F—240

IONOSPHERIC DATA IN JAPAN

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F−240

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RADIO RESEARCH LABORATORIES

NUKUI-KITAMACHI, KOGANEI-SHI, TOKYO, JAPAN

CONTENTS

SITE OF THE RADIO WAVE OBSERVATORIES AND HIRAISO BRANCH

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

	Latitude	Longitude	Site
Wakkanai	45°23.6′N.	141°41.1′E.	Midori-cho, Wakkanai-shi, Hokkaido
Akita	39°43.5′N.	140°08.2′E.	Tegata Sumiyoshi-cho, Akita-shi, Akita-ken
Kokubunji	35°42.4′N.	139°29.3′E.	Nukui-Kitamachi, 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 Branch.

	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_0F2, f_0F1, f_0E — The ordinary wave critical frequency for the $F2$, $F1$ and E layers, respectively.

f_0E_s — The ordinary wave top frequency corresponding to highest frequency at which a mainly continuous trace is observed.

f_bE_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_0E_s.

$hpF2$ — The virtual height of the $F2$ layer measured on the ordinary

wave component at a frequency equal to $0.834 f_0F2$.

ypF2 The semi-thickness of the *F*2 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 *hpF*2 and the virtual height at $0.969 f_0F2$).

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 *Es*.

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. Definitions of the CNT, MED, UQ and LQ

Median count (CNT) is the number of values from which a median has been computed. In addition to numerical values, the count may include certain descriptive letters.

Median (MED) of a set of numbers is the middle value when the numbers are arranged in order of magnitude, or the average of the two middle values if there is an even number of values.

Upper quartile (UQ) is the median value of the upper half of the values when they are ranked according to magnitude; the *lower quartile* (LQ) is the median value of the lower half.

d. Description of Standard Types of *Es*

The eight standard types of *Es* are identified by corresponding capital letters: *F*, *L*, *C*, *H*, *Q*, *R*, *A*, *S*. These letters suggest the names flat, low, cusp, high, equatorial, retardation, auroral and slant, respectively. The letter '*N*' is used to designate any *Es* trace that does not correspond to any of the eight types.

F	An *Es* 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 *Es* traces observed in the daytime are classified according to their virtual hight: *H* or *L*.
L	A flat *Es* 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 *Es* 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 *Es* 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 *Es* trace lying clearly above the high frequency end of the normal *E* trace. (Usually a daytime type.)
Q	An *Es* 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 *Es* 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 *Es* 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 *Es* trace which rises steadily with frequency and usually emerges from another type *Es* 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 *Es* trace such as *Es-L* or *Es-F*, at frequencies which greatly exceed the *E* layer critical frequency, whereas at low latitudes it usually rises from *Es-Q* *Es-C* or *Es-H* at frequencies near the regular *E* critical frequency. Type *S* is never used to determine f_0Es and $h'Es$. The slant trace is sometimes observed to start at f_0E without echoes clearly identifiable as *Es* echoes being seen.

N The designation '*N*' is used to denote an *Es* 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.

e. Multiple Reflections from *Es*

When the ionogram shows the presence of multiple reflections from *Es* 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 MHz at Hiraiso Branch.
Antennas are two parabolic reflectors : 10 meter for 200 MHz and
5 meter for 500 MHz, 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} $W \cdot m^{-2} Hz^{-1}$ 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 MHz 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.

Bracet means that observation time does not exceed one third of the period.

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 general, 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. Field Strengths of WWV and WWVH

Field Strengths observations of WWV and WWVH transmitted from Fort Collins, Colorado and Hawaii, respectively, are carried out at Hiraiso Branch. In order to avoid interferences with other standard frequency waves on the same frequency, the upper side-band of 440 Hz is picked up by the use of a narrow band pass filter with ±40 Hz bandwidth.

The *tabulated field strength* is the average of peak value of the incident upper side-band field intensity in dB above one microvolt per meter. The *duration* of observation is two minutes for WWV and three minutes for WWVH following the time indicated in universal time on the table.

