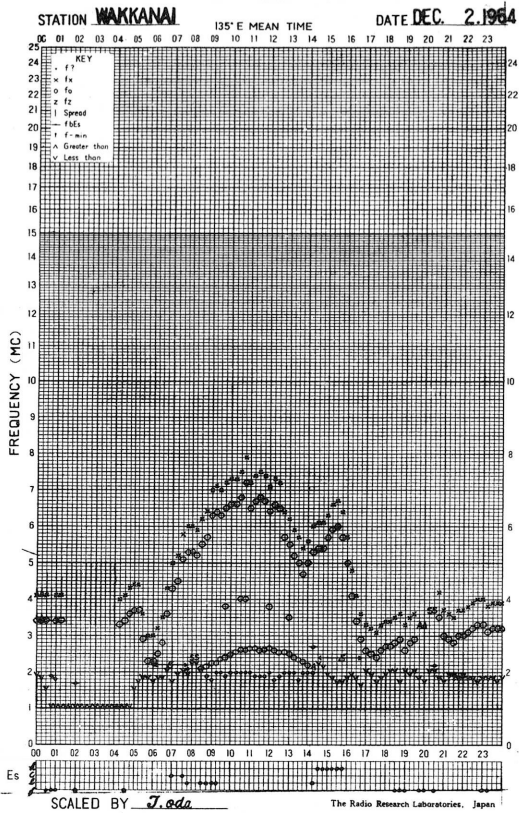
f-PLOT OF IONOSPHERIC DATA



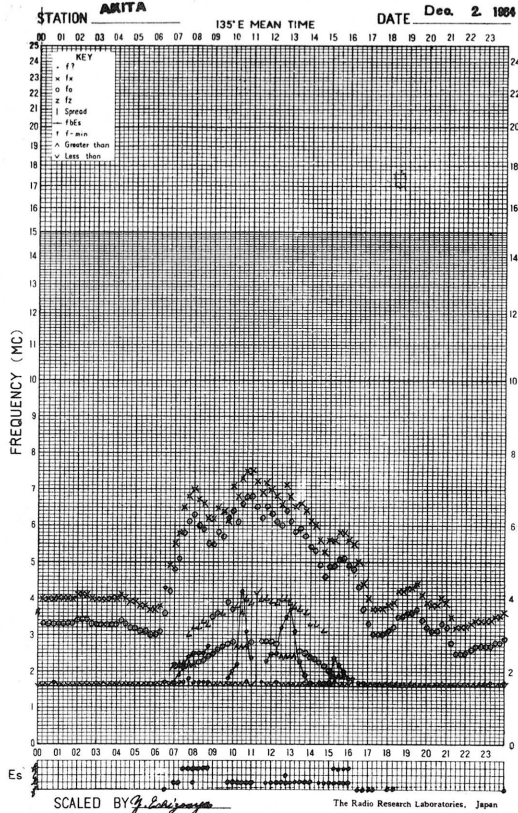
f-PLOT OF IONOSPHERIC DATA



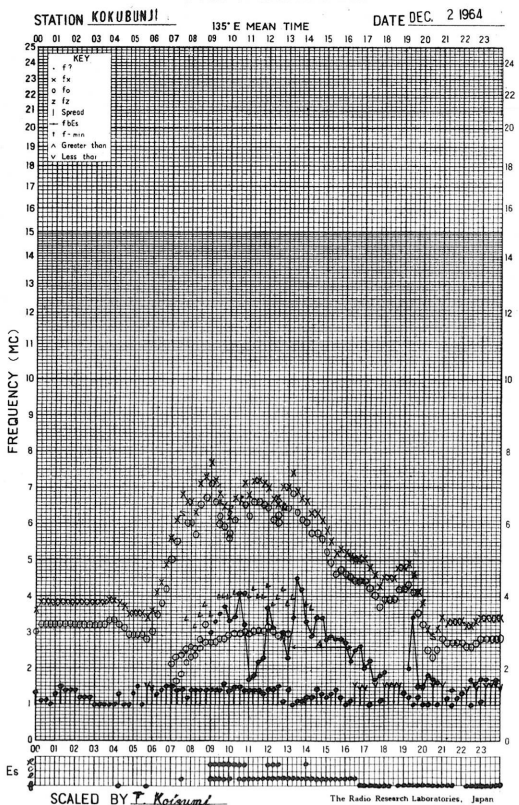
f-PLOT OF IONOSPHERIC DATA



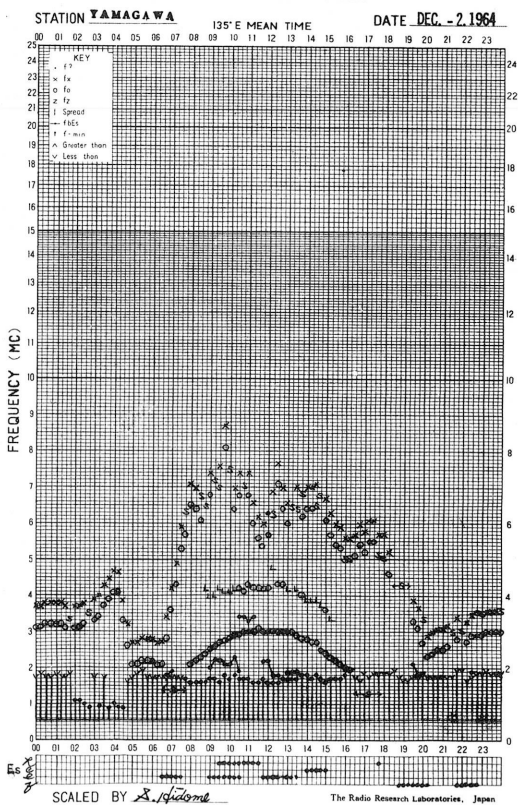
f-PLOT OF IONOSPHERIC DATA



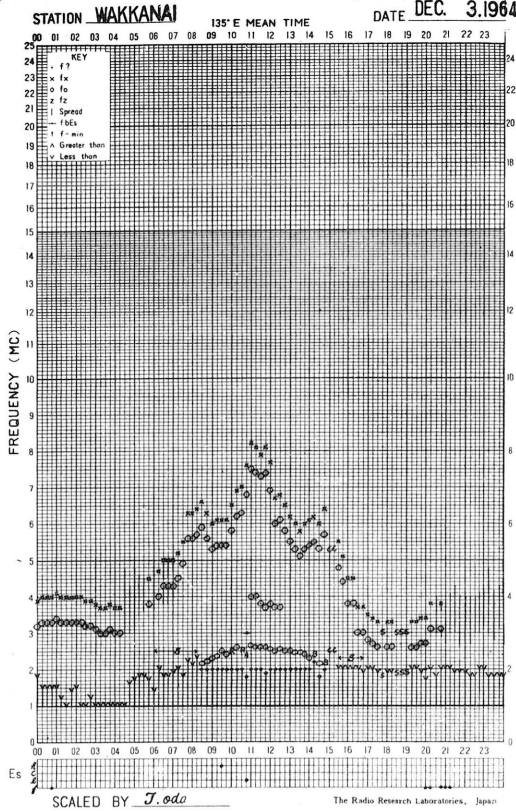
f-PLOT OF IONOSPHERIC DATA



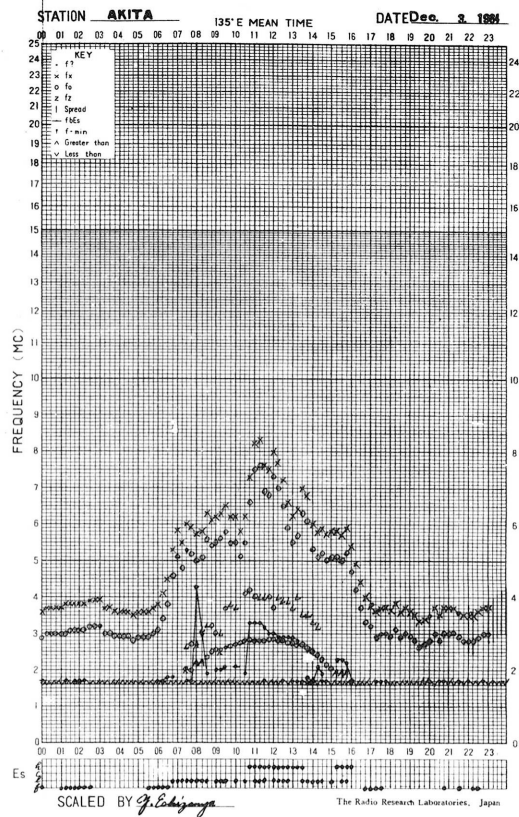
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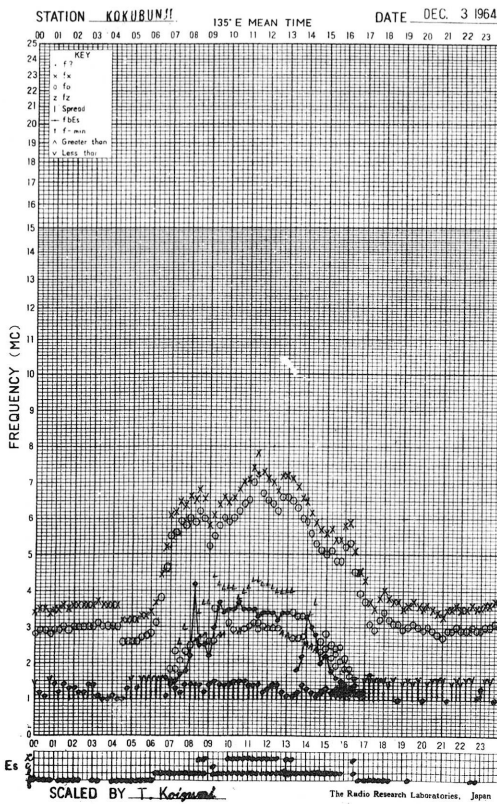
f-PLOT OF IONOSPHERIC DATA



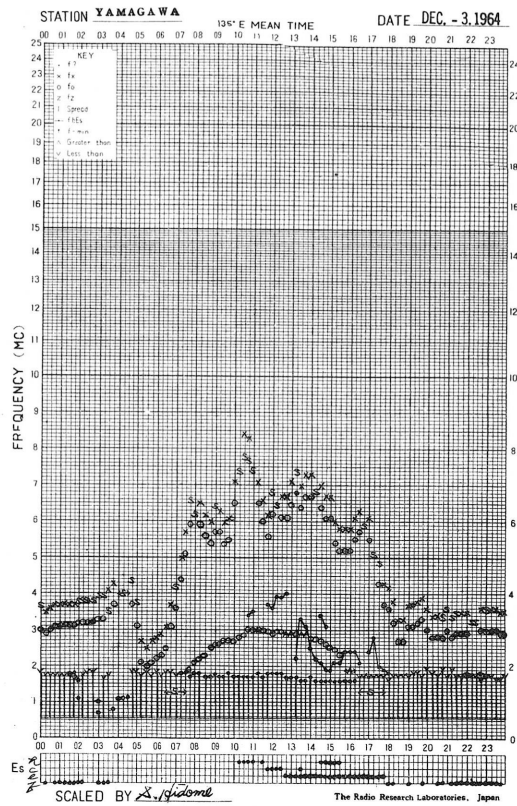
f-PLOT OF IONOSPHERIC DATA



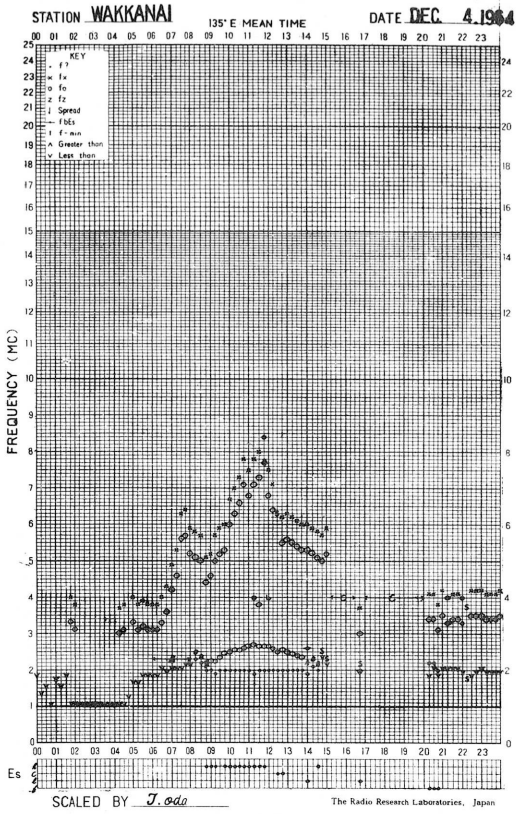
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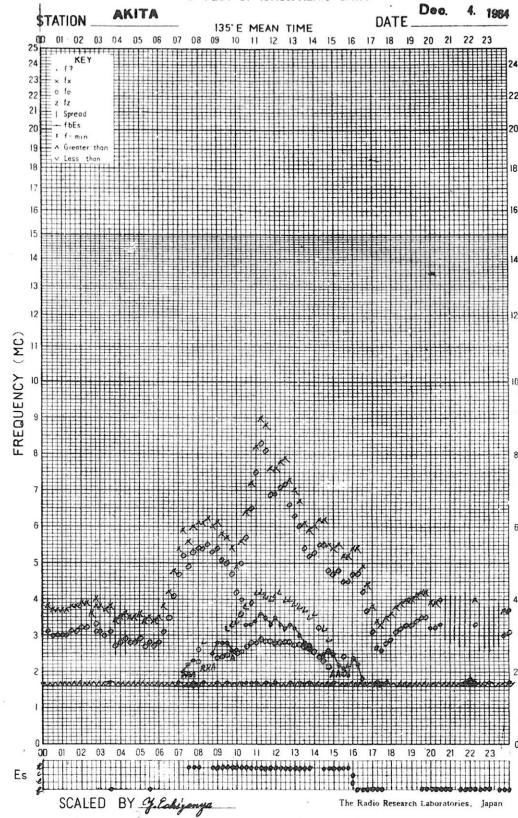
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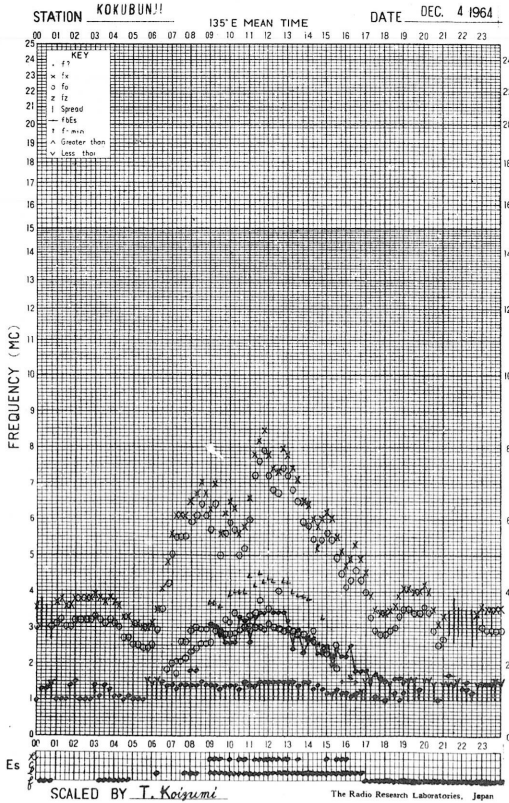
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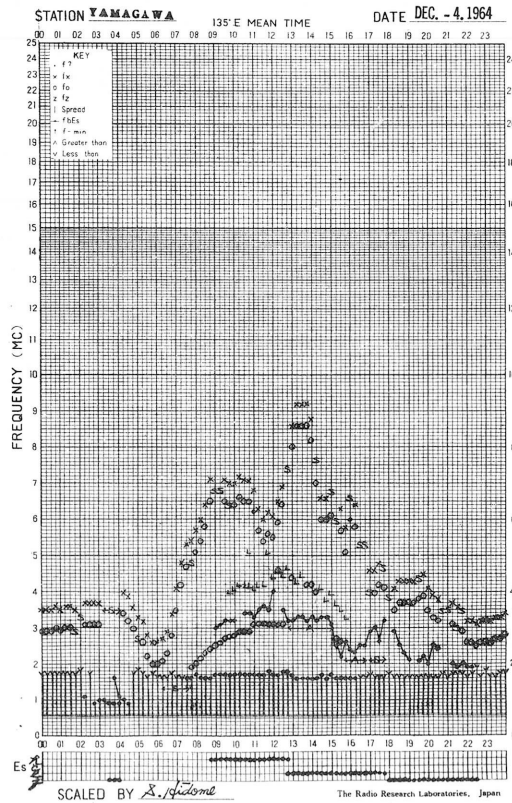
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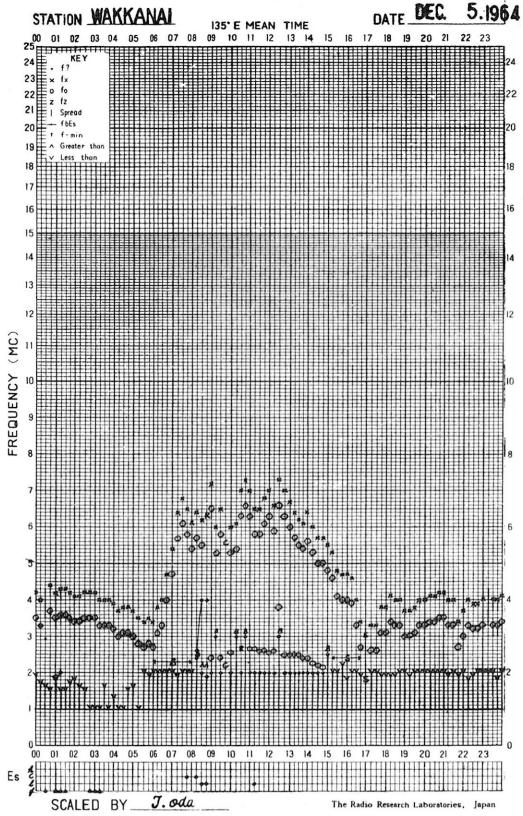
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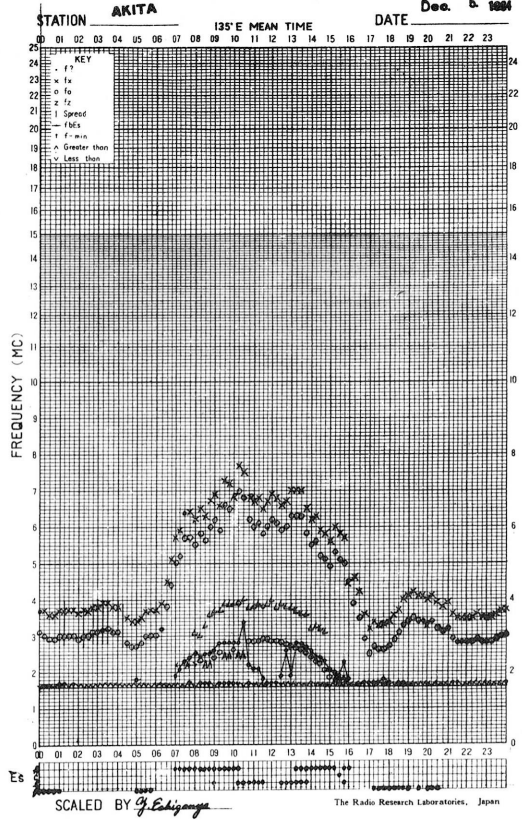
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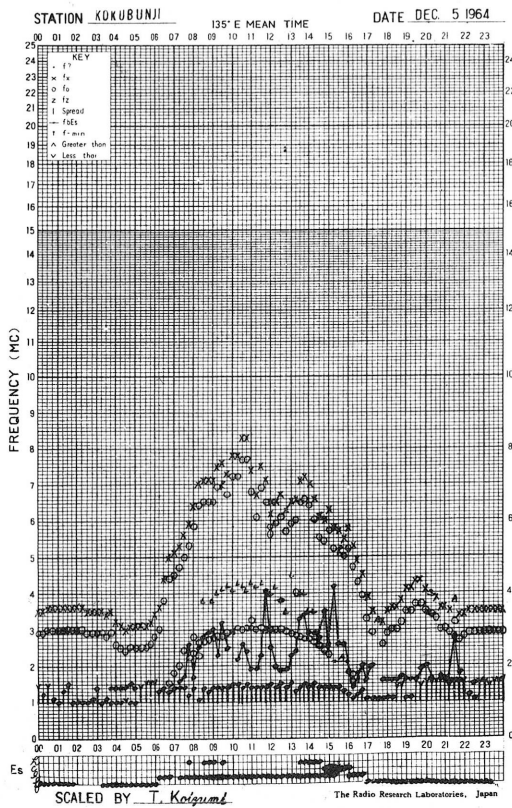
f-PLOT OF IONOSPHERIC DATA



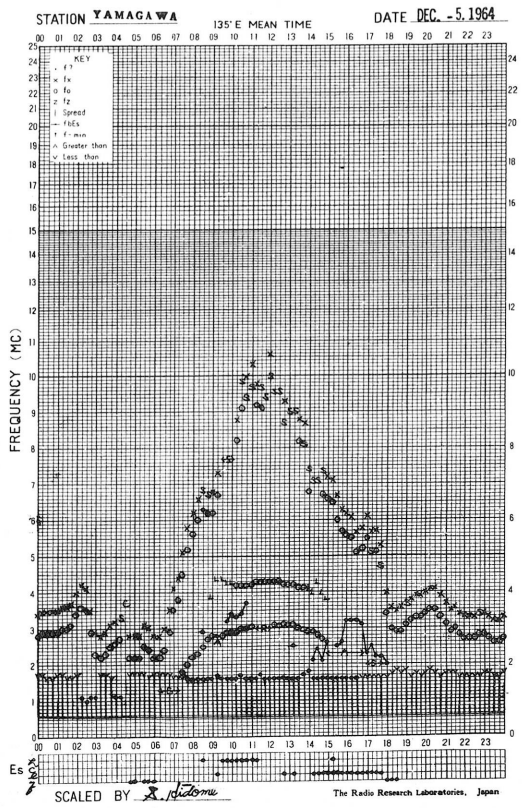
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f-PLOT OF IONOSPHERIC DATA