Particulars of the transmitter and receiver are summarized in the following tables:

Transmitter

	WWV	WWVH
Location	Fort Collins, Colorado Long. 105°02′ W Lat. 40°41′ N	Maui, Hawaii Long. 156°28′ W Lat. 20°46′ N
Power	3 kW for the upper side-band	0.5 kW* for the upper side-band
Antenna	λ/2 vertical	λ/2 vertical
Distance	9150 km	6270 km

* Reduced from the carrier power of 2 kW with amplitude modulation of 100%.

Receiver

Antenna	4.5 m vertical rod
Bandwidth	±40Hz for the upper side-band
Calibration	every half an hour

The meaning of *Descriptive symbols* is as follows:

C: Measurement influenced by, or impossible because of, any non-propagational reasons.

S: Measurement influenced by, or impossible because of, interferences or atmospherics.

U: Inaccurate measurement influenced by interferences, atmospherics, or non-propagational reasons.

E: Less than the following figure.

b. 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)
2=poor (disturbed)
3=rather poor (unstable)
4=normal
5=good

The tabulated circuits contain Hamburg (commercial circuit), WWV (10, 15 and 20 MHz frequencies broadcast from Fort Collins, Colorado), Lima (commercial circuit) and WWVH (10 and 15MHz frequencies broadcast from Hawaii), which are received at Hiraiso Branch.

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

N=normal
U=unstable
W=disturbed

The letter W expresses HF propagation disturbances which are expected to occur during the following 12 hours after issue. The letter U and N also means unstable and normal conditions, respectively.

Whole day radio quality indices stand for the averages of the 6-hourly indices of the circuits of Hamburg, WWV and Lima.

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

c. Sudden Ionospheric Disturbances (S. I. D.)

The data of short wave fade-out (SWF) are prepared from the records of field intensities at Hiraiso, of the following circuits. Start-time, Duration, Type and Importance are obtained from the data of a circuit whose Drop-out Intensity is underlined. Drop-out Intensities of 10, 15 and 20 MHz are indicated by (′), (none), and (″), respectively. Characteristics of the phenomenon are classified as follows.

Circuits and Drop-out intensities

CO.....WWV 20, 15 and 10 MHz (Fort Collins, Colorado)
LM .....Various frequencies of commercial circuit (Lima)
HA.....WWVH 15 and 10 MHz (Hawaii)
TO.....JJY 15 and 10 MHz (Tokyo)
SH.....BPV 15 and 10 MHz (Shanghai)
HB.....Various frequencies of commercial circuit (Hamburg)

Start-time and Duration

Types

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

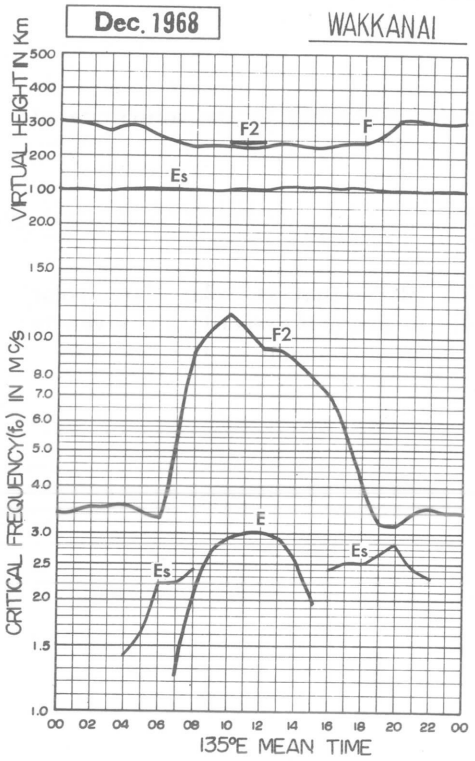
Importances

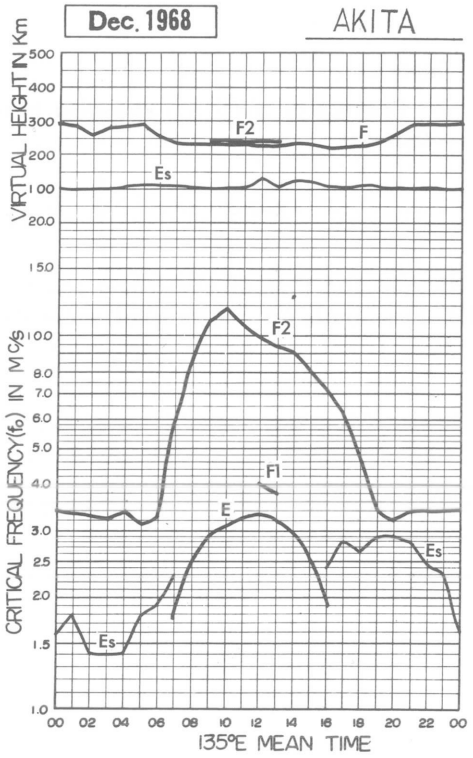
Degrees of SWF are classified into 9 grades according to the amplitude of fade-out ;

1−	1	1+
2−	2	2+
3−	3	3+

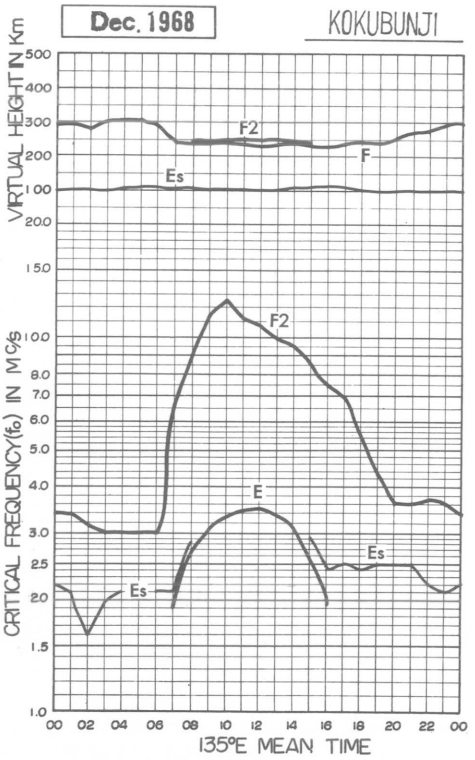
Besides, the time of phenomena associated with SID's, that is, solar flare, solar radio noise outburst and crochet (solar flare effect in magnetic record), are given in this table from interchange messages of IUWDS or measurements at Hiraiso.

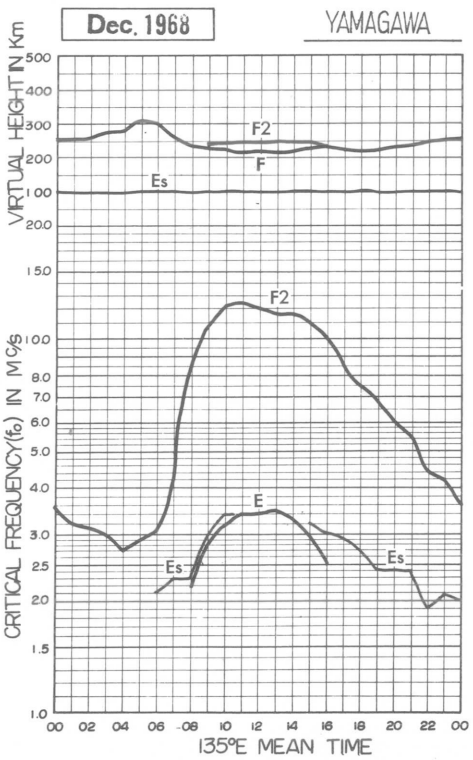
IONOSPHERIC DATA
MONTHLY MEDIAN CHARACTERISTICS





IONOSPHERIC DATA
MONTHLY MEDIAN CHARACTERISTICS





IONOSPHERIC DATA
LIST OF MEDIAN VALUES

OBSERVED AT: WAKKANAI

Dec. 1968

135° E Mean Time (G. M. T. +9h)