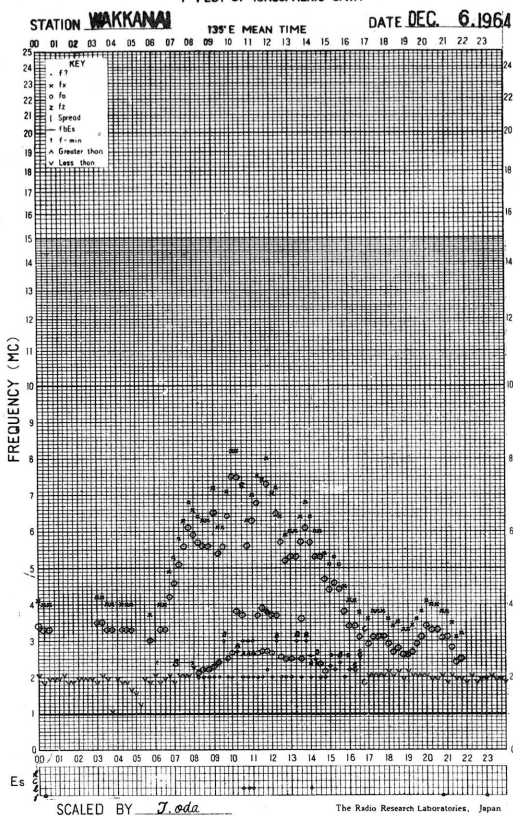


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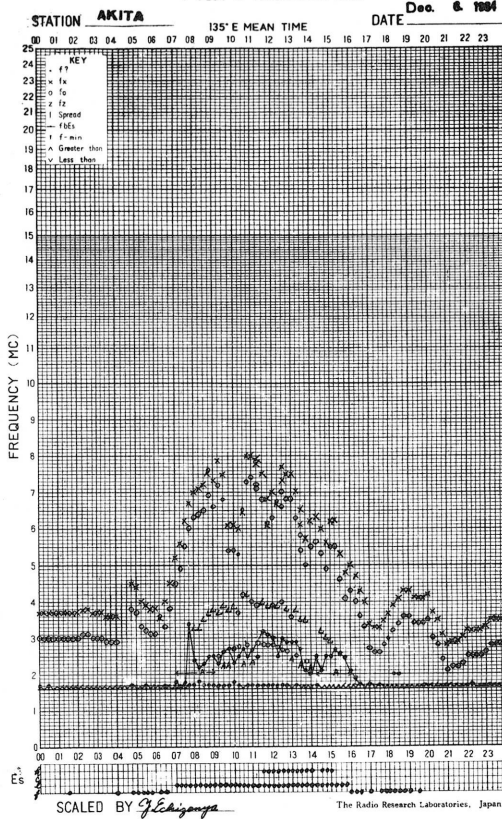




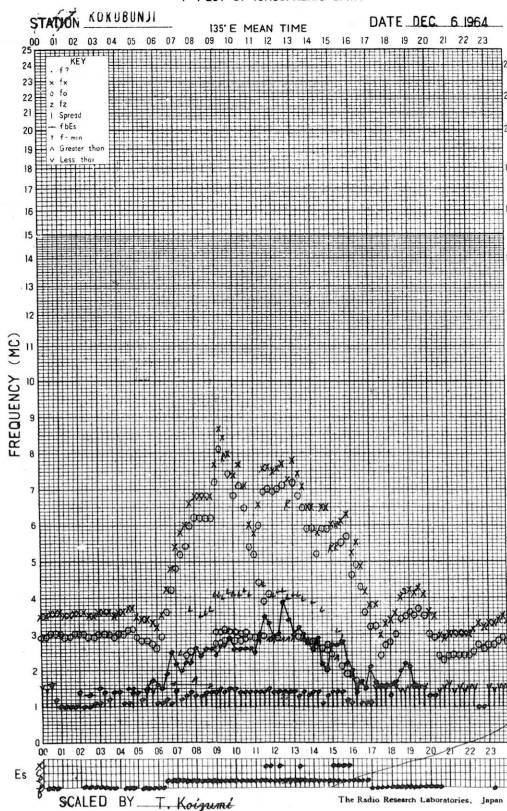
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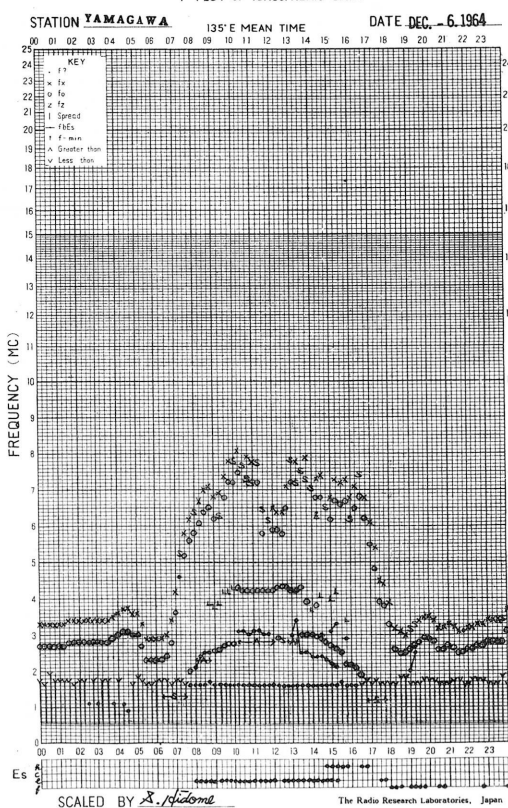
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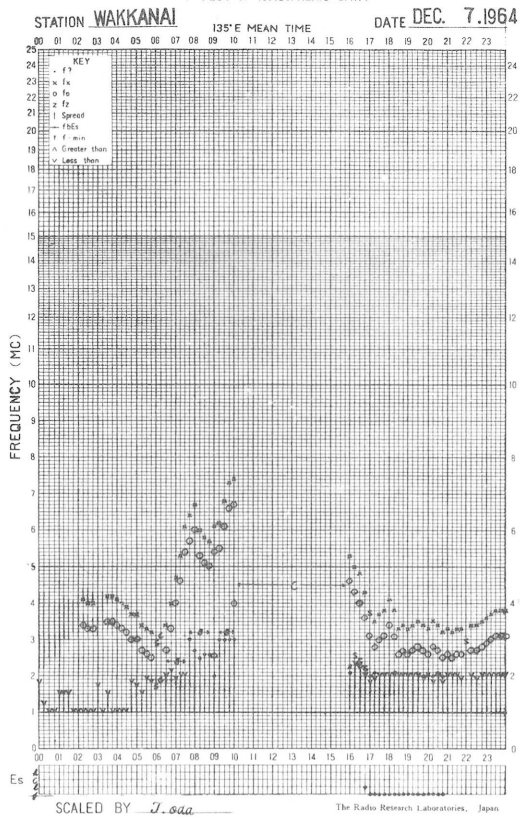
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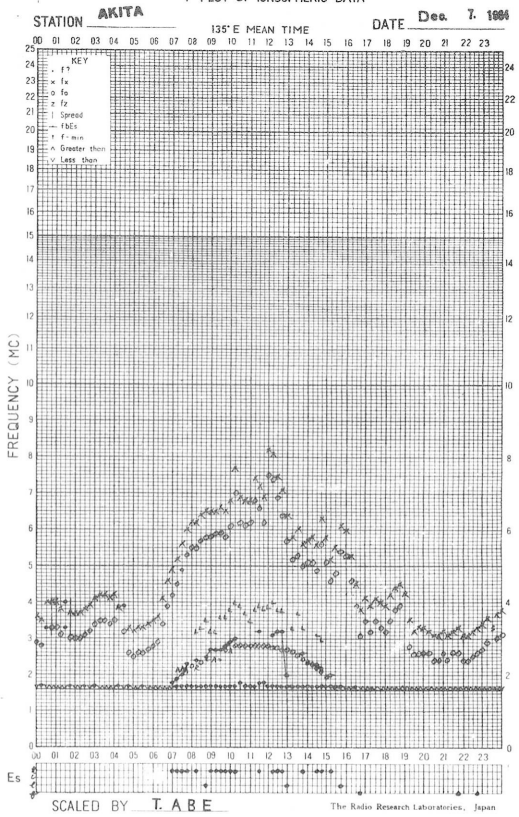
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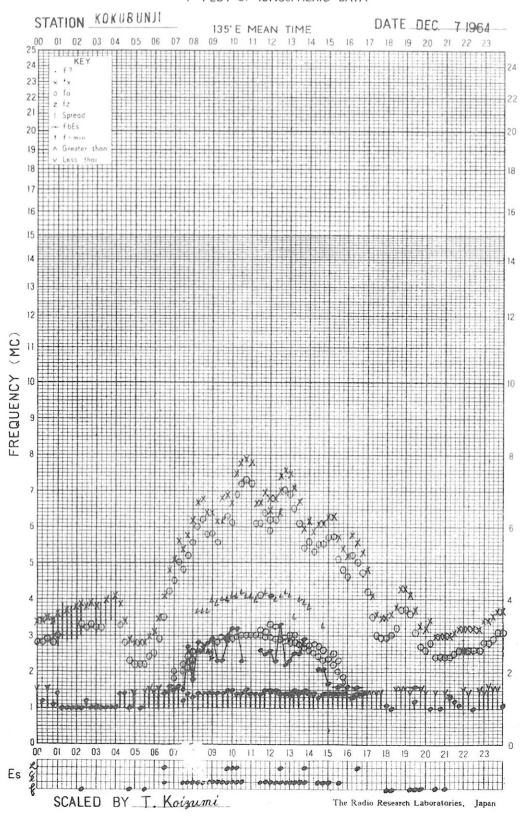
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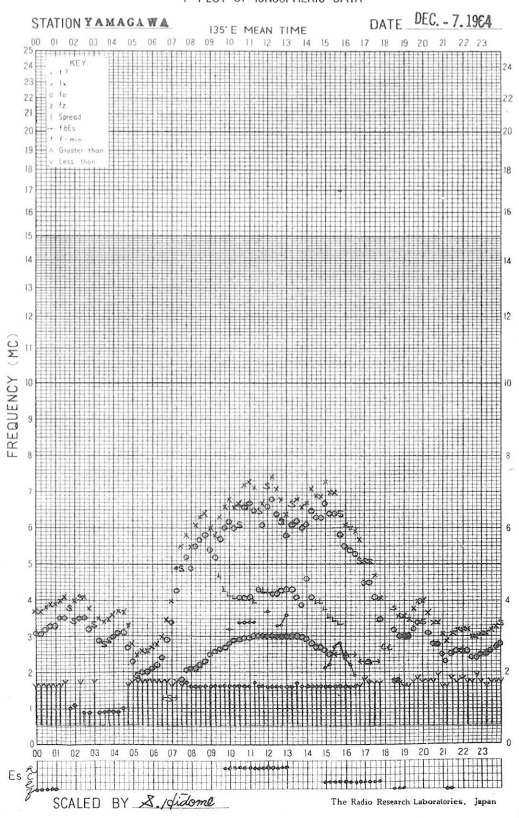
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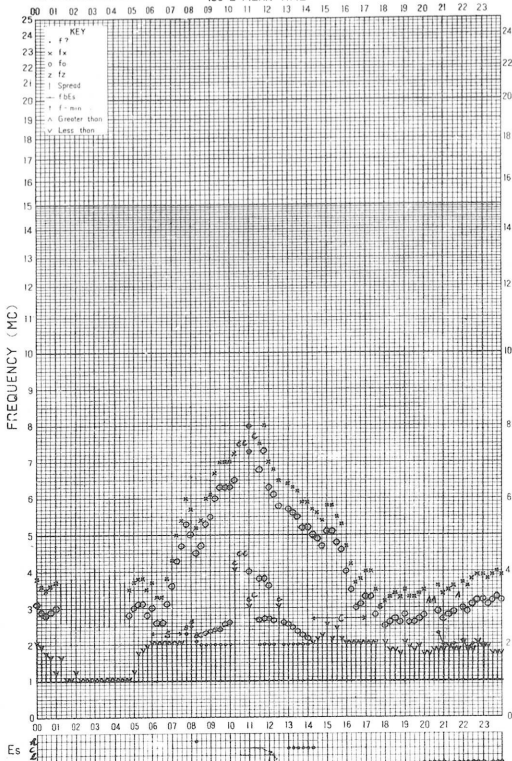


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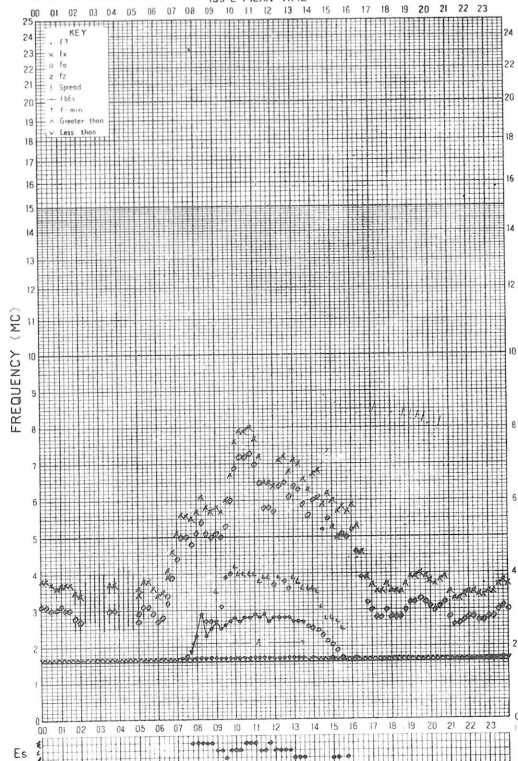
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SCALED BY *J.oda* The Radio Research Laboratories, Japan

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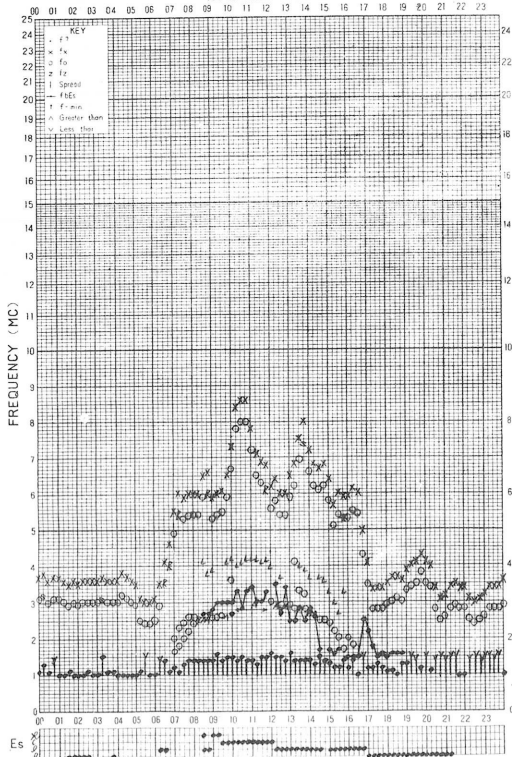
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SCALED BY *T. ABE* The Radio Research Laboratories, Japan

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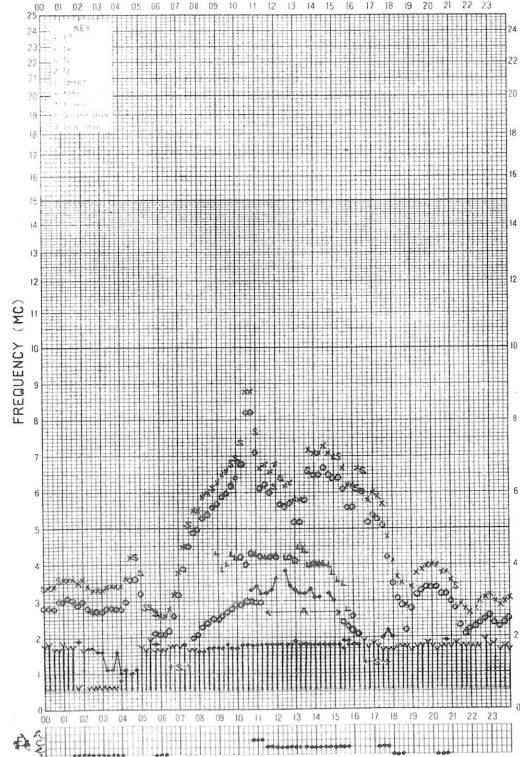
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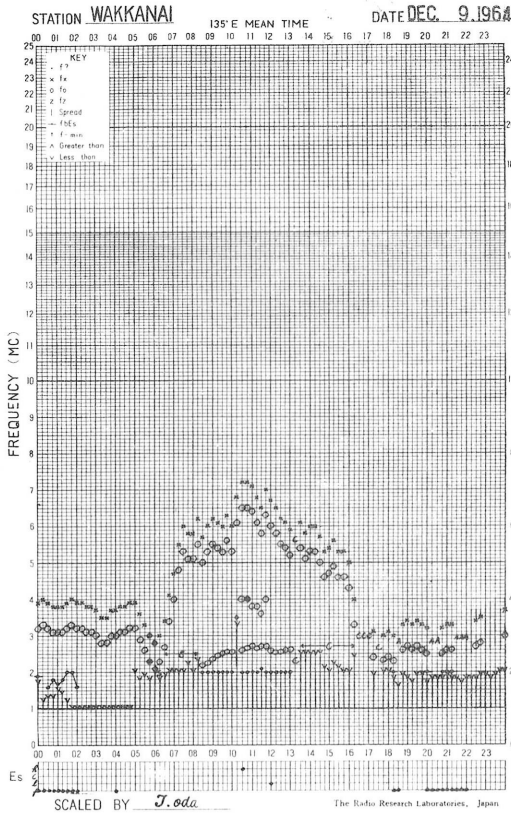
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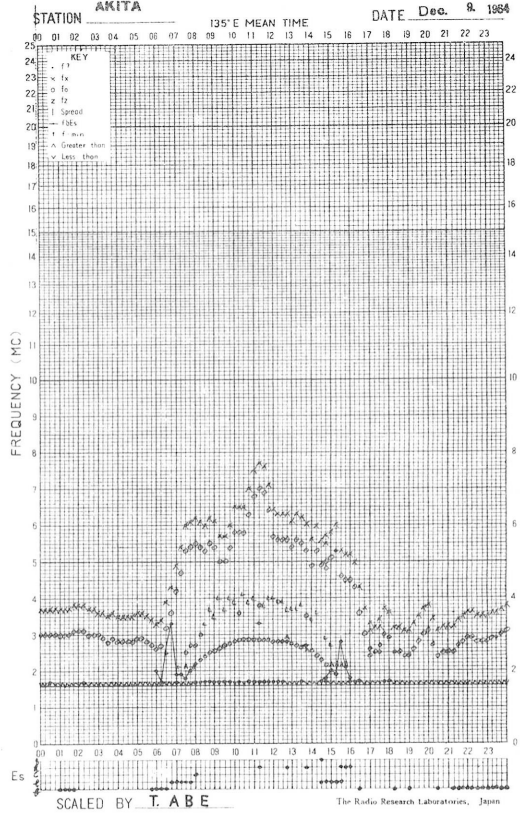


SCALED BY *S. Ishizawa* The Radio Research Laboratories, Japan

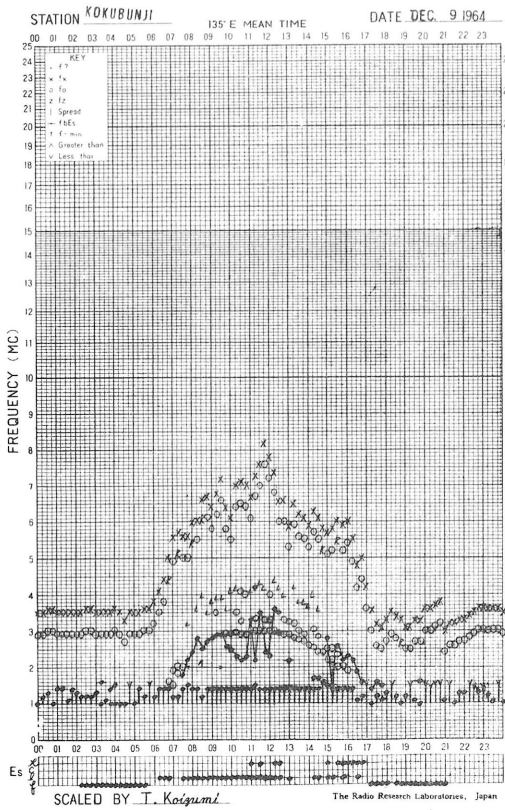
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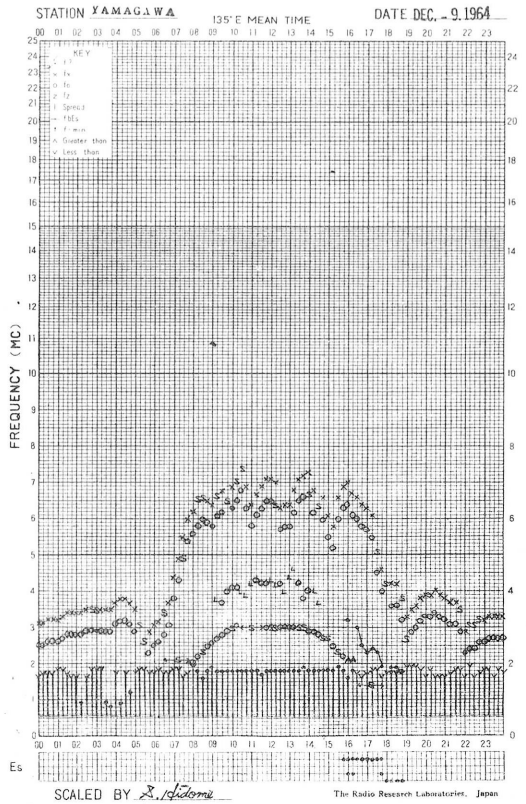
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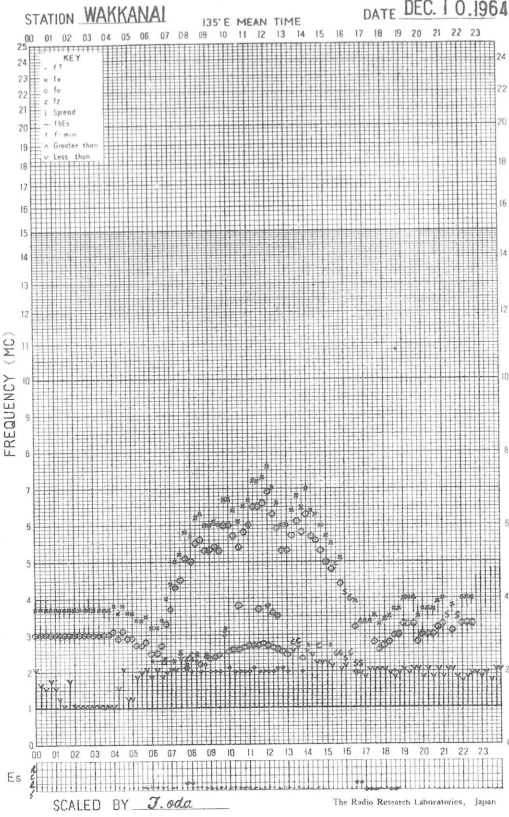
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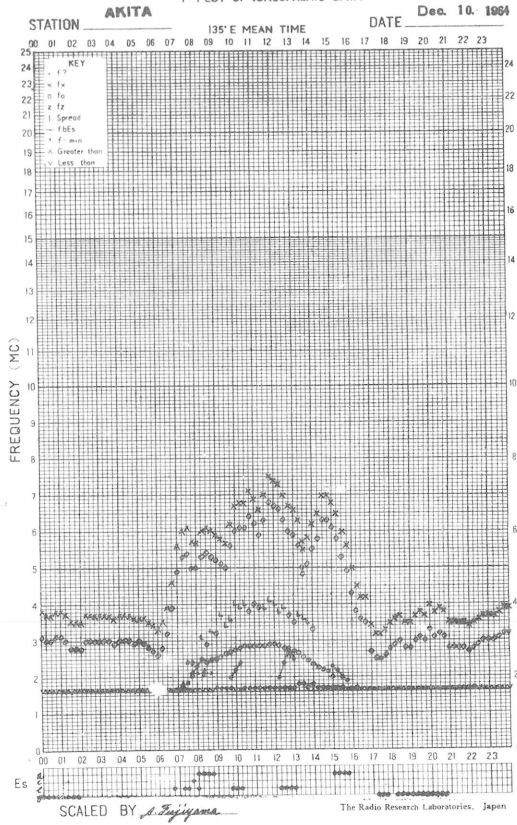
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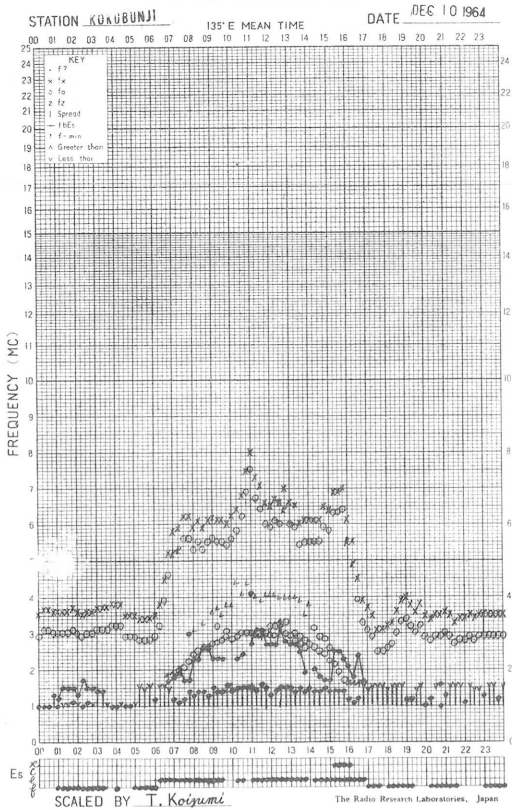
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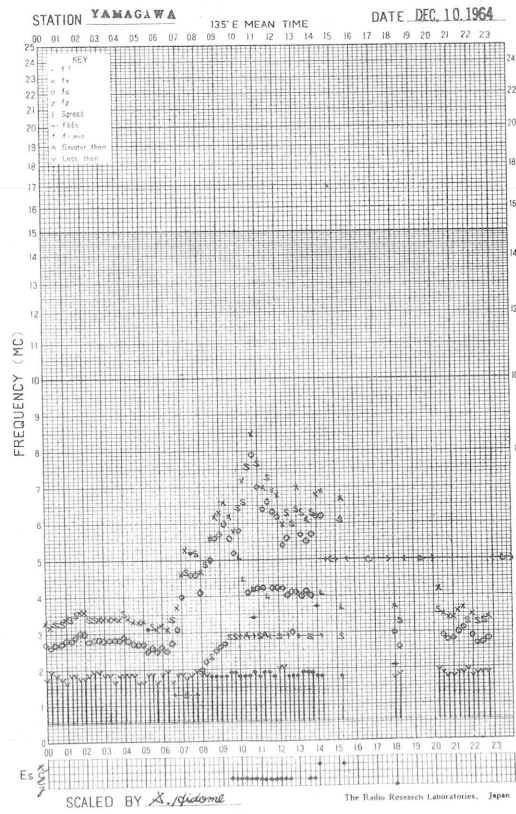
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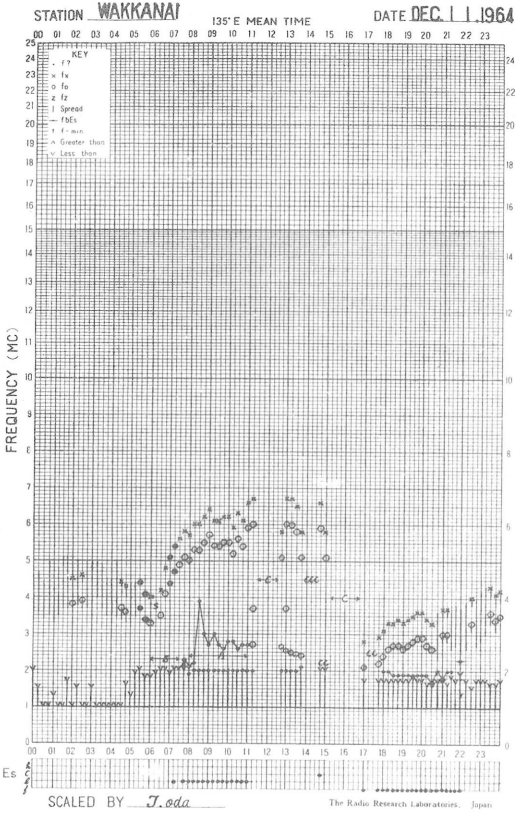
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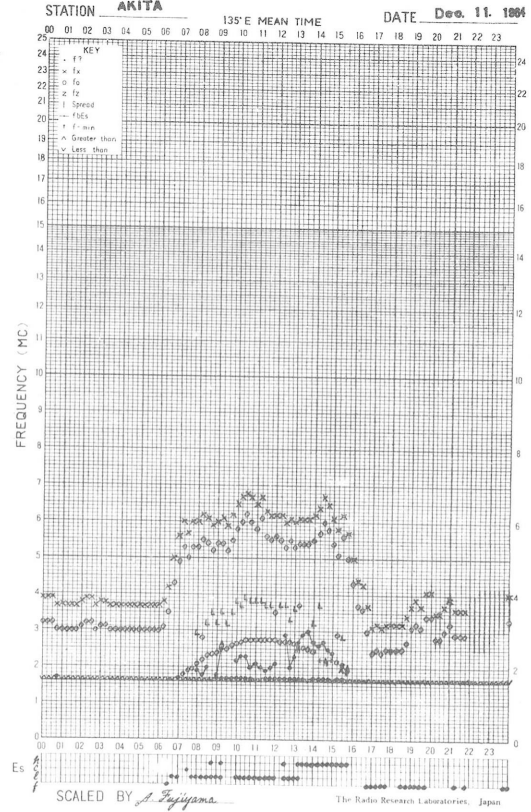
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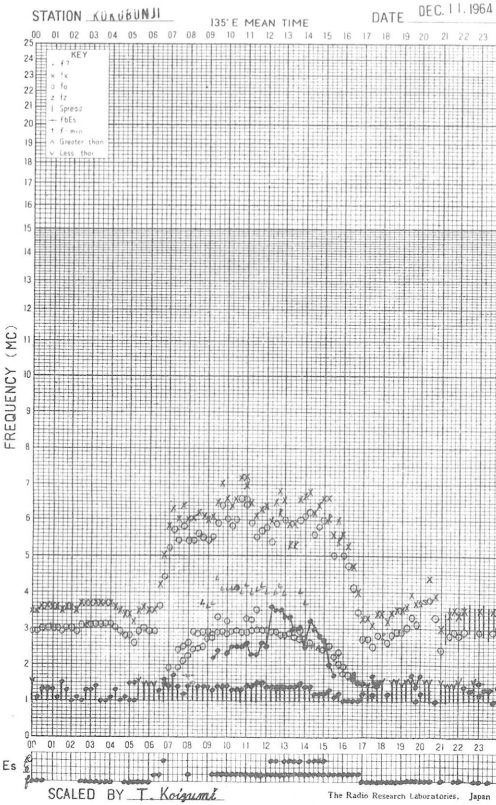
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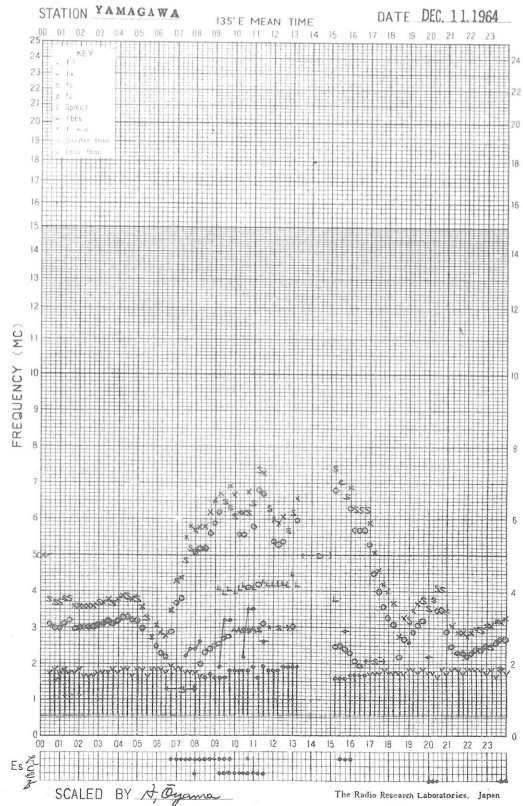
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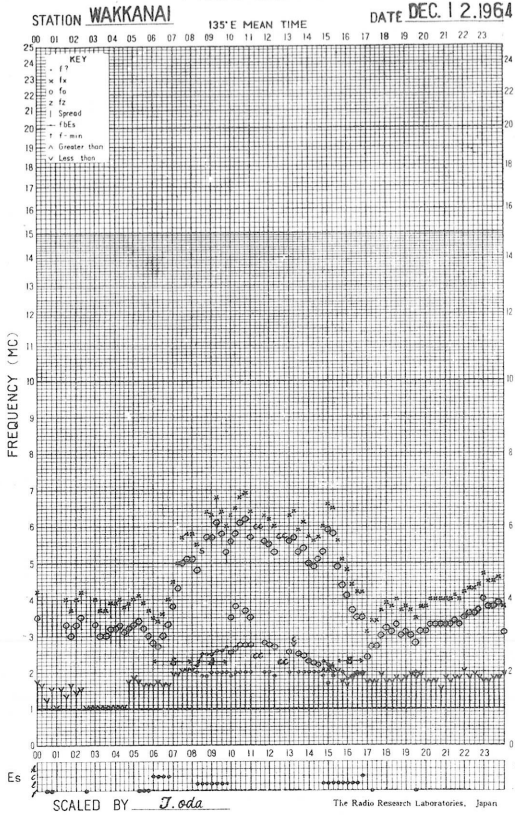
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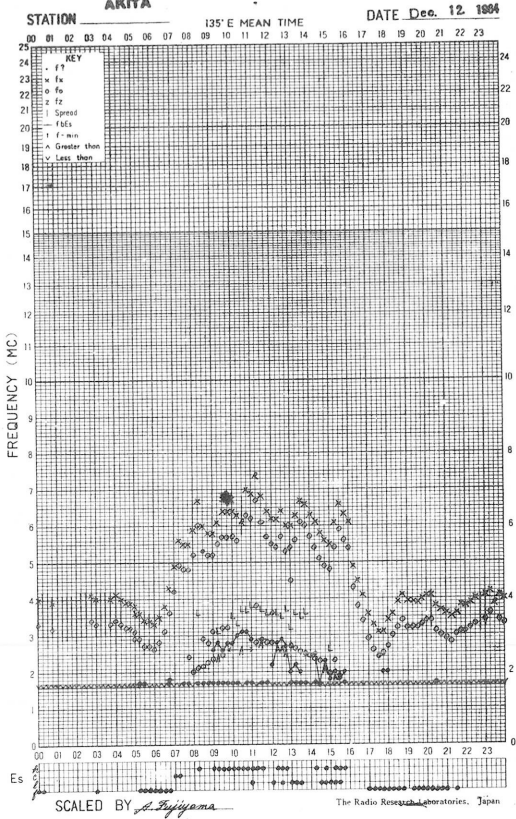
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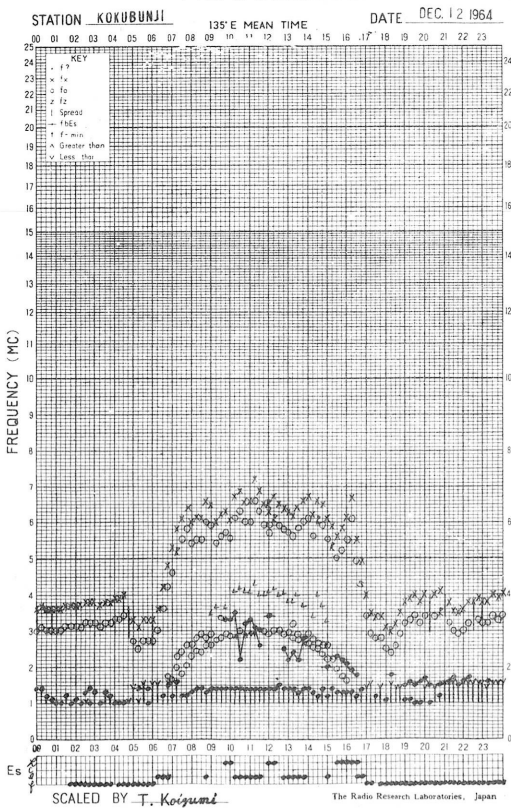
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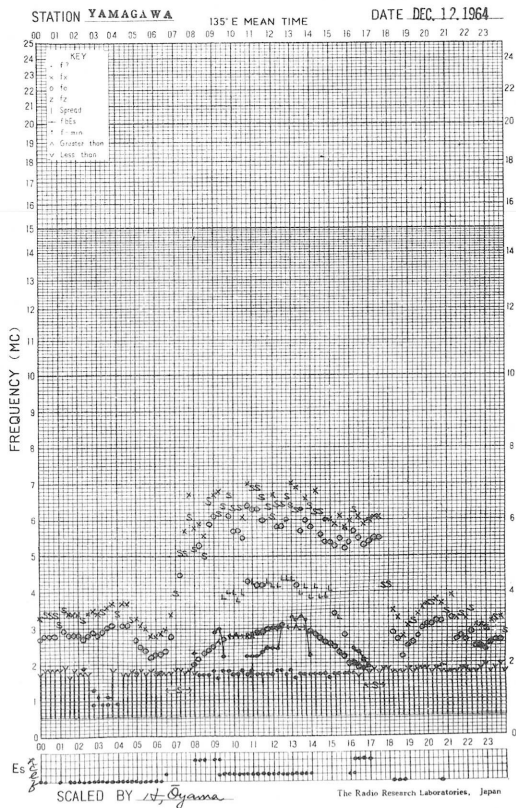
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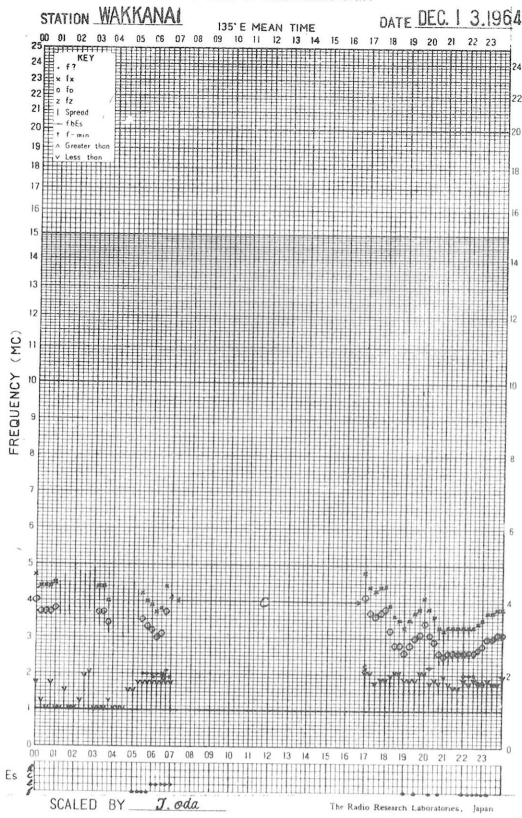
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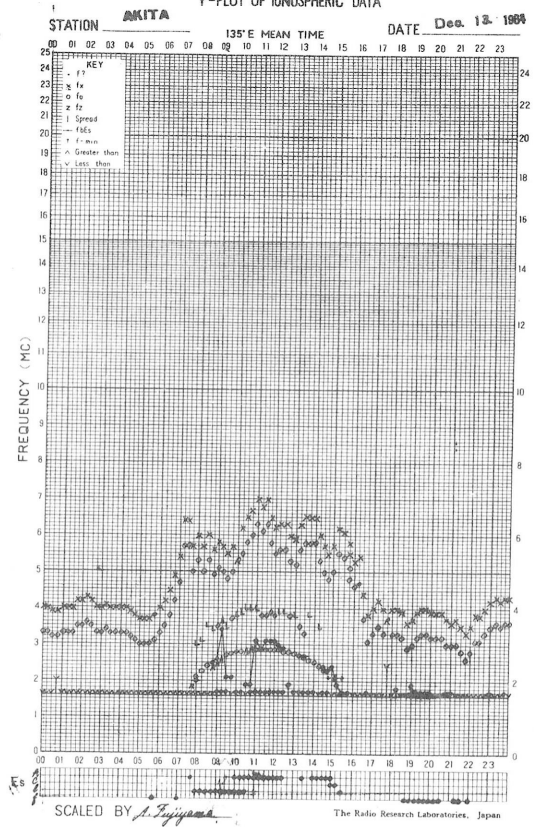
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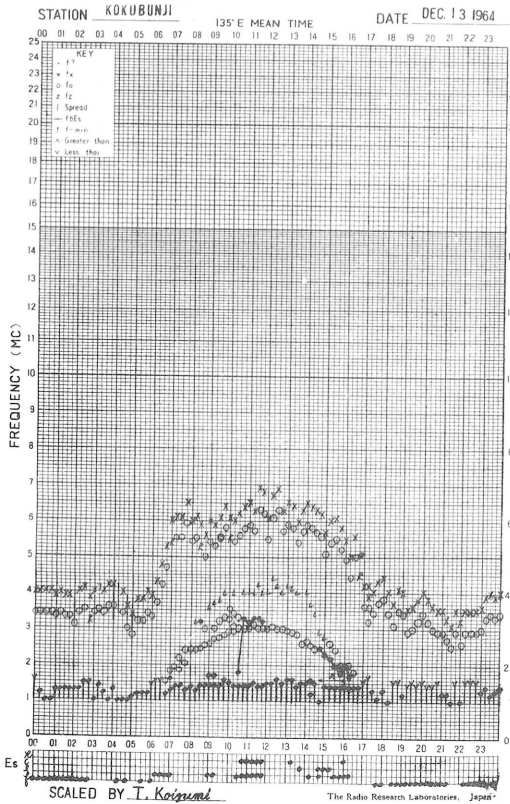
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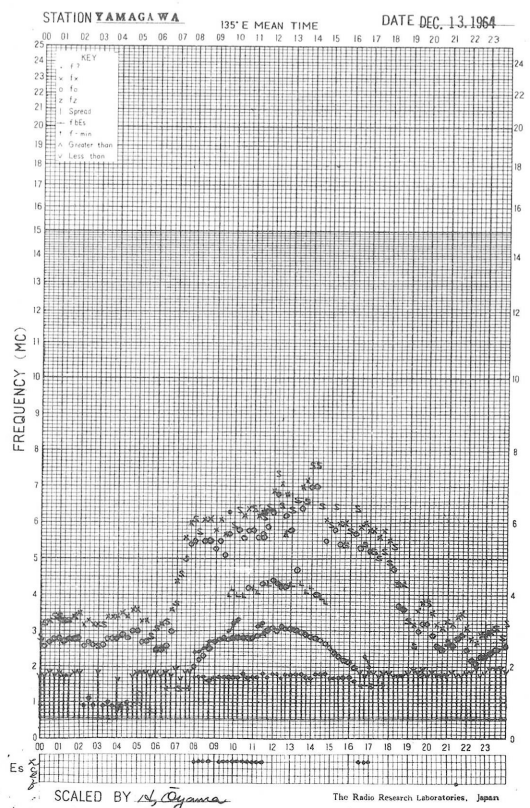
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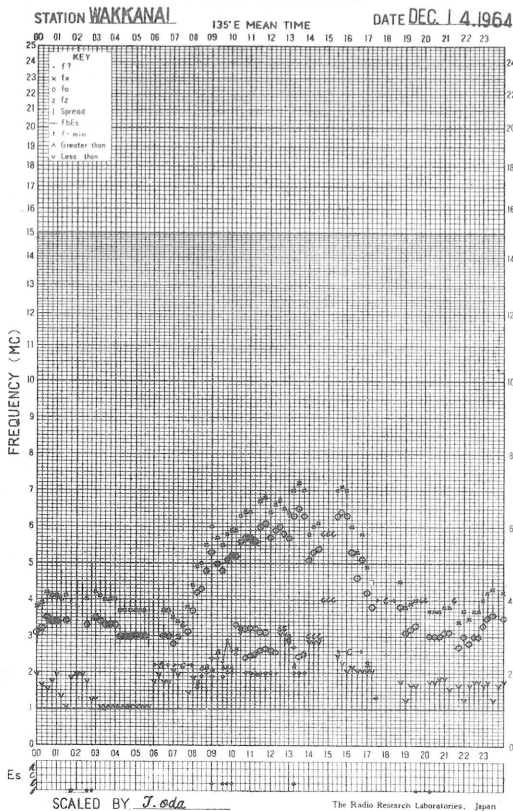