CHAR	HR	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
foF2	MED	034	034	035	035	036	034	033	055	091	105	116	107	094	093	086	078	070	054	040	032	031	034	035	034
	CNT	29	30	28	28	29	29	30	30	29	29	28	30	31	31	31	31	31	31	31	31	31	30	30	31
	Q R	005	005	005	007	005	006	004	011	015	012	017	019	015	013	014	009	006	008	010	003	004	004	005	005
foF1	MED												410L	U400L											
	CNT												5	3											
foE	MED								125	205	265	290	300	300	290	255	200	E							
	CNT								7	17	22	23	27	27	27	26	18	5							
foEs	MED	E017E	E015E	E	E011E	014	016	J022X	022	024G	E024G	E023G	G	G	G	G	U020	024	J025X	J025X	J026X	J028X	J024X	J023X	E016E
	CNT	31	31	30	30	30	30	30	30	29	29	29	31	30	30	31	31	31	31	31	31	30	31	31	31
	Q R							D010	D013									014	019	020	016	019	012	008	D009
f-min	MED	E	E	E	E	E	E	E	E	015	017	020	020	020	020	020	017	E	E	E	E	E	E	E	E
	CNT	31	31	30	30	30	30	30	30	29	29	29	31	30	30	31	31	31	31	31	31	30	31	31	31
M (3000) F2	MED	275	275	278	280	275	285	295	318	335	340	335	335	330	325	325	330	330	315	325	305	275	275	278	275
	CNT	29	30	28	28	29	29	30	30	29	29	28	30	31	31	31	31	31	31	31	31	31	30	30	31
M (3000) F1	MED												400L	U415L											
	CNT												5	3											
h'F2	MED										245	240	228	240											
	CNT										1	5	12	7											
h'F	MED	302	300	292	275	292	280	260	242	225	230	235	225	225	240	235	225	225	235	240	260	310	310	300	300
	CNT	31	31	30	30	30	30	30	30	29	29	28	30	31	31	31	31	31	31	31	28	31	31	31	31
h'Es	MED	105	100	100	100	110	110	110	105	105	105	105	115	105	108	115	115	110	110	110	105	105	105	105	105
	CNT	14	14	13	15	19	17	22	20	14	13	11	6	5	8	9	16	23	22	26	25	22	23	24	15
hpF2	MED																								
	CNT																								
ypF2	MED																								
	CNT																								

IONOSPHERIC DATA
LIST OF MEDIAN VALUES

OBSERVED AT: AKITA

Dec. 1968

135° E Mean Time (G. M. T. +9h)

CHAR	HR	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
foF2	MED	034	033	033	032	034	031	033	060	088	110	118	106	099	093	091	082	072	061	047	034	032	034	034	034
	CNT	28	28	27	26	27	27	29	29	29	29	31	31	31	31	31	31	31	31	29	28	28	28	30	28
	Q R	006	005	005	005	006	007	007	010	014	022	014	016	013	014	013	012	009	010	013	009	008	007	005	004
foF1	MED										390L		600H	U405L	U380L										
	CNT										1		1	2	2										
foE	MED								175	245	290	310	325	330	320	295	250	190							
	CNT								5	23	26	29	29	30	29	26	19	9							
foEs	MED	J016X	J018X	J014X	014	J014X	018	J019X	J023X	G	G	G	G	G	G	G	E026G	024	J028X	J026X	J029X	J029X	J028X	J024X	J023X
	CNT	30	30	29	29	29	29	29	29	29	29	28	29	31	31	31	31	30	30	30	31	31	30	31	30
	Q R	D009	010				D007	D012	D012										022	024	028	D026	019	014	D015
f-min	MED	E014S	E	E	E	E	E013E	E014S	014	016	019	022	023	023	022	022	018	015	E014S	E014S	E014S	E014S	E014S	E014S	E014S
	CNT	30	30	29	29	29	29	29	29	29	29	28	29	31	31	31	31	30	30	30	31	31	30	31	30
M (3000) F2	MED	292	290	290	280	285	285	305	330	335	330	335	335	325	325	335	340	335	325	325	320	302	290	295	292
	CNT	28	28	27	26	27	27	29	29	29	29	31	31	31	31	31	31	31	31	29	28	28	28	30	28
M (3000) F1	MED										410L		370H	U338L	U398L										
	CNT										1		1	2	2										
h'F2	MED									235	238	240	235	235	240	245									
	CNT									1	10	30	30	31	27	1									
h'F	MED	290	288	265	280	285	290	262	230	230	230	230	230	225	230	235	230	220	225	230	240	265	292	285	280
	CNT	29	30	29	29	29	29	28	29	29	29	31	31	31	31	31	31	31	31	29	28	28	28	30	28
h'Es	MED	100	100	100	102	110	115	110	110	105	105	105	110	130	105	125	120	110	105	110	105	105	105	105	100
	CNT	17	20	19	14	16	16	17	19	11	7	8	8	7	5	12	15	17	27	23	26	21	25	24	20
hpF2	MED																								
	CNT																								
ypF2	MED																								
	CNT																								