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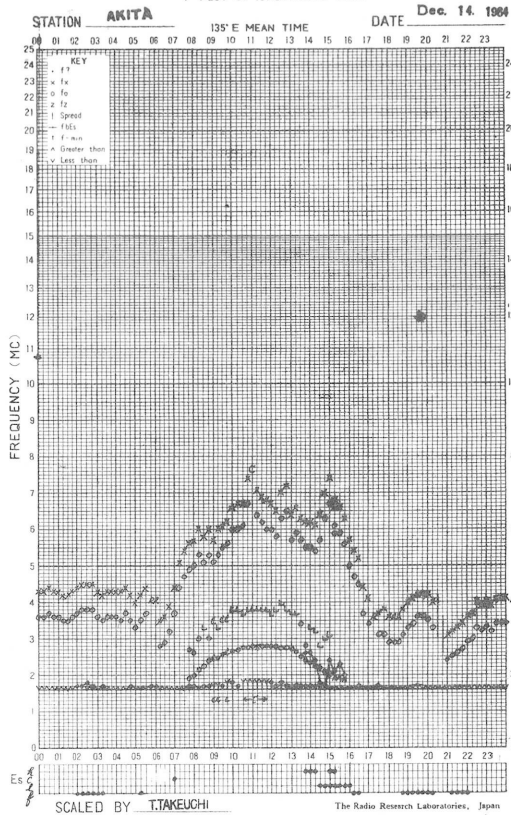




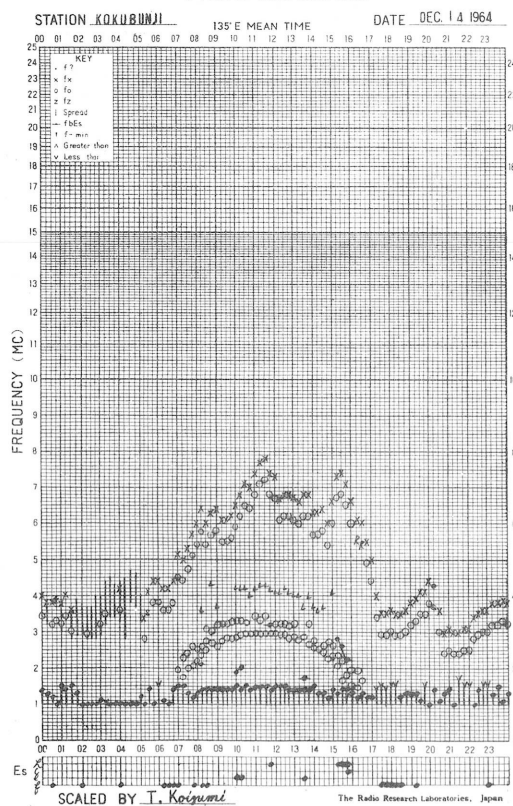
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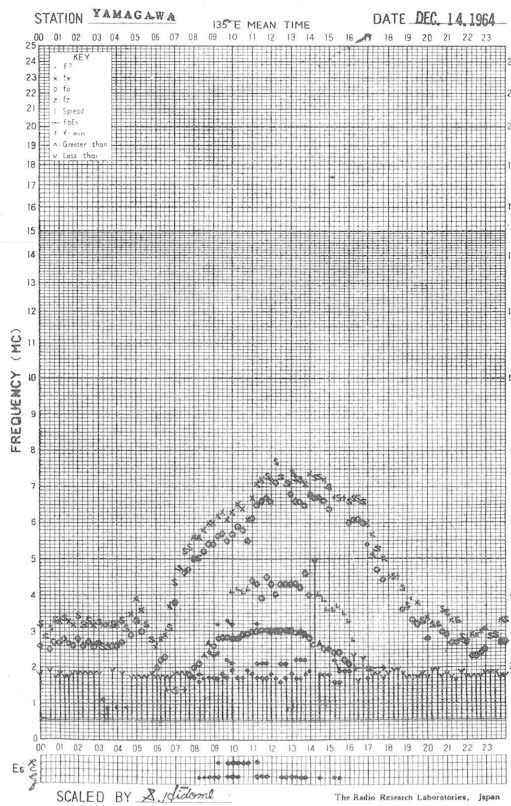
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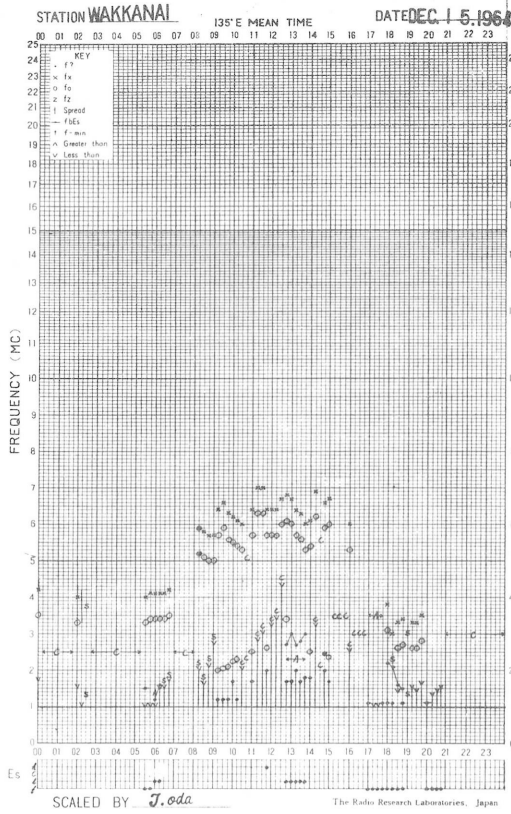
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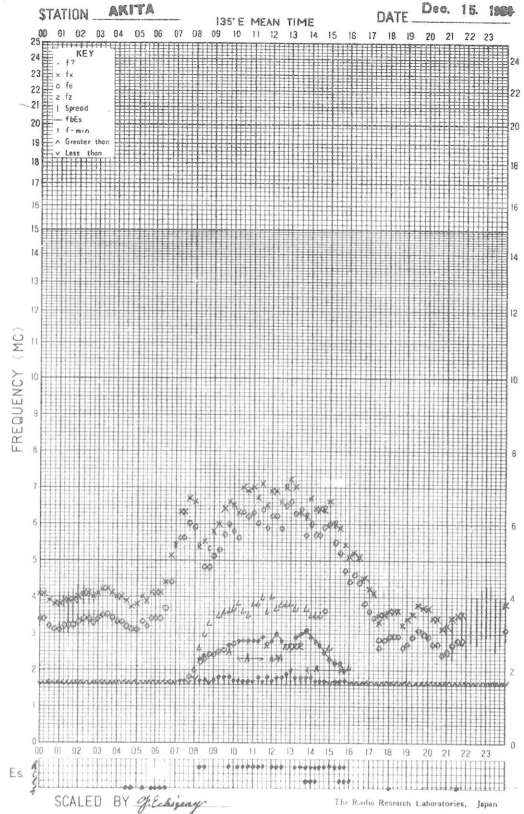
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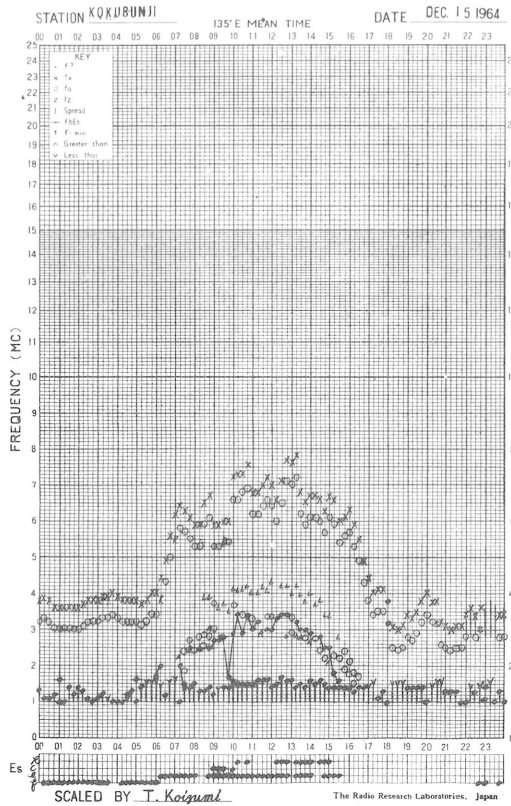
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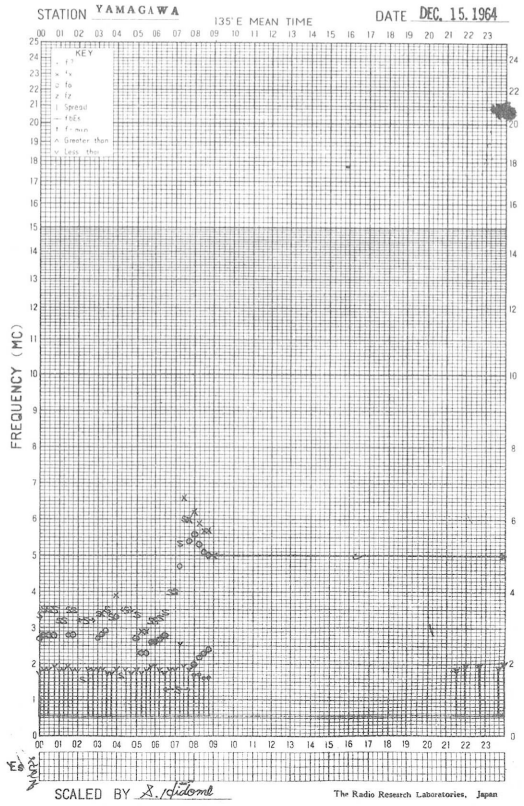
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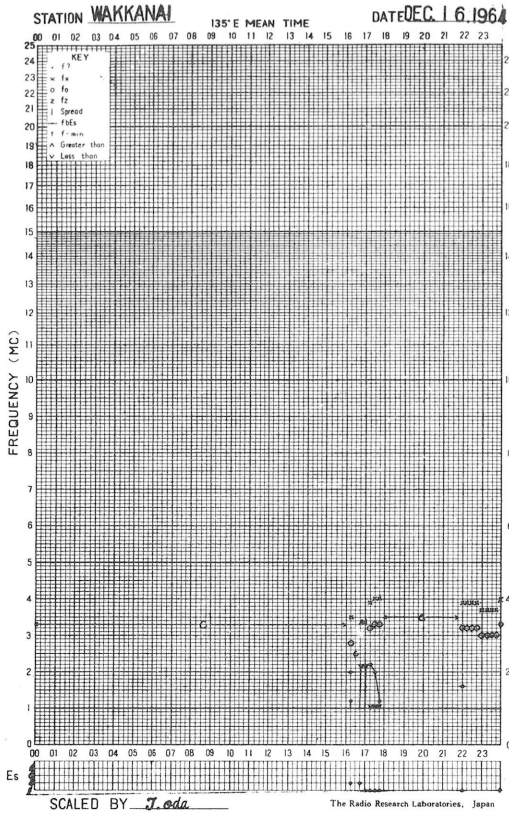
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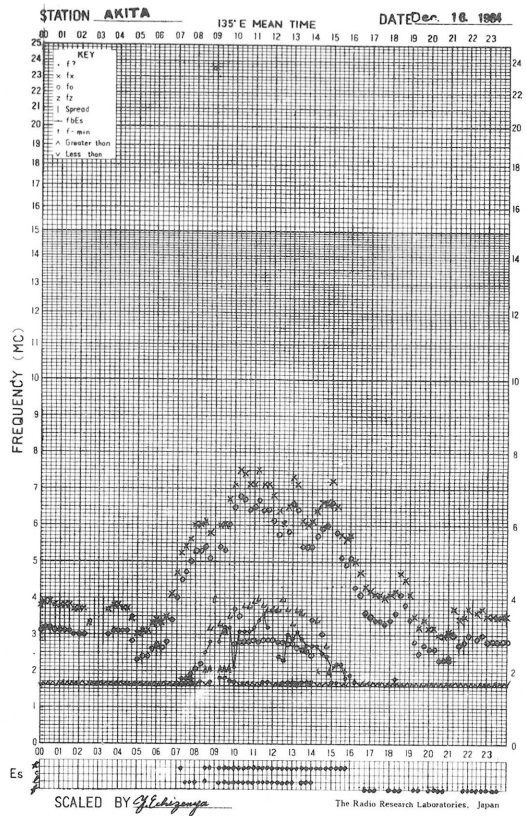
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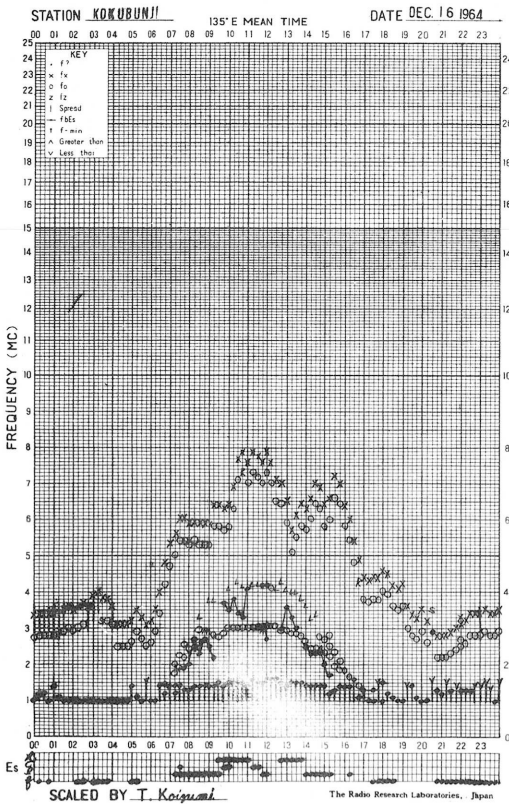
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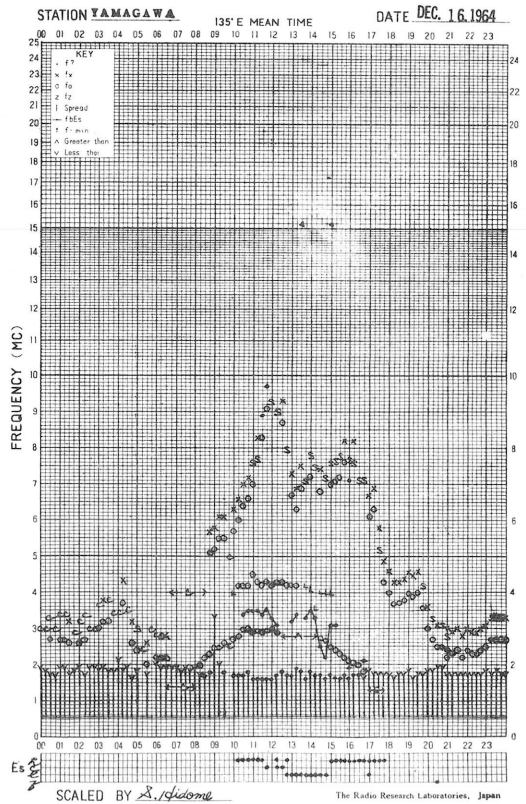
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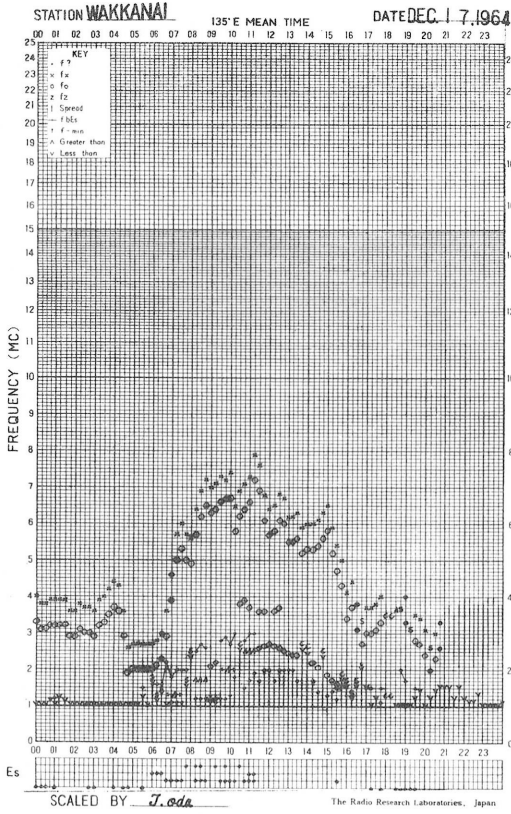
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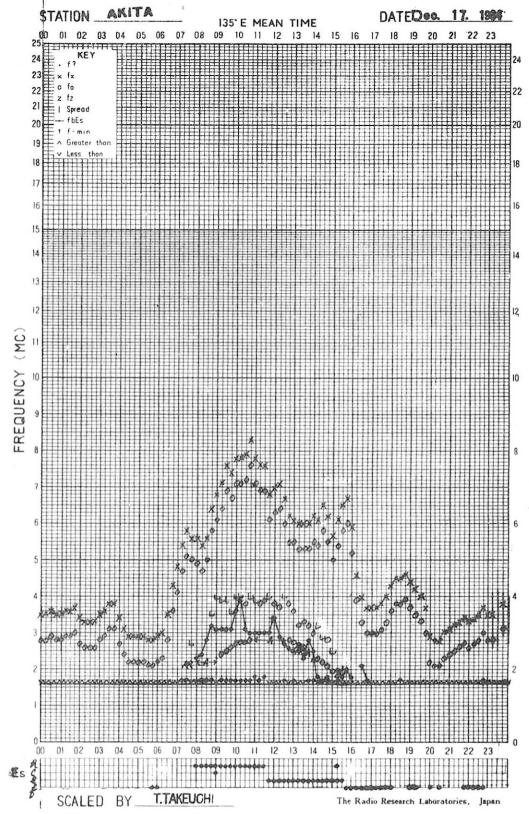
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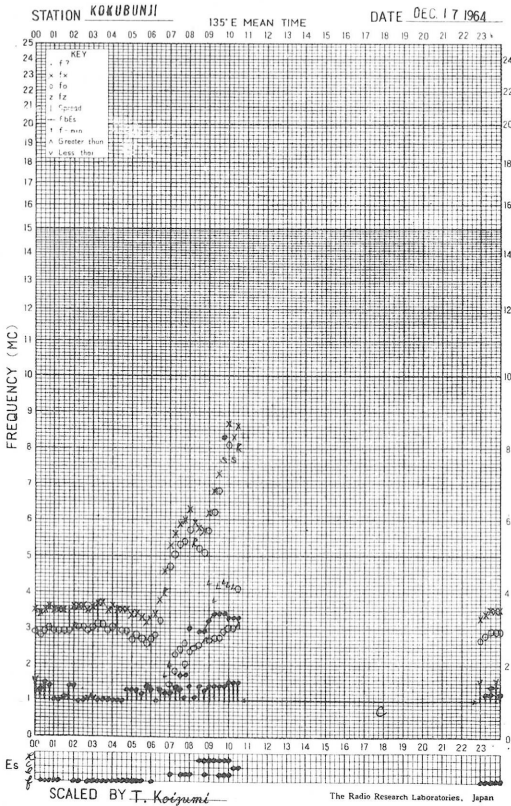
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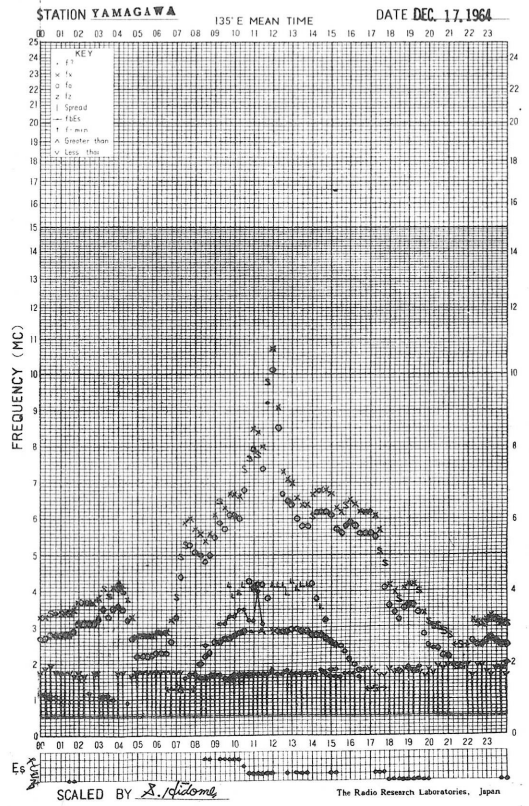
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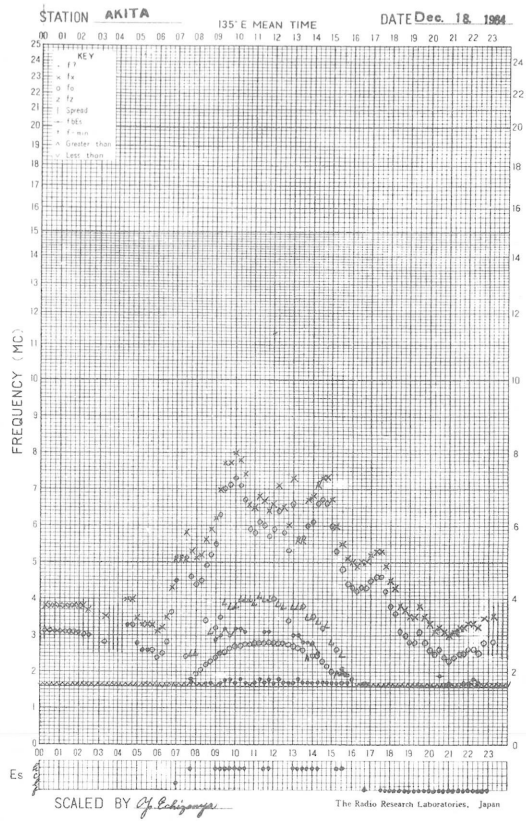
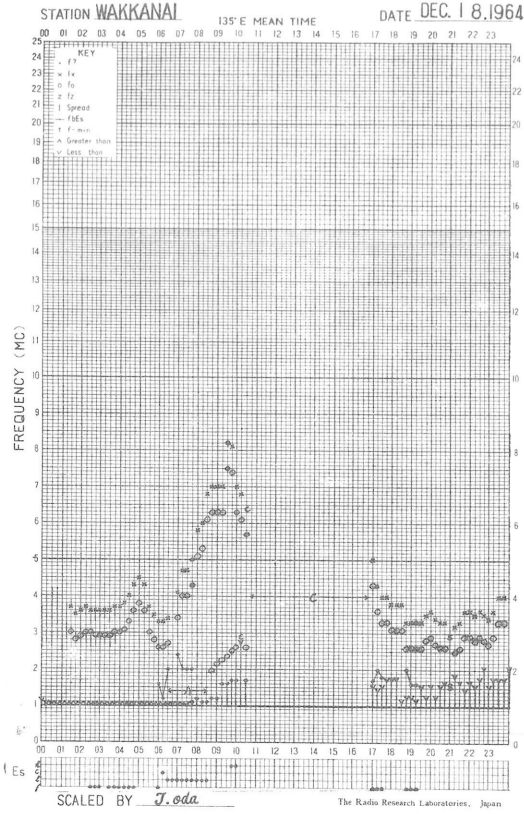


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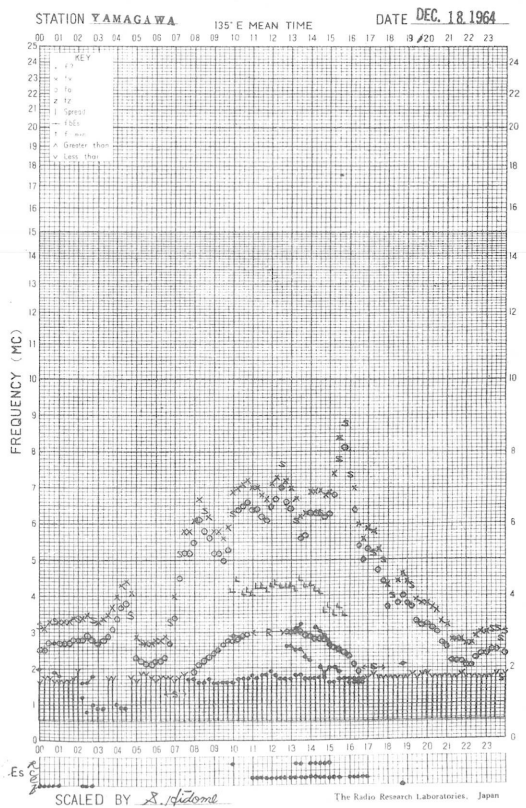
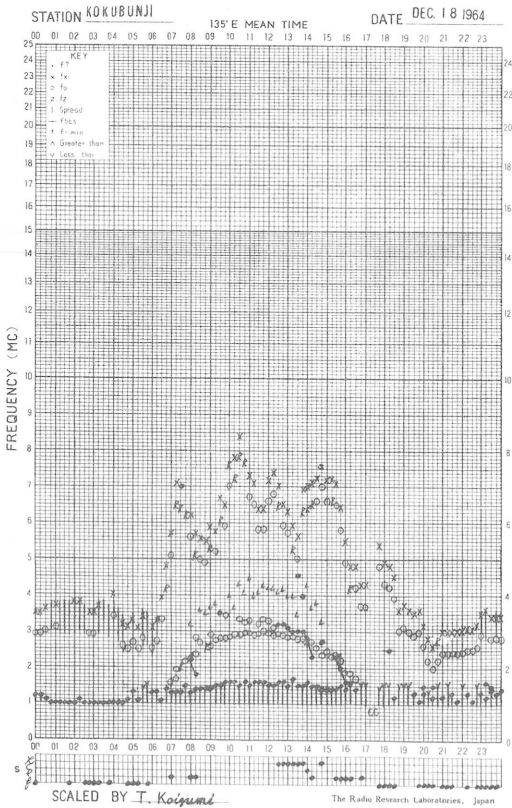
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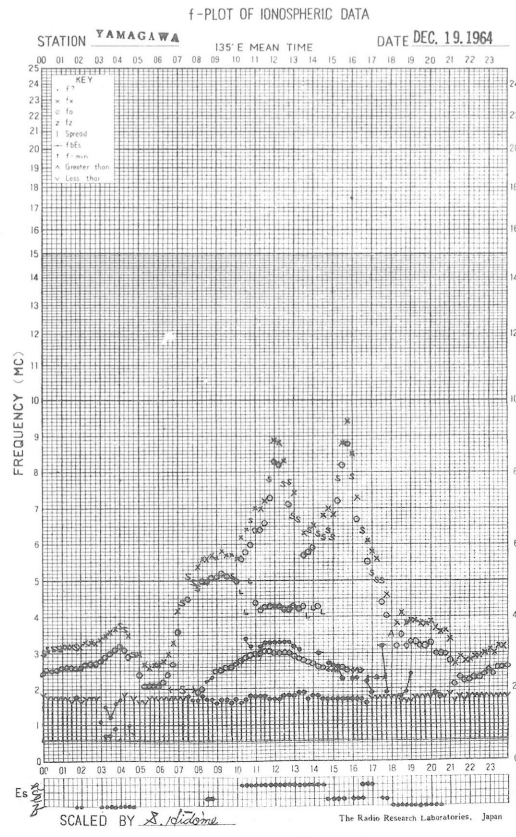
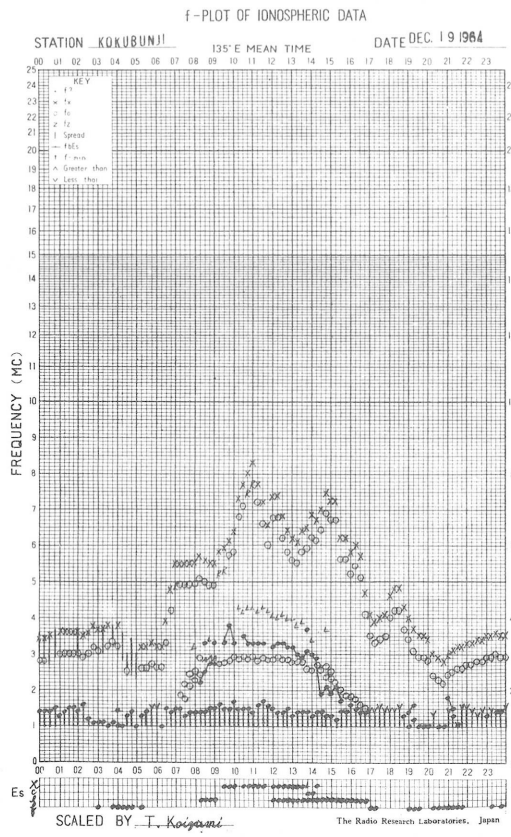
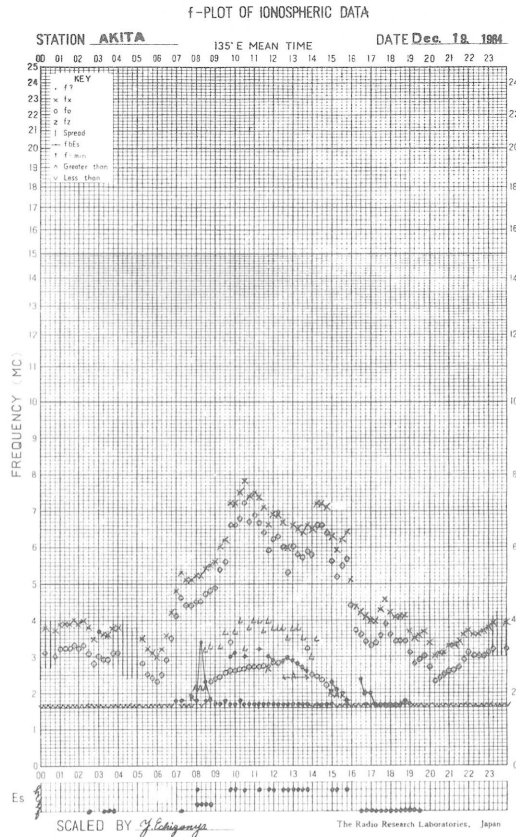
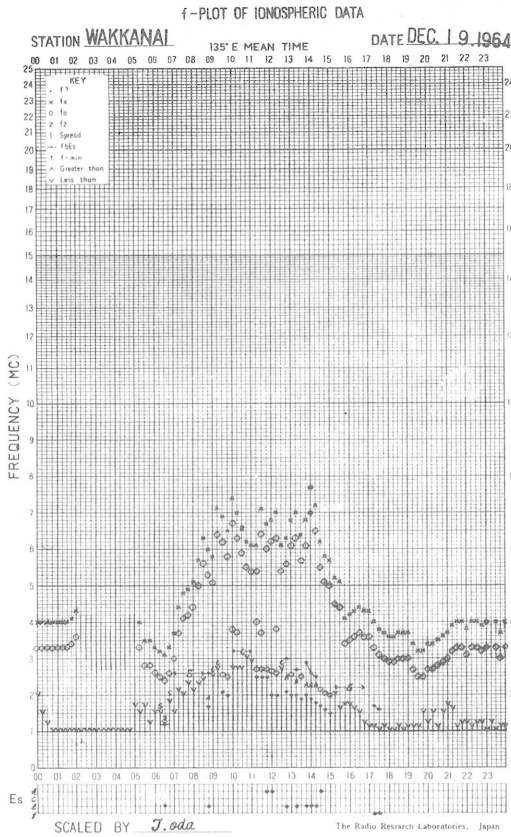
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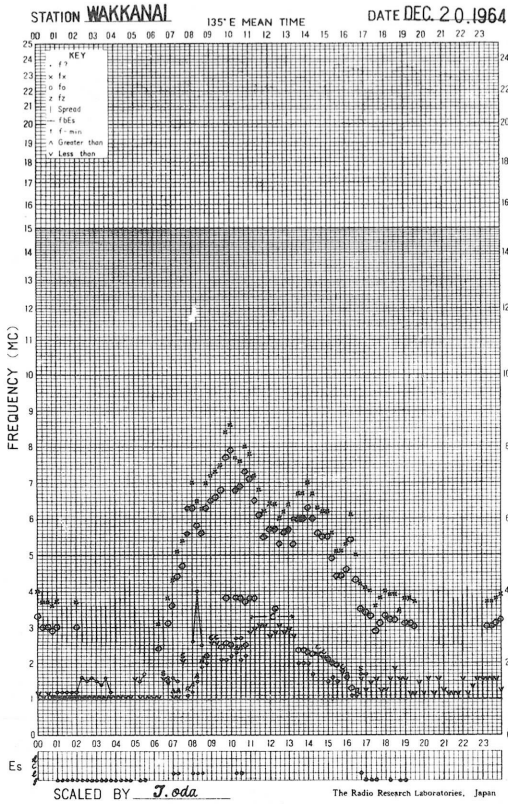
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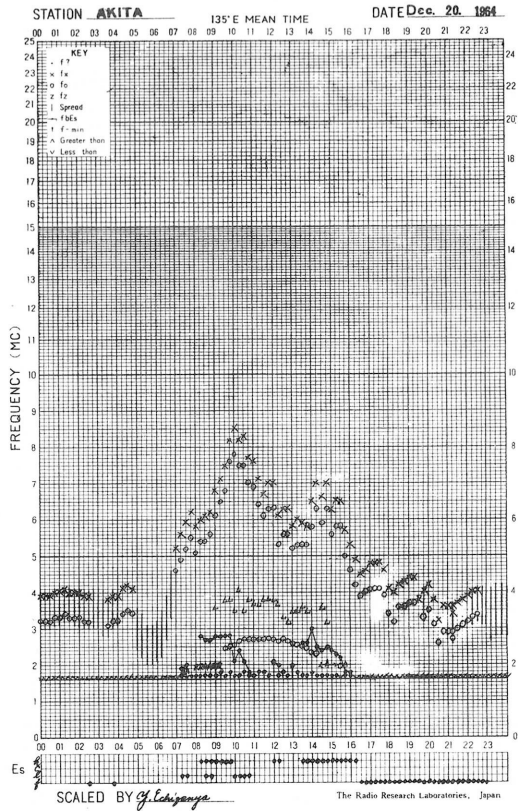




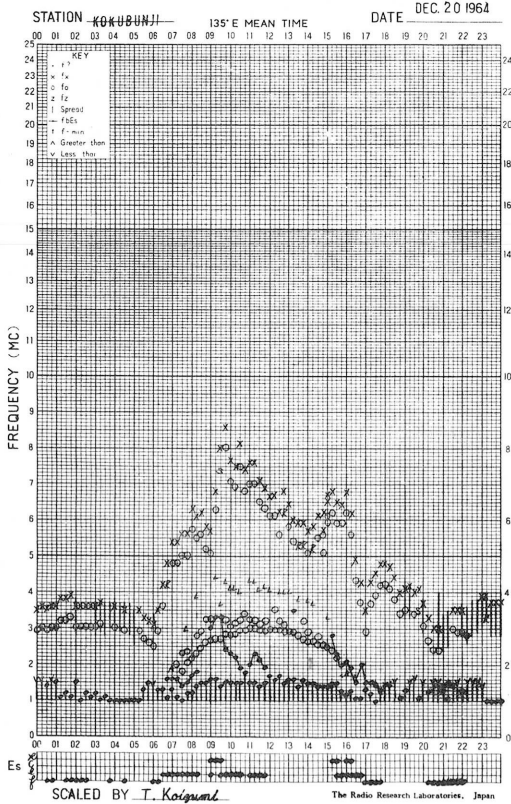
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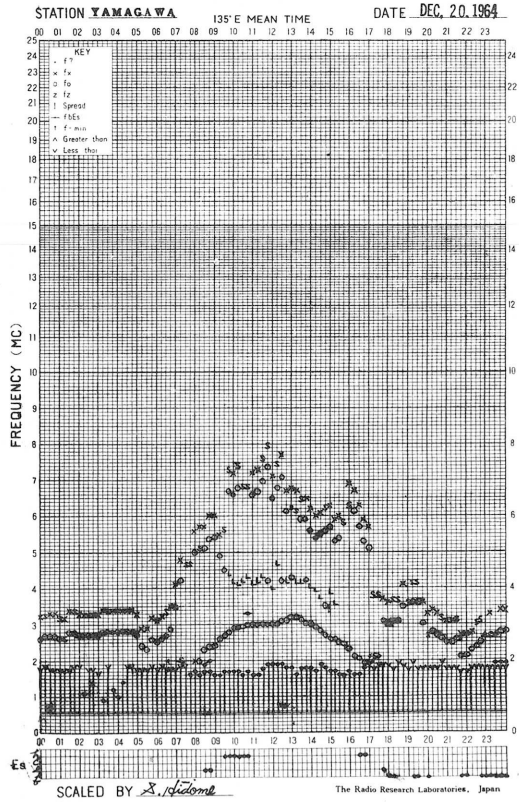
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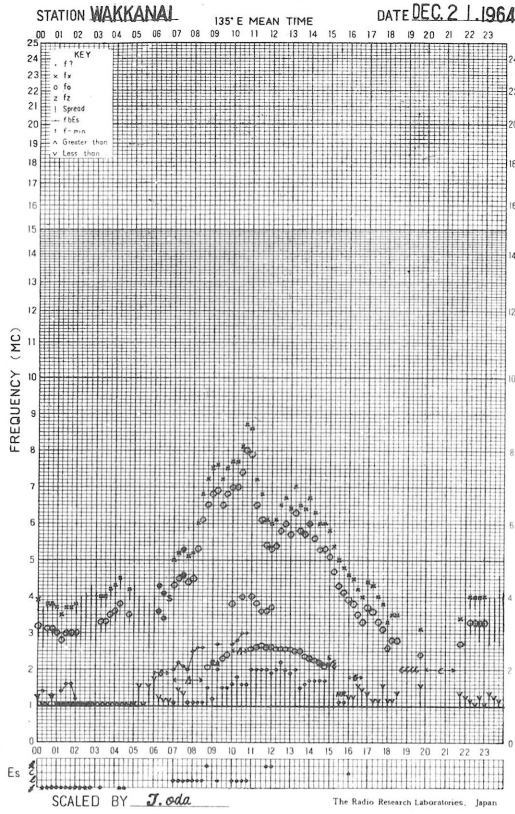
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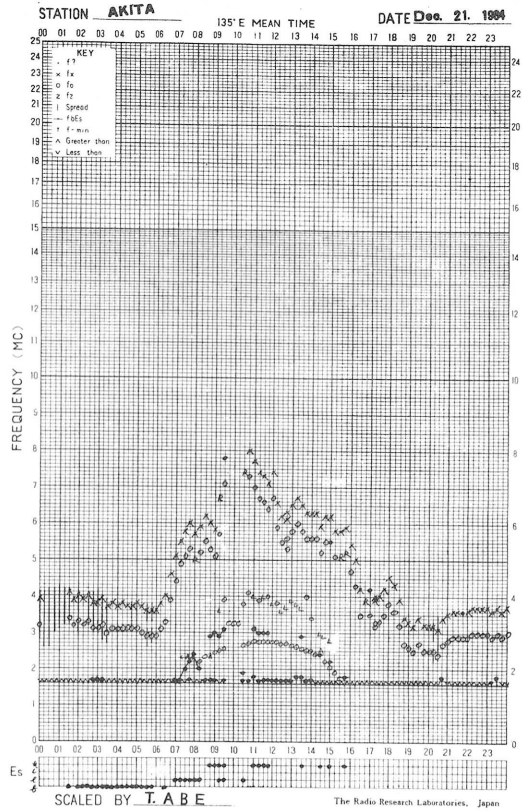
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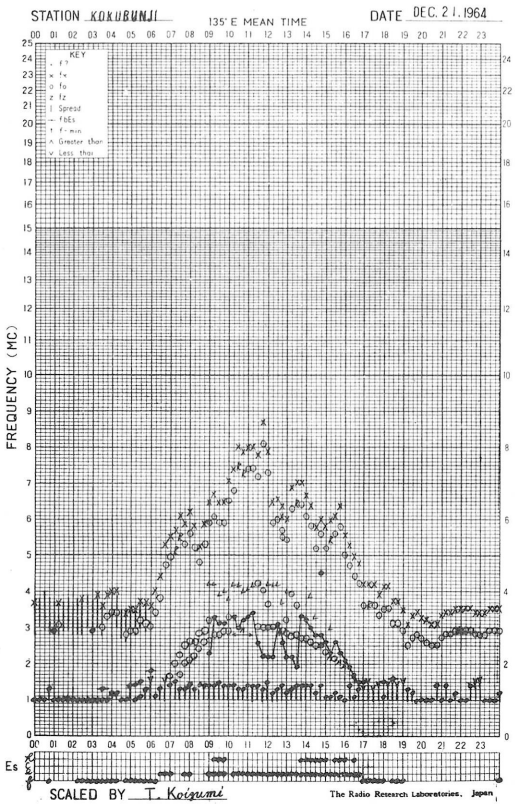
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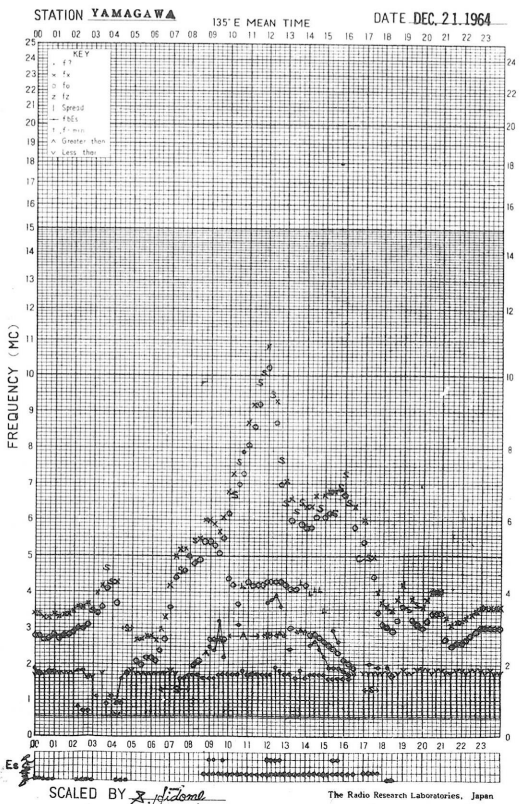
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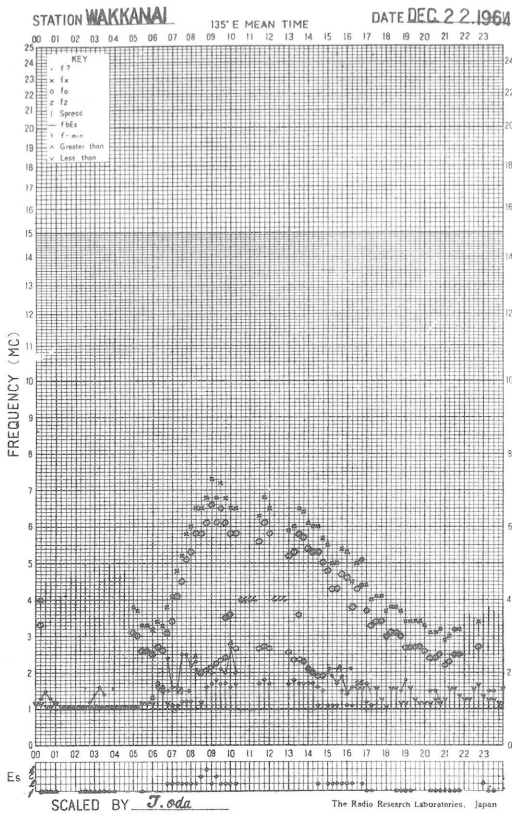