IONOSPHERIC DATA
LIST OF MEDIAN VALUES

OBSERVED AT: KOKUBUNJI

Dec. 1968

135° E Mean Time (G.M.T. +9h)

CHAR \ HR		00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
foF2	MED	034	034	031	030	030	030	030	065	090	114	125	111	108	098	095	085	074	068	054	043	036	036	037	036
	CNT	30	30	29	30	29	31	29	29	30	30	31	31	31	31	30	30	30	30	30	29	27	30	30	30
	Q R	005	006	005	005	005	007	008	009	013	019	019	015	022	017	017	012	013	009	012	014	007	009	009	007
foF1	MED																								
	CNT																								
foE	MED								190	262	305	330	345	348	U335	310	255	195							
	CNT								8	12	23	26	21	22	23	19	9	8							
foEs	MED	022	021	016	020	021	E018	021	021	028	029G	029G	E029G	G	G	E021G	029	024	J025X	J024X	J025X	025	025	022	021
	CNT	31	31	30	31	31	31	31	31	30	30	31	31	31	31	30	30	30	30	31	31	31	31	31	31
	Q R	007	D007	D005	D006	D008	D007	D008	D010								D011	015	017	016	011	D017	015	D012	D009
f-min	MED	E016S	E015S	E016S	E015S	E015S	E015S	E016S	016	016	016	018	025	026	026	016	016	016	E016S	E016S	E016S	E016S	E016S	E016S	E016S
	CNT	031	031	031	031	031	031	031	031	030	030	031	031	031	031	030	030	030	030	031	031	031	031	031	031
M (3000) F2	MED	285	288	290	278	275	280	295	330	335	330	335	325	325	315	320	325	325	320	325	320	300	285	292	290
	CNT	30	30	29	30	29	31	29	29	30	30	31	31	31	31	30	30	30	30	30	29	27	30	30	30
M (3000) F1	MED																								
	CNT																								
h'F2	MED								240	238	245	245	245	250	250	250	240	220							
	CNT								1	6	18	25	25	27	21	15	5	1							
h'F	MED	294	285	275	300	302	310	280	235	232	240	235	230	225	230	240	230	224	230	240	240	250	270	275	290
	CNT	30	30	29	30	30	31	29	31	30	30	30	31	31	31	30	30	30	29	29	29	26	29	29	31
h'Es	MED	100	100	100	100	105	110	110	105	108	105	105	105	100	105	110	110	110	110	105	100	100	100	100	100
	CNT	23	20	14	17	18	15	17	19	20	20	18	15	13	11	14	19	24	25	29	26	21	23	20	17
hpF2	MED	352	342	340	370	370	370	330	275	265	288	280	290	290	295	290	275	278	290	278	290	305	350	345	342
	CNT	30	30	29	30	29	31	29	29	30	30	31	31	31	31	30	30	30	30	30	28	27	30	30	30
ypF2	MED	090	088	090	098	095	095	095	090	080	075	075	075	080	090	080	085	095	085	090	090	095	095	088	090
	CNT	30	30	29	30	29	31	29	29	30	30	31	31	31	31	30	30	30	30	30	28	27	30	30	30

IONOSPHERIC DATA
LIST OF MEDIAN VALUES

OBSERVED AT: YAMAGAWA

Dec. 1968

135° E Mean Time (G.M.T. +9h)