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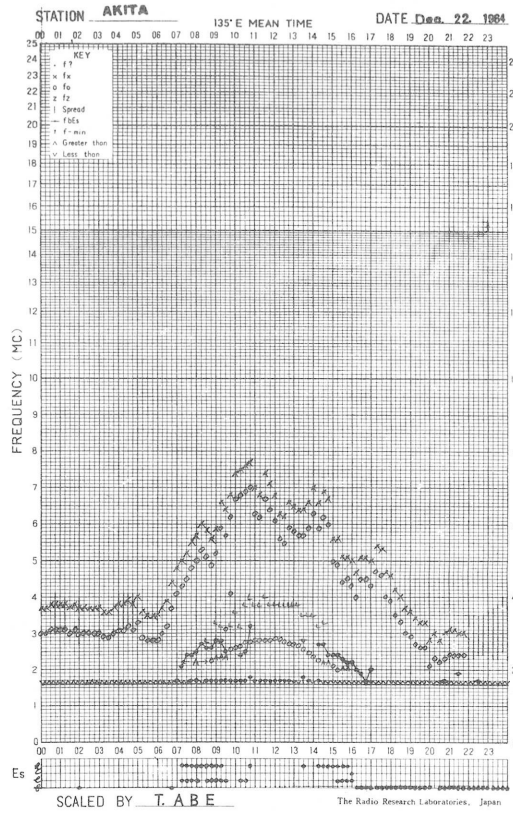




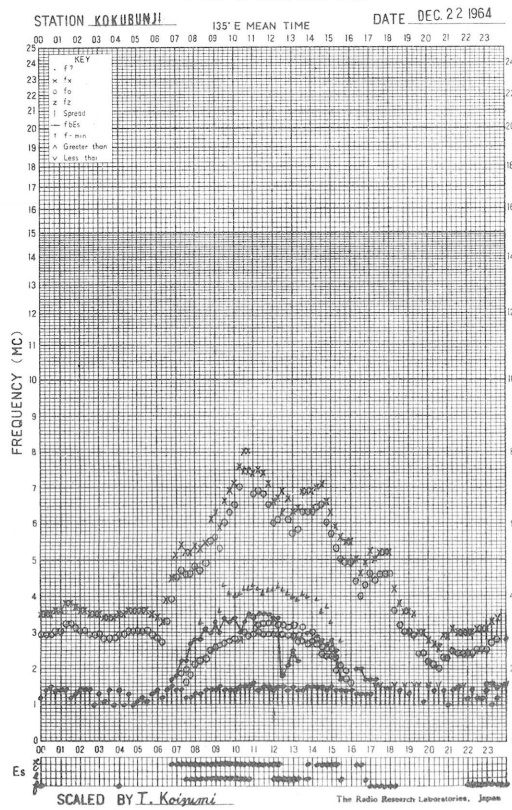
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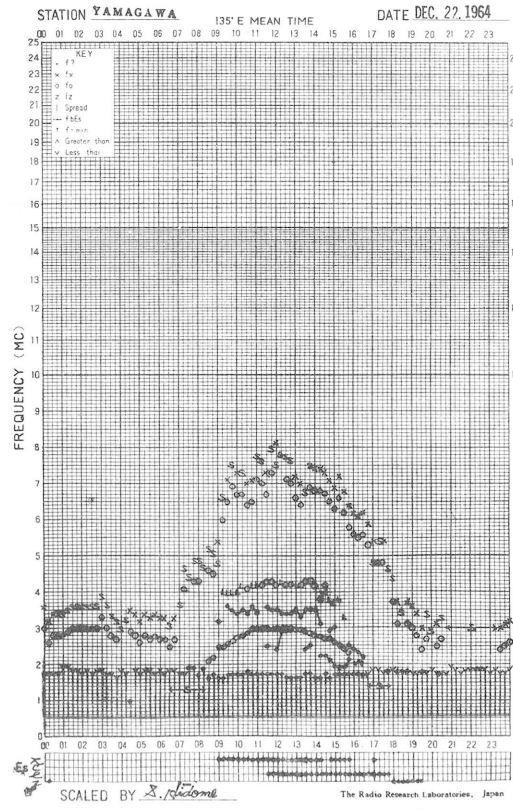
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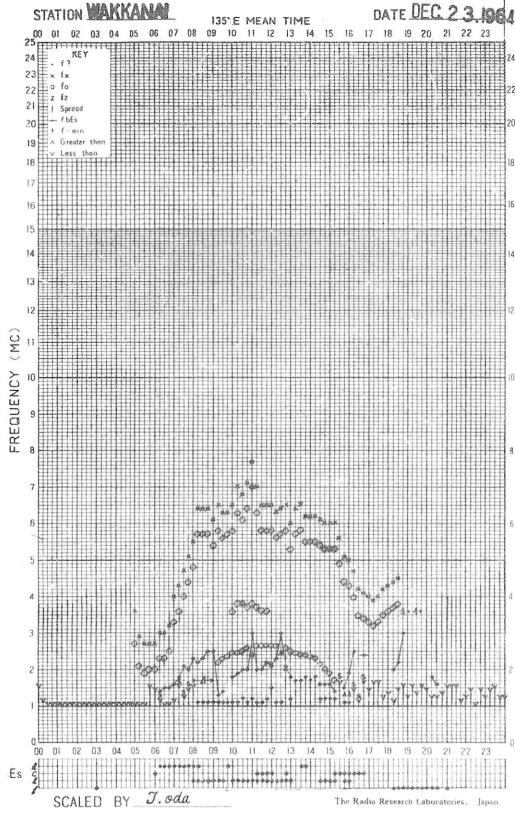
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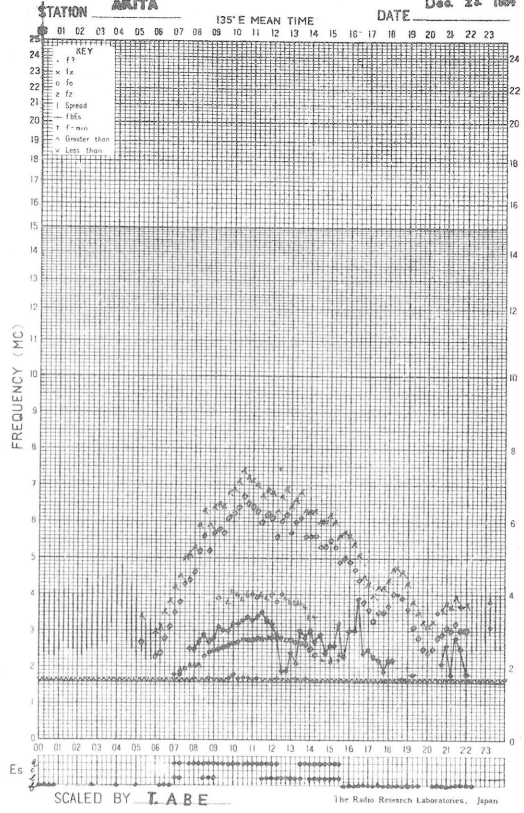
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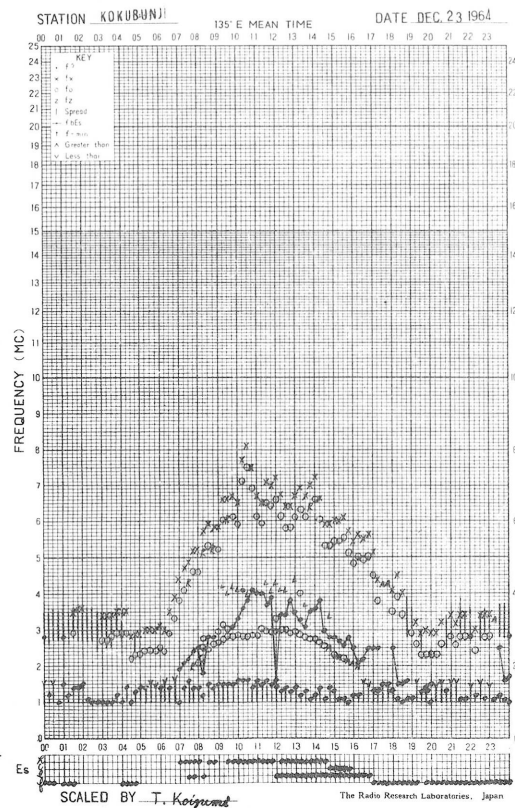
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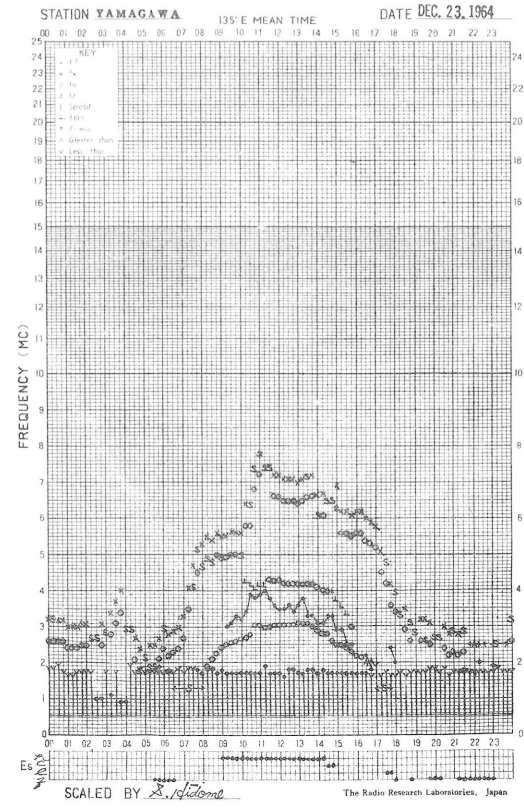
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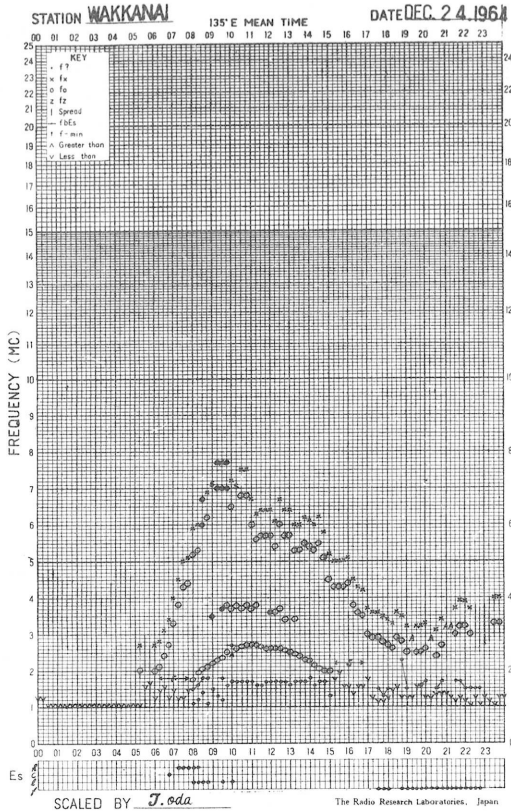
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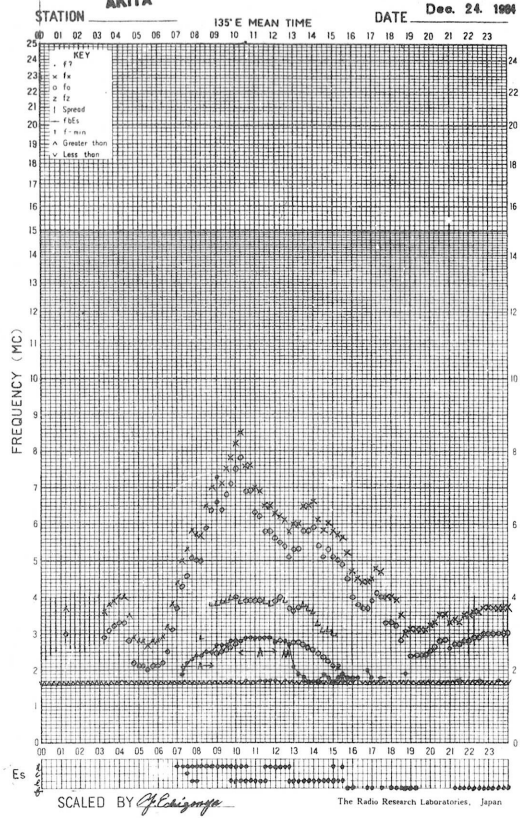
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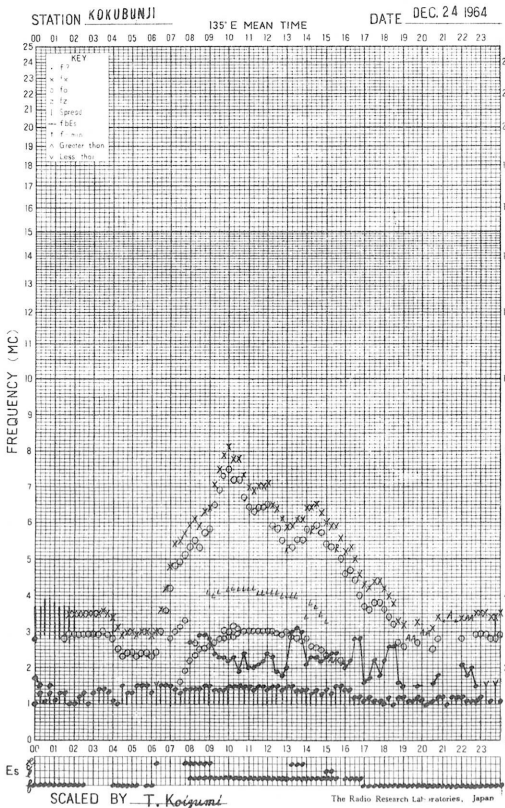
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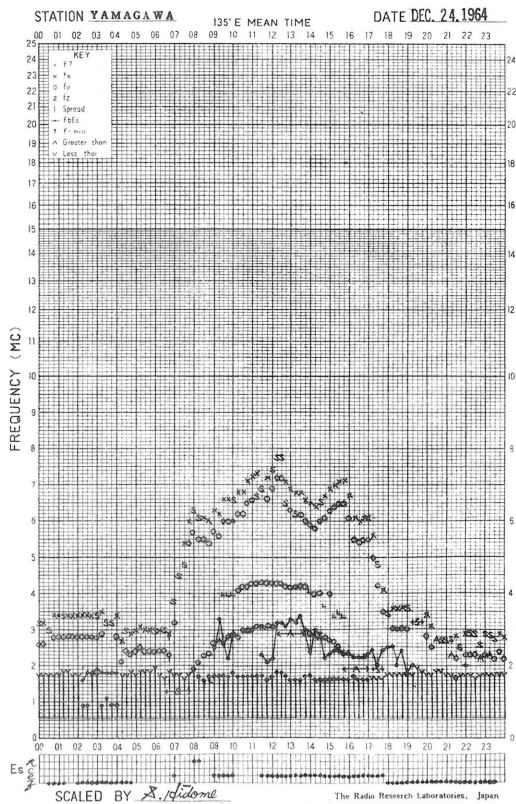
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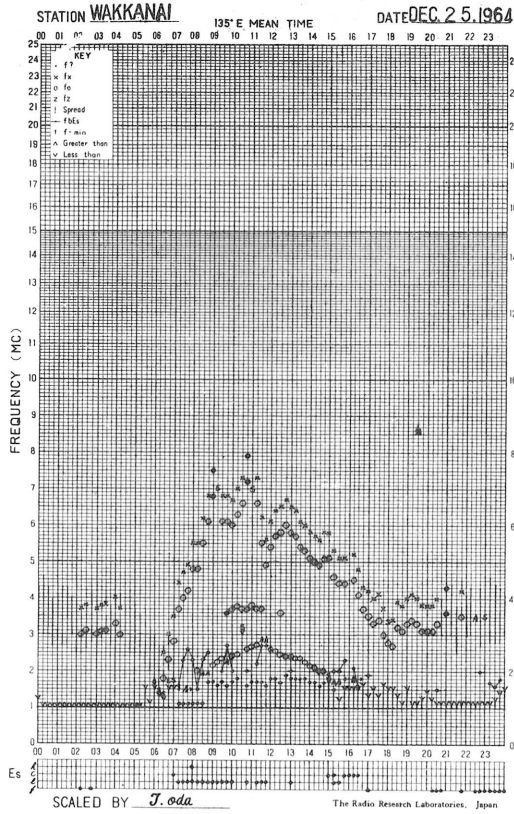
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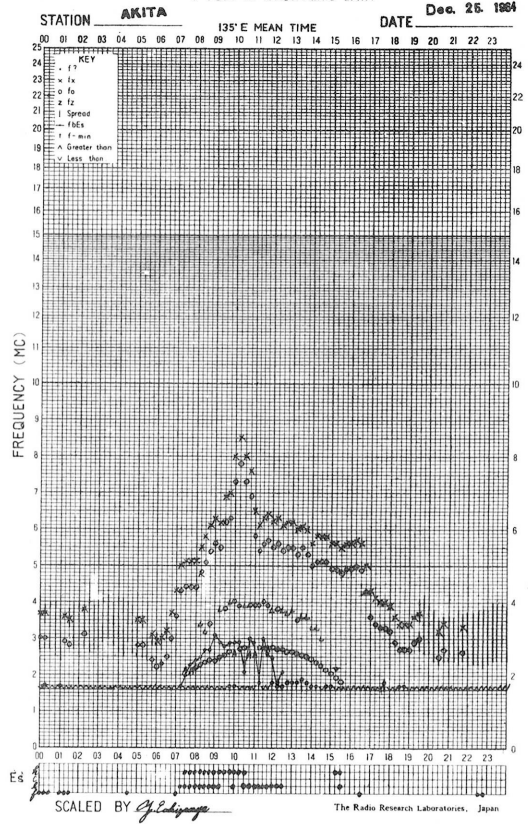
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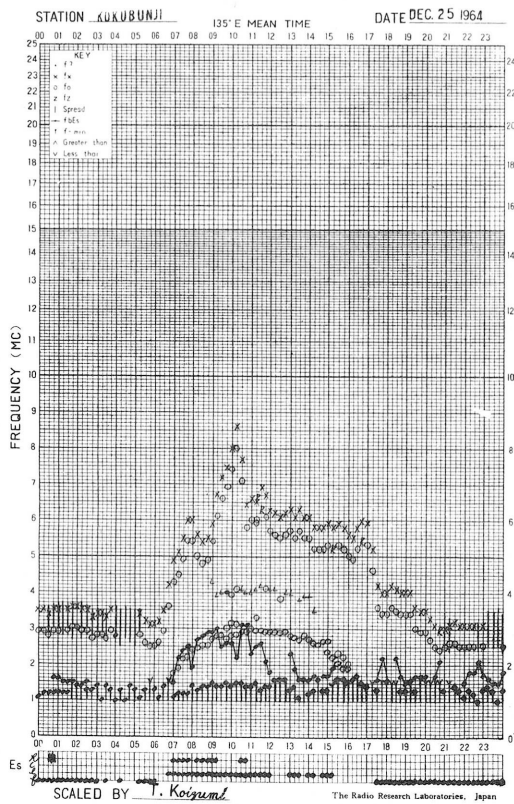
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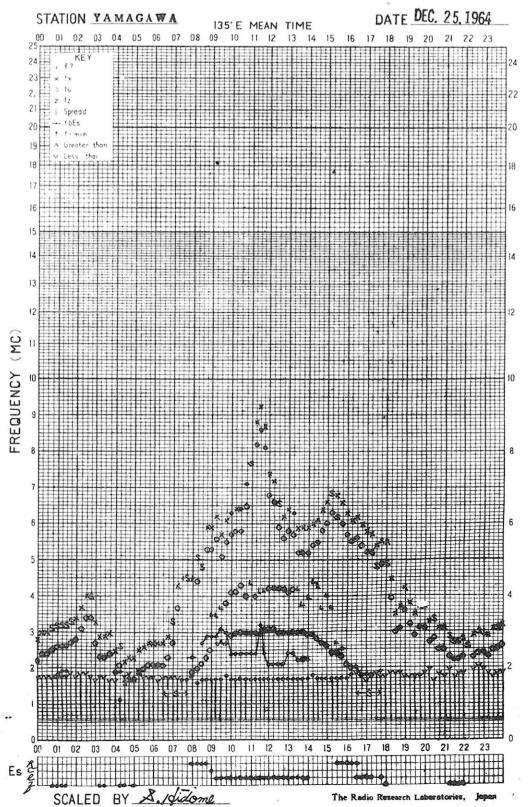
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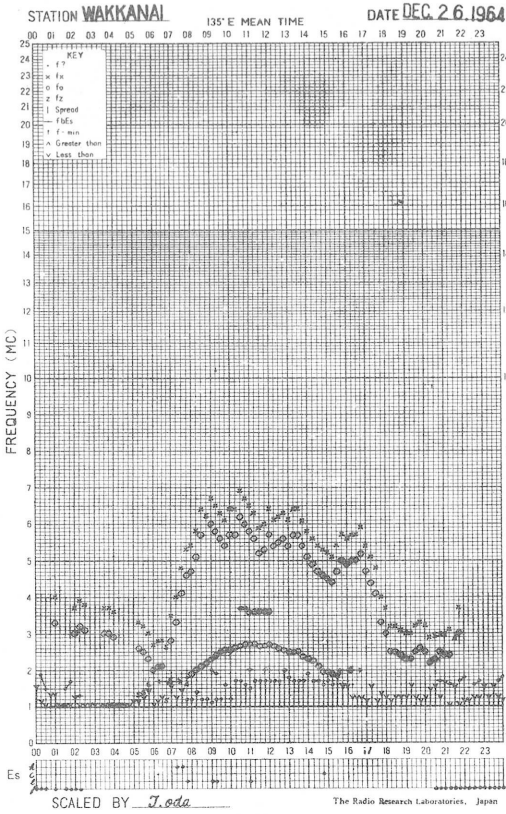
f-PLOT OF IONOSPHERIC DATA