CHAR \ HR		00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
foF2	MED	036	032	031	030	027	029	031	050S	087S	106	122	123	120	116	116	110	101	084	075	068	060	054	044	042
	CNT	31	31	31	31	31	30	31	31	31	29	31	31	31	30	30	31	31	30	31	31	31	31	31	30
	Q R	011	006	008	006	005	004	007	008	014	020	022	019	026	026	021	018	020	016	012	014	012	012	011	015
foF1	MED										330	430L	U450L	480L		U450L	400L	300							
	CNT										2	2	3	2		1	1	3							
foE	MED									220	285	320	340	340	348	330	300	250	170						
	CNT									25	28	30	28	27	26	27	28	26	2						
foEs	MED	020	E015	E015E	E015E	E012E	E014B	021	023	023	J030	034	J034	034G	029G	028G	032	J030X	J029X	J027X	J024X	J024X	J024X	019	021
	CNT	31	31	31	31	31	31	31	31	31	30	28	30	31	31	31	31	31	31	31	31	31	31	30	31
	Q R	D008	D008	D011	D009		D009	D009	007		011	005	010	012	013		010	014	013	012	015	010	D014	D010	D009
f-min	MED	E015S	E014S	012	011	E	012	E015S	E015S	E014S	014	015	016	017	016	015	015	015	E015S	E015S	E015S	E015S	E015S	E015S	E015S
	CNT	31	31	31	31	31	31	31	31	31	30	28	30	31	31	31	31	31	31	31	31	31	31	30	31
M (3000) F2	MED	290	295	290	275	275	268	280	305S	335S	325	320	320	310	302	300	310	320	320	315	320	305	290	290	290
	CNT	31	31	31	31	31	30	31	31	31	29	31	31	31	30	30	31	31	30	31	31	31	31	31	30
M (3000) F1	MED										418	388L	U380L	390L		U360L	375L	405							
	CNT										2	2	3	2		1	1	3							
h'F2	MED									250	240	250	250	250	250	250	248	230							
	CNT									1	23	30	31	31	31	30	28	11							
h'F	MED	262	262	262	U276	U278	315	302	260	230	225	225	215	220	222	225	230	230	220	220	222	228	235	250	252
	CNT	30	30	31	30	31	31	31	31	31	31	31	31	30	29	29	31	31	31	31	31	31	29	31	31
h'Es	MED	100	100	100	100	105	105	105	105	100	105	105	105	105	100	105	105	105	100	105	100	100	100	100	100
	CNT	20	14	15	13	9	10	18	24	22	24	24	26	27	25	21	28	27	28	30	28	25	22	19	19
hpF2	MED																								
	CNT																								
ypF2	MED																								
	CNT																								

IONOSPHERIC DATA

DEC. 1968 | foF2 (0.1) | 135° E Mean Time (G. M. T. + 9 h)

Station WAKKANAI Lat. 45° 23.6' N. Long. 141° 41.1' E Sweep 1.0 Mc to 20.0 Mc in 20 sec in automatic operation