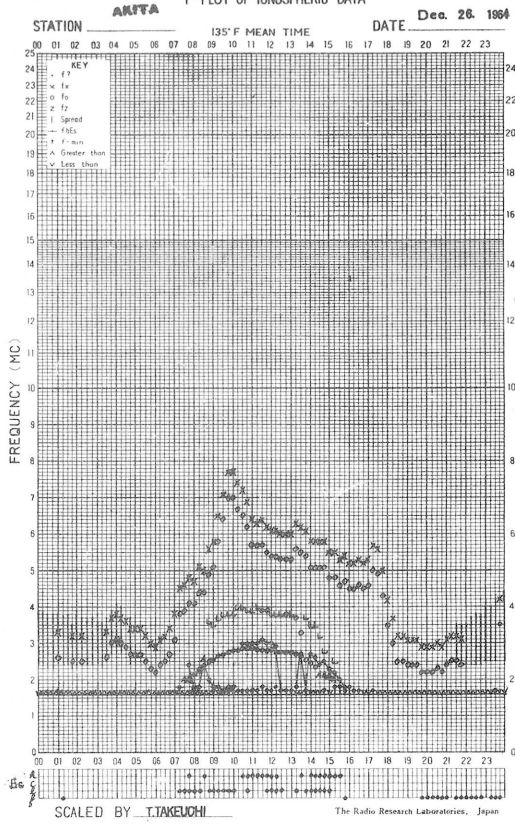
f-PLOT OF IONOSPHERIC DATA



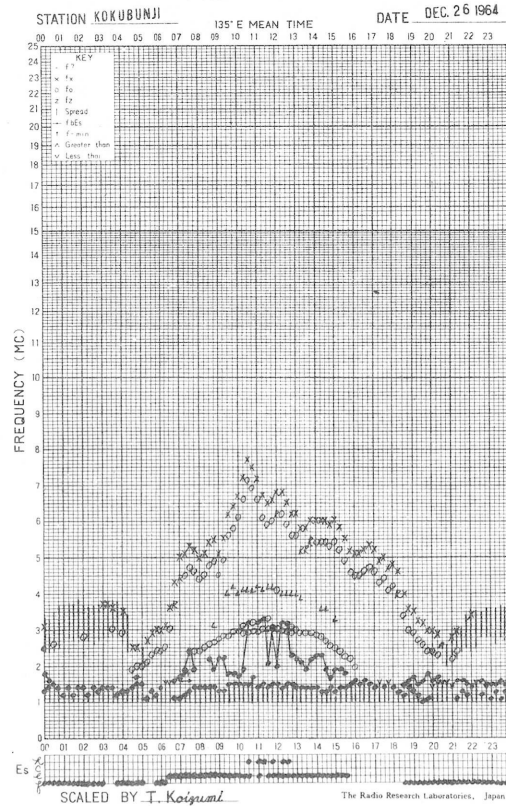
f-PLOT OF IONOSPHERIC DATA



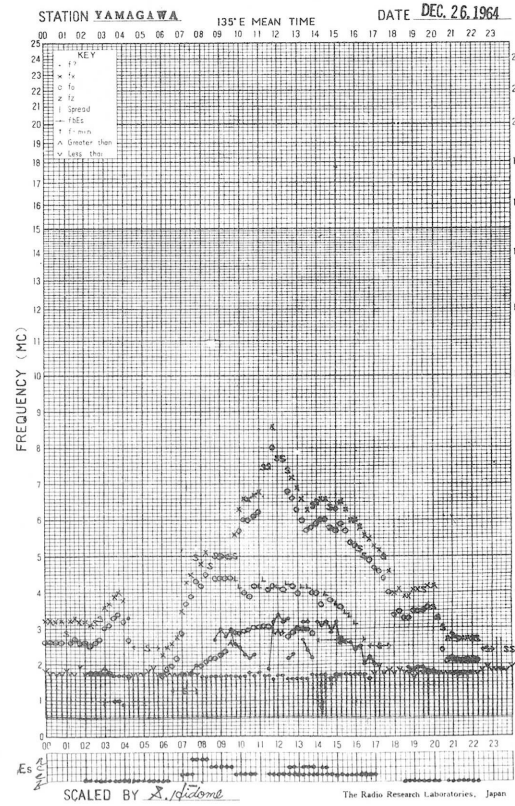
f-PLOT OF IONOSPHERIC DATA



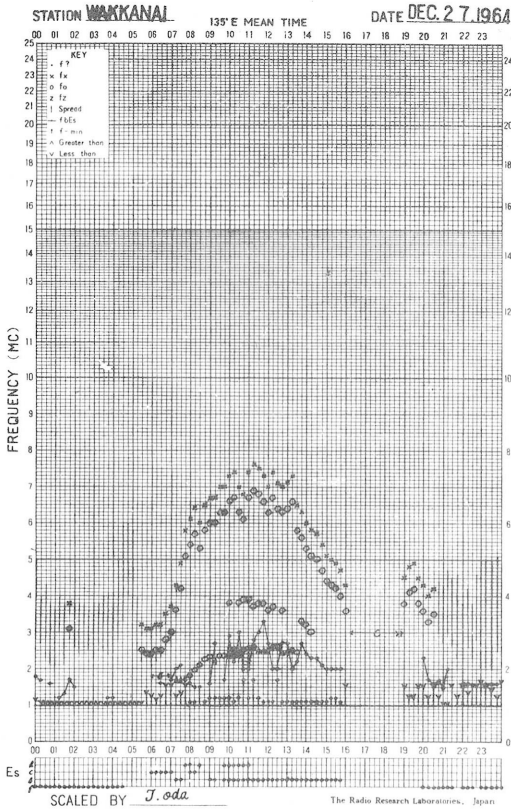
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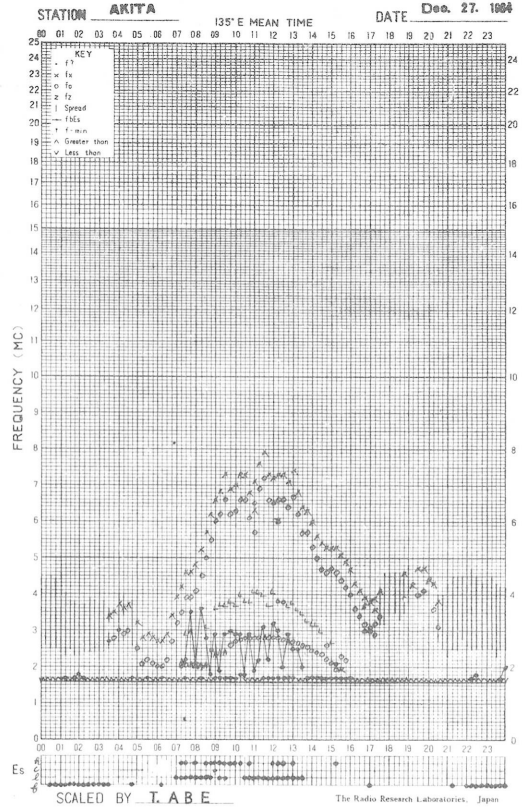
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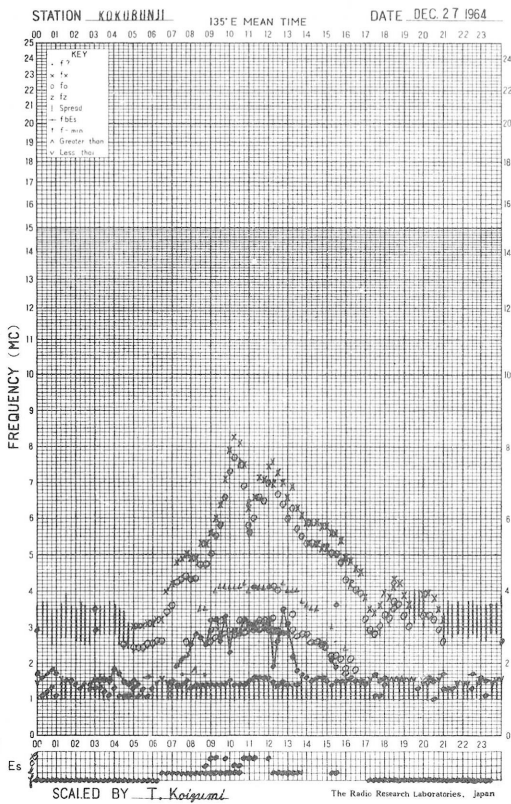
f-PLOT OF IONOSPHERIC DATA



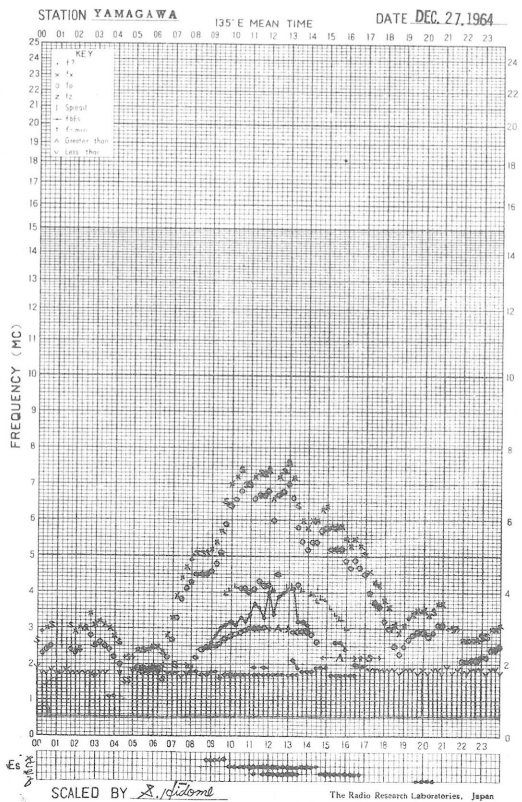
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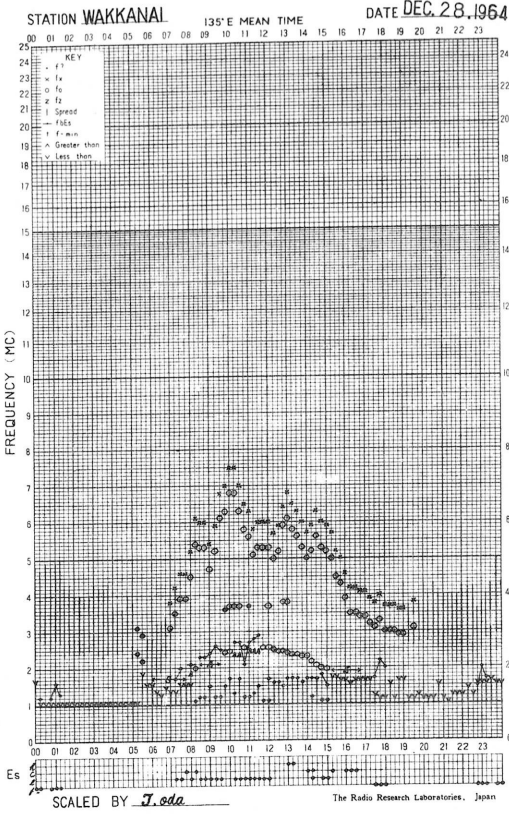
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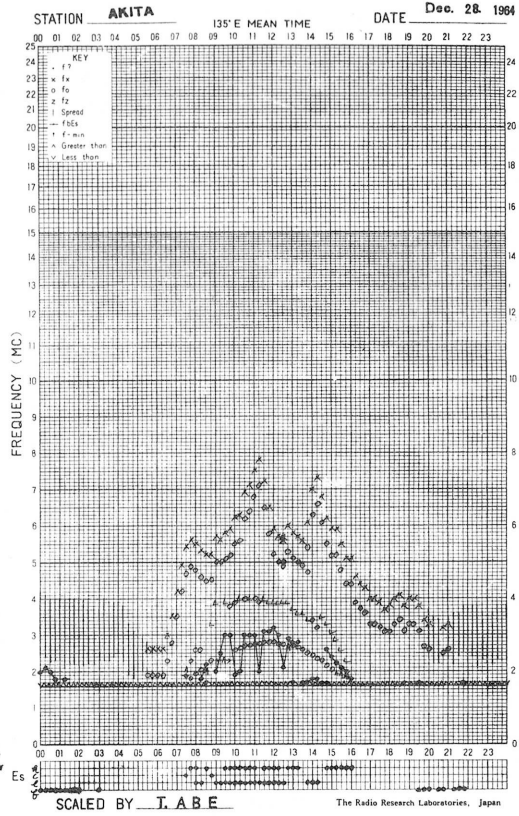
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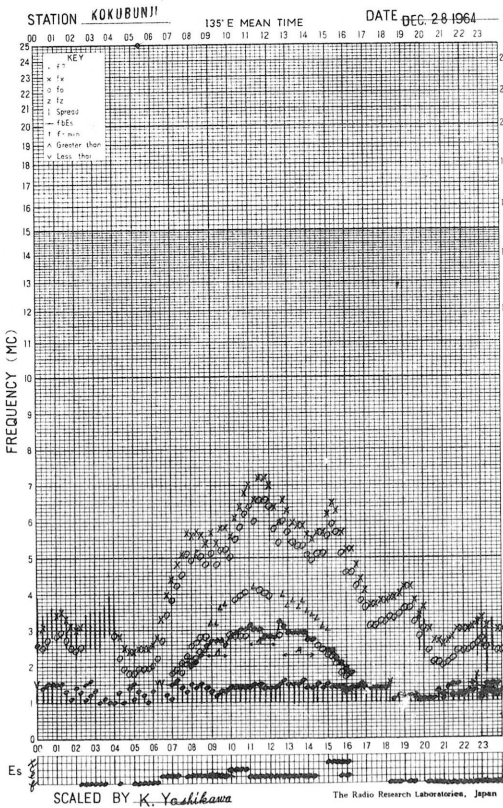
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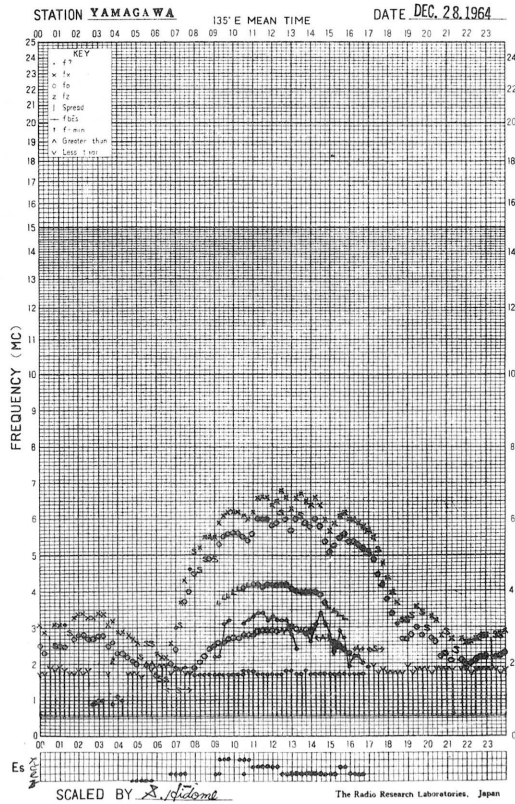
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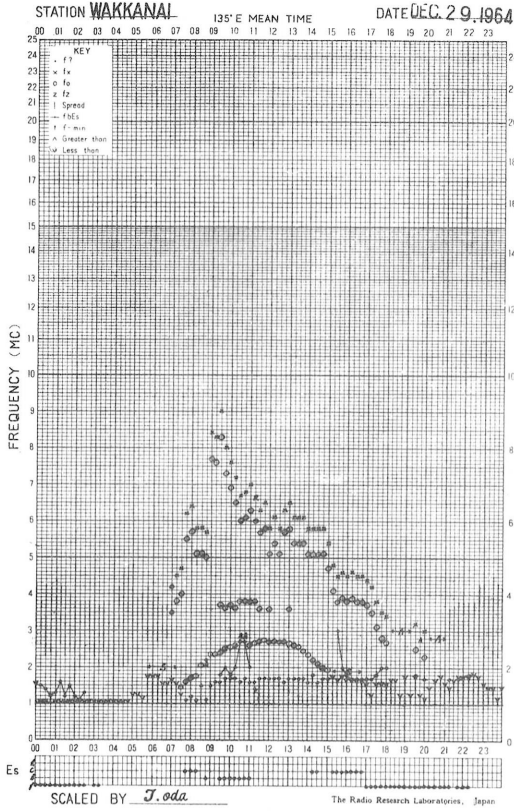
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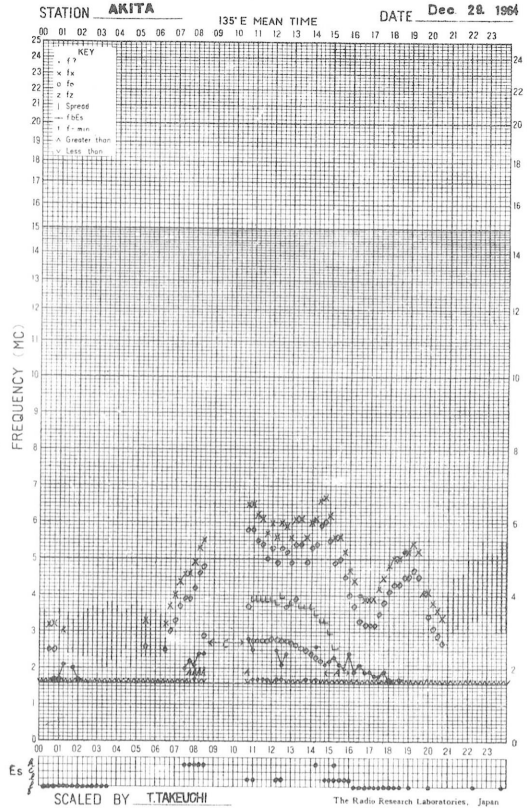
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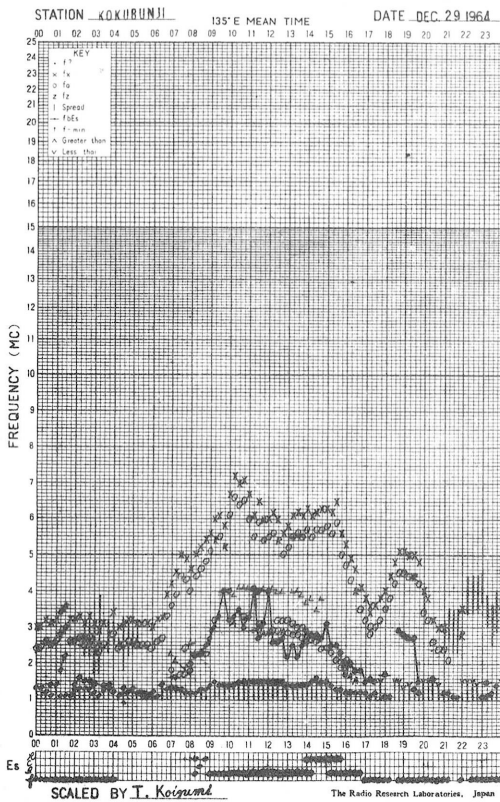
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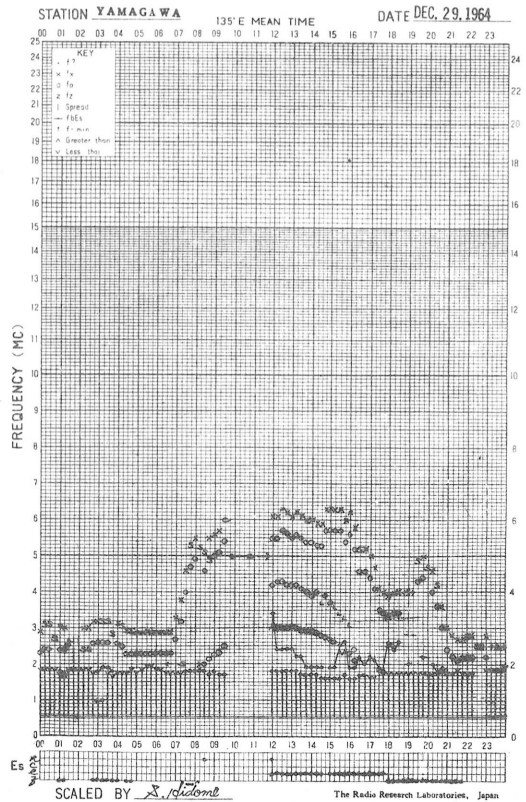
f-PLOT OF IONOSPHERIC DATA



f-PLOT OF IONOSPHERIC DATA

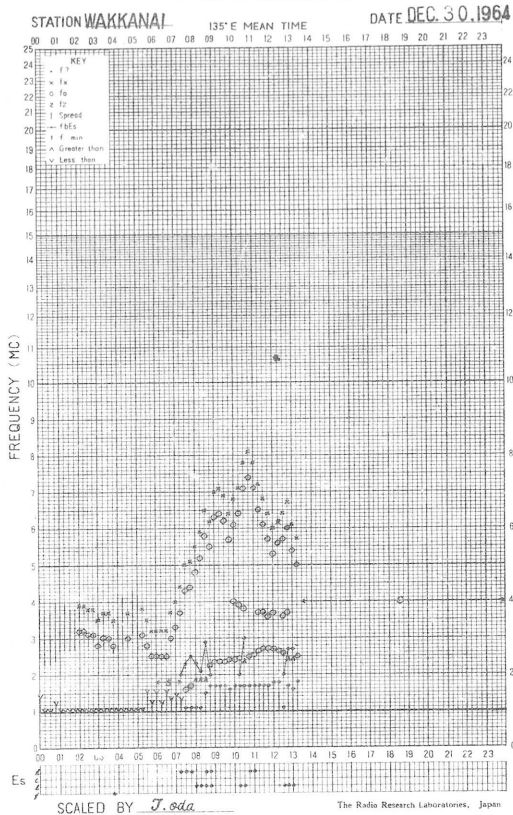


f-PLOT OF IONOSPHERIC DATA

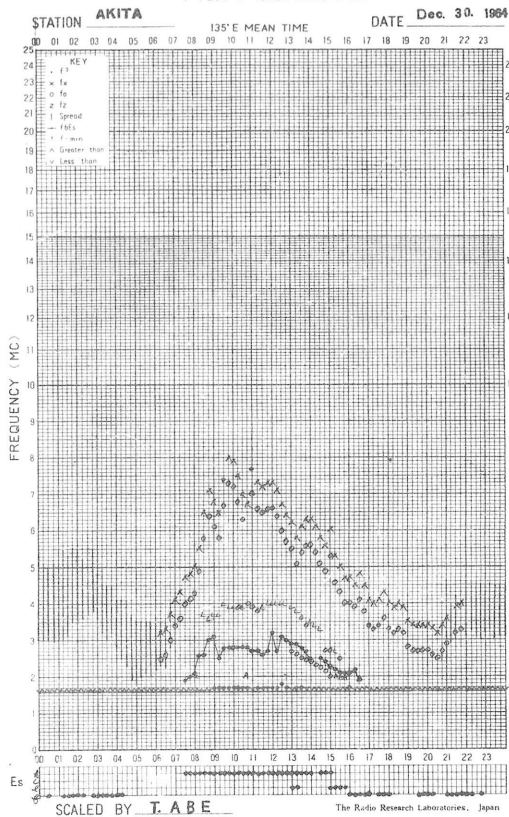




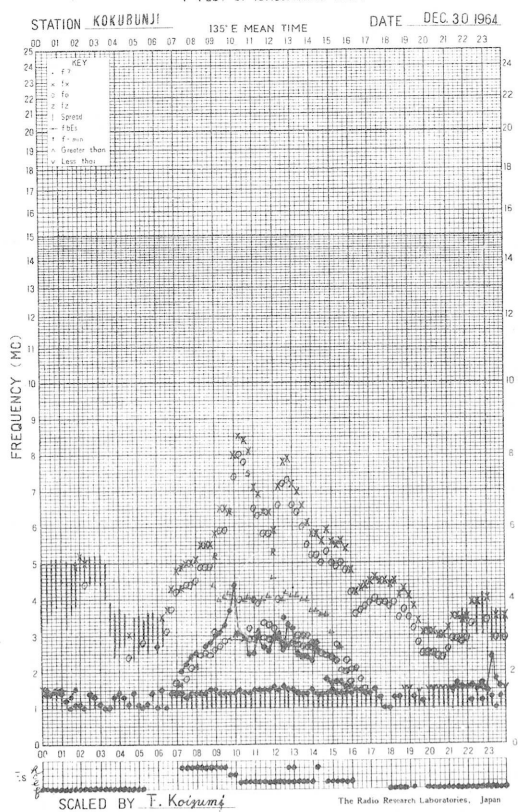
f-PLOT OF IONOSPHERIC DATA



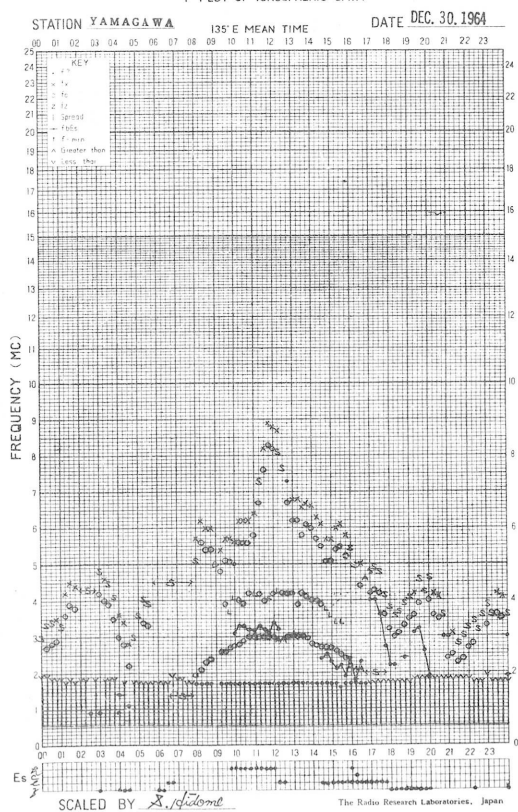
f-PLOT OF IONOSPHERIC DATA



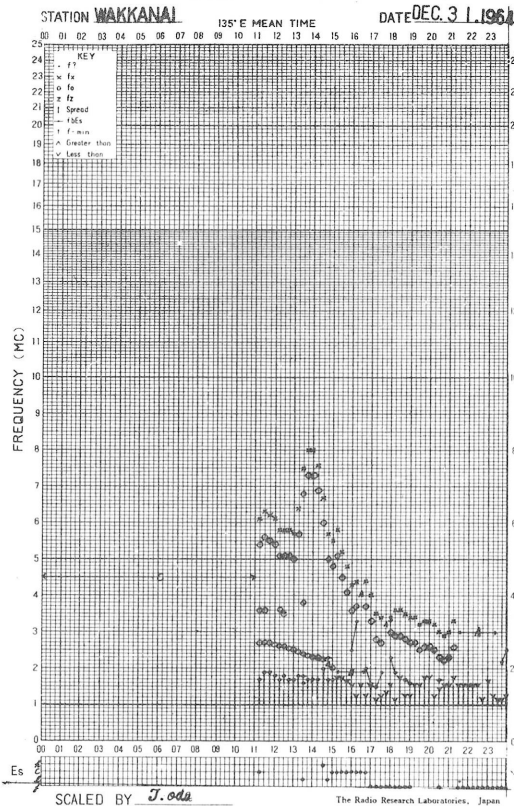
f-PLOT OF IONOSPHERIC DATA



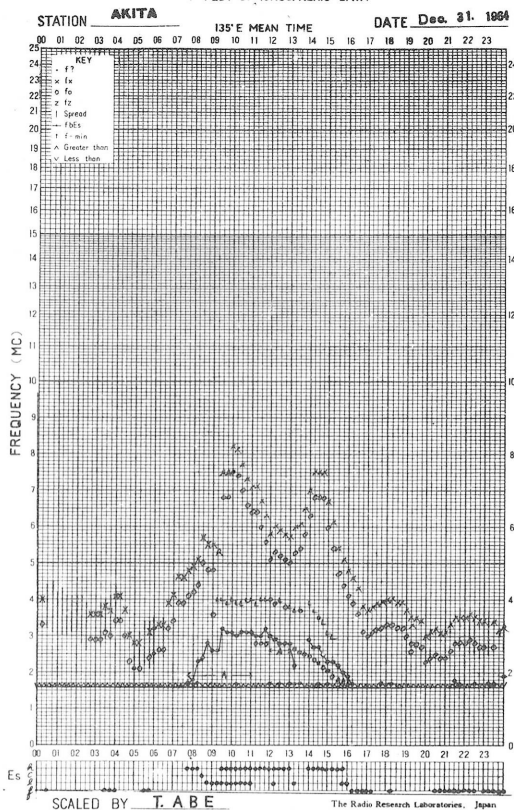
f-PLOT OF IONOSPHERIC DATA



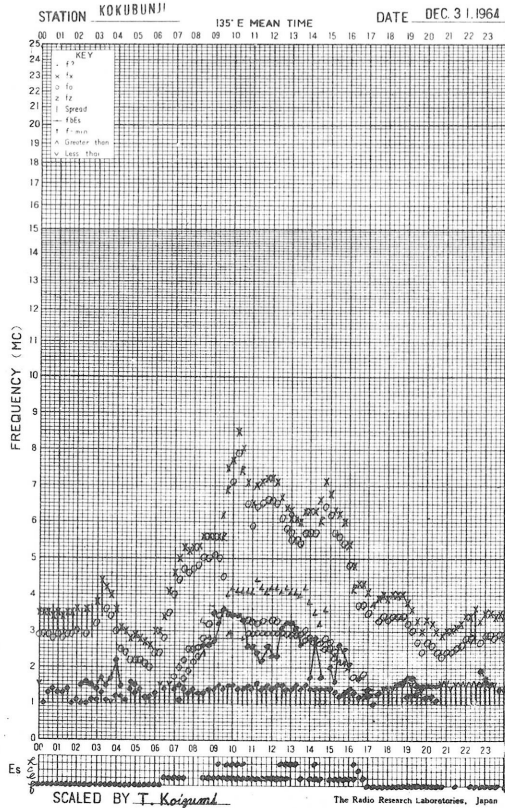
f-PLOT OF IONOSPHERIC DATA



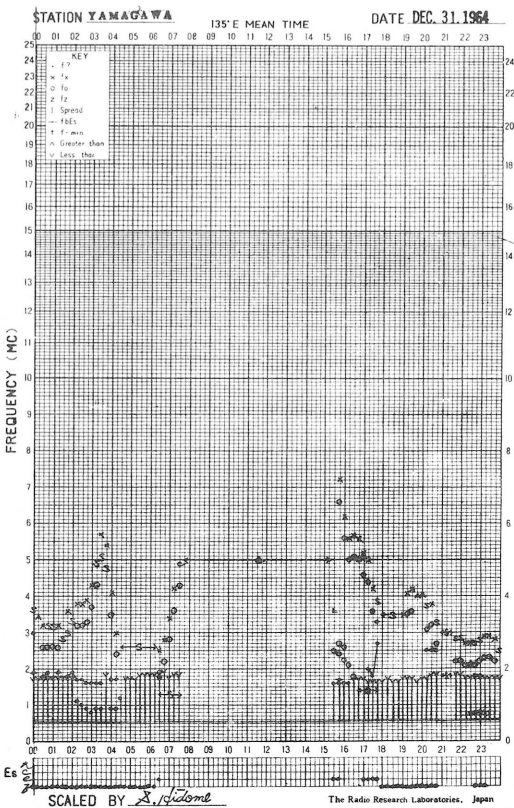
f-PLOT OF IONOSPHERIC DATA



f-PLOT OF IONOSPHERIC DATA



f-PLOT OF IONOSPHERIC DATA



## SOLAR RADIO EMISSION

Flux Density and Variability										
Month: December 1964.						Frequency: 200 Mc/s				
Flux density $10^{-22} W_m^{-2} (c/s)^{-1}$						Variability 0 to 3				
UT	00-03	03-06	06-09	21-24	Day	00-03	03-06	06-09	21-24	Day
Date										
1	9	9	(9)	(9)	9	0	0	(0)	(0)	0
2	10	10	(9)	-	9	0	0	(0)	-	0
3	-	6	(6)	(8)	(6)	-	0	(0)	(0)	(0)
4	8	8	(7)	(8)	8	0	0	(0)	(0)	0
5	8	8	(7)	(8)	8	0	0	(0)	(0)	0
6	7	6	(6)	(9)	7	0	0	(0)	(0)	0
7	9	8	(8)	(7)	8	0	0	(0)	(0)	0
8	8	8	(7)	(9)	8	0	0	(0)	(0)	0
9	9	8	(8)	(7)	8	0	0	(0)	(0)	0
10	7	7	(7)	-	7	0	0	(0)	-	0
11	7	7	(7)	(8)	7	0	0	(0)	(0)	0
12	8	7	(6)	(7)	7	0	0	(0)	(0)	0
13	8	8	(8)	(8)	8	0	0	(0)	(0)	0
14	8	8	(9)	-	8	0	0	(0)	-	0
15	-	-	-	-	-	-	-	-	-	-
16	7	7	(7)	(9)	7	0	0	(0)	(0)	0
17	9	11	(8)	(8)	10	0	0	(0)	(0)	0
18	9	9	(8)	(10)	9	0	0	(0)	(0)	0
19	10	9	(9)	(11)	10	0	0	(0)	(0)	0
20	11	10	(8)	-	10	0	0	(0)	-	0
21	(13)	13	(12)	(12)	13	(0)	0	(0)	(0)	0
22	12	12	(14)	(8)	12	0	0	(0)	(0)	0
23	9	9	(9)	-	9	0	0	(0)	-	0
24	(10)	(11)	-	(11)	(10)	(0)	(0)	-	(0)	(0)
25	11	11	(11)	(10)	11	0	0	(0)	(0)	0
26	11	13	(12)	(17)	12	0	0	(0)	(0)	0
27	16	12	(12)	(12)	14	0	0	(0)	(0)	0
28	12	13	(11)	(12)	12	0	0	(0)	(0)	0
29	12	11	(11)	(11)	12	0	0	(0)	(0)	0
30	11	10	(9)	-	10	0	0	(0)	-	0
31	-	12	(11)	(14)	12	-	0	(0)	(0)	0

Note No observations during the following periods:

2nd 2150-	3rd 0400	23rd 2150-	24th 0100
10th 2150-	11th 0100	24th 0200-	0500
14th 2150-	16th 0100	24th 0600-	0730
20th 2150-	21st 0200	30th 2150-	31st 0300

## SOLAR RADIO EMISSION

<u>Flux Density</u>					
Month: December 1964.					
Observing Station: Hiraiso			Frequency: 500 Mc/s		
Flux density $10^{-22} \text{Wm}^{-2} (\text{c/s})^{-1}$					
UT	00-03	03-06	06-09	21-24	Day
Date					
1	21	20	-	19	20
2	19	20	-	(19)	19
3	-	-	-	-	(19)
4	18	17	-	18	18
5	18	18	-	20	18
6	18	17	-	19	18
7	18	18	-	20	18
8	19	19	-	21	19
9	19	19	-	21	20
10	21	21	-	19	21
11	20	19	-	20	19
12	20	20	-	20	20
13	20	19	-	19	20
14	19	18	-	(19)	19
15	-	-	-	20	(19)
16	-	-	-	-	(20)
17	21	19	-	-	20
18	19	17	-	20	18
19	20	20	-	20	20
20	19	19	-	19	19
21	20	18	-	21	19
22	18	18	-	19	19
23	20	20	-	20	20
24	20	20	-	18	20
25	19	19	-	19	19
26	20	18	-	18	19
27	18	19	-	20	19
28	18	20	-	-	19
29	-	-	-	20	-
30	19	18	-	18	19
31	18	17	-	18	18

Note No observations during the following periods:

2nd	2300-	4th	0100	17th	2150-	18th	0100
9th	0000-		0100	26th	0200-		0300
14th	2300-	15th	0730	28th	2150-	29th	0730
16th	0000-	17th	0100				

## RADIO PROPAGATION QUALITY FIGURES

HIRAISO

Time in U.T.

Dec. 1964	Whole Day Index	L. N.			W W V				S. F.				W W V H				Warning				Principal magnetic storms			
		06	12	18	00	06	12	18	00	06	12	18	00	06	12	18	00	06	12	18	Start	End	ΔH	
		12	18	24	06	12	18	24	06	12	18	24	06	12	18	24	06	12	18	24				
1	4o				(5)	-	-	3	4	4	4	4	4	4	-	4	N	N	N	N				
2	4o				-	-	-	4	4	4	4	4	4	4	5	-	4	N	N	N	N			
3	4-				-	-	-	3	5	4	4	3	4	4	-	3	N	N	N	N				
4	4-				-	-	-	5	3	4	4	3	4	3	-	4	N	N	N	N				
5	4+				(5)	-	-	4	3	4	4	5	4	4	-	4	N	N	N	N				
6	4-				(4)	-	-	3	(4)	4	4	4	4	4	4	-	5	N	N	N	N			
7	4+				-	-	-	5	4	4	4	4	4	4	4	-	4	N	N	N	N			
8	4o				-	-	-	4	4	4	4	4	4	4	4	-	4	N	N	N	N			
9	4+				-	-	-	4	4	4	5	(4)	4	4	-	4	N	N	N	N				
10	4-				(4)	-	-	3	4	4	4	4	4	5	4	-	4	N	N	N	N			
11	4o				-	-	-	4	3	4	4	5	4	4	-	4	N	N	N	N				
12	4+				-	-	-	4	4	4	5	(4)	4	4	-	4	N	N	N	N				
13	4o				-	-	-	3	4	4	5	(4)	3	4	-	4	N	N	N	N				
14	4o				-	-	-	(4)	4	4	4	4	4	4	-	4	N	N	N	N				
(15)	4o				-	-	-	4	4	4	4	4	4	4	-	4	N	N	N	N				
(16)	4+				-	-	-	5	4	4	4	4	4	4	-	5	N	N	N	N				
(17)	4+				-	-	-	4	5	4	4	4	4	4	-	4	N	N	N	N				
18	4+				-	-	-	5	4	4	4	5	5	4	-	4	N	N	N	N				
19	4+				(5)	-	-	5	5	4	4	3	5	5	-	4	N	N	N	N				
20	4+				(4)	-	-	(5)	5	4	4	4	4	4	-	4	N	N	N	N				
21	4+				(5)	-	-	5	3	4	4	4	4	4	-	4	N	N	N	N				
22	4+				(4)	-	-	(4)	4	5	4	4	5	5	-	4	N	N	N	N				
23	4o				-	-	-	4	4	4	4	4	5	4	-	4	N	N	N	N				
24	4-				-	-	-	3	4	4	4	4	4	4	-	4	N	N	N	N				
25	4o				-	-	-	4	4	4	4	4	5	5	-	5	N	N	N	N				
26	4+				-	-	-	4	4	4	4	5	4	4	-	5	N	N	N	N				
27	5-				(5)	-	-	4	5	4	4	5	5	5	-	4	N	N	N	N				
28°	4o				-	-	-	4	5	4	4	3	5	4	-	4	N	N	N	N				
29°	4-				-	-	(4)	4	4	4	4	3	5	4	-	4	N	N	N	N				
30	4-				(5)	-	-	4	3	3	4	3	4	4	-	5	N	N	N	N				
31	4-				-	-	-	4	3	3	4	4	4	4	-	5	N	N	N	N				

## IQSY GEOALERT and ADALERT (Western Pacific Region)

\* = MAGSTORM

o = MAGCALME

Δ = COSMIC EVENT

( ) = Regular World Day

C = artificial accident

- = impossible to evaluate

--- = continuing magnetic storm

( ) = inaccurate

## SUDDEN IONOSPHERIC DISTURBANCES (S.I.D.)

HIRAISO

No Sudden Ionospheric Disturbance was observed during December, 1964.

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IONOSPHERIC DATA IN JAPAN FOR DECEMBER 1964

第 16 卷 第 12 号

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電話 (971) 9341

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