Hour / 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	35	U F 40	F 40	41	38	36	31	62	85	H 94	103	108	93	98	100	86	74	51	34	31	29	33	34	35
2	37	38	37	38	37	35	31	65	101	107	116	109	113	H 104	97	83	70	53	46	40	33	36	36	35
3	35	37	36	I A 35	U S 37	I A 34	34	66	97	124	130	116	119	113	H 114	88	81	63	53	U S 32	29	36	U S 33	F 33
4	33	32	31	31	33	32	36	63	101	123	123	138	106	109	111	96	75	64	64	50	43	43	33	33
5	33	33	32	31	31	30	35	66	94	108	R	R	114	106	98	85	77	56	40	33	35	39	38	42
6	33	35	36	38	36	34	27	57	101	115	124	121	97	93	95	76	84	47	43	34	I A 33	F 33	F 41	F 41
7	F 39	38	38	38	F 37	36	36	62	C	C	C	100	92	91	81	77	63	55	40	39	37	40	41	F 42
8	F 43	U F 43	40	38	40	40	39	63	92	107	116	123	92	87	85	77	67	58	53	36	41	41	40	33
9	30	30	33	37	38	37	43	64	101	128	127	119	104	105	97	83	76	58	47	43	36	34	34	30
10	30	29	29	31	32	31	31	55	91	105	108	103	99	101	86	80	69	58	44	30	33	36	43	29
11	F	F 36	F 39	F 37	U F 34	29	32	63	101	118	120	116	92	98	81	71	70	51	33	27	30	33	36	38
12	37	35	U F 36	F	F 40	40	39	62	83	102	125	122	107	104	104	87	72	50	39	32	30	34	35	37
13	36	35	37	41	41	28	28	53	91	107	117	104	91	90	100	79	64	51	37	31	F 40	F	F	F 43
14	46	F	F	F	43	43	30	50	82	102	116	108	90	93	83	67	69	57	35	30	30	33	36	37
15	37	34	33	35	36	34	32	53	79	93	105	93	81	85	76	67	71	54	40	30	28	I C 29	31	34
16	F	U F 32	C	C	C	C	C	C	C	C	C	93	89	87	83	78	79	67	65	33	31	34	36	37
17	F 35	37	F	U F 39	F 43	F	F 40	55	94	98	104	116	109	101	84	80	64	60	I A 47	30	I C 28	32	33	31
18	32	33	33	34	34	34	33	50	78	97	104	93	90	91	76	73	64	40	31	29	29	31	33	34
19	36	33	34	35	40	28	22	47	82	104	109	94	94	88	86	86	74	51	45	33	29	33	32	34
20	34	33	37	37	F	F 34	34	52	84	98	104	97	91	90	78	69	68	53	40	I A 30	I A 30	29	31	32
21	30	30	32	33	34	30	26	45	74	96	105	97	I C 88	85	79	69	71	48	30	27	32	F 34	F 37	F 33
22	F 33	35	36	F 32	F 33	F 33	34	I A 41	80	110	113	118	111	94	81	76	72	50	38	30	32	37	36	27
23	30	31	33	33	33	34	33	58	80	88	115	109	100	I C 95	87	71	70	57	33	I A 32	30	30	F 33	33
24	30	31	F 30	F 33	27	27	25	I C 56	90	110	121	106	101	98	86	74	69	45	33	22	27	F 30	33	32
25	31	30	30	31	32	30	30	46	98	128	116	97	93	87	86	74	68	58	40	I A 24	24	28	31	33
26	33	33	31	31	31	29	32	51	88	103	96	100	90	90	91	74	63	50	36	32	33	36	38	39
27	40	40	39	38	38	38	33	49	87	110	103	105	88	89	91	80	73	52	39	30	33	36	38	39
28	32	30	29	30	29	32	32	51	91	124	145	123	107	110	96	84	76	61	46	33	33	39	39	30
29	38	38	38	37	37	36	38	52	80	U C 93	116	104	94	92	90	76	69	54	45	34	33	35	35	34
30	33	33	33	31	33	33	33	54	95	92	107	94	90	78	83	78	61	58	50	33	26	33	35	34
31	36	36	36	31	33	34	35	57	105	103	126	115	103	84	I C 82	78	66	50	39	29	30	32	33	33
	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
CNT	29	30	28	28	29	29	30	30	29	29	28	30	31	31	31	31	31	31	31	31	31	30	30	31
MED	34	34	35	35	36	34	33	55	91	105	116	107	94	93	86	78	70	54	40	32	31	34	35	34
UQ	37	37	37	38	38	36	35	62	97	110	122	116	105	101	96	83	74	58	46	33	33	36	38	37
LQ	32	32	32	31	33	30	31	51	82	98	105	97	90	88	82	74	68	50	36	30	29	32	33	33

IONOSPHERIC DATA

DEC. 1968 | foF1 (0.01) | 135 E Mean Time (G. M. T. + 9 h)

Station WAKKANAI Lat. 45 23.6 N. Long. 141 41.1 E Sweep 1.0 Mc to 20.0 Mc in 20 sec in automatic operation

Hour / 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											L	L												
3											L	370	360											
4												L												
5											B	B												
6											L	L												
7										C	C													
8													L											
9																								
10													L											
11																								
12																								
13										A														
14																								
15																								
16										C	C	L 410	U L 400											
17													L											
18																								
19																								
20																								
21													C											
22													U L 420											
23																								
24																								
25											L	L 410	B											
26												U L 420												
27												U L 410												
28												L												
29												L												
30																								
31												L	L											
	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
CNT												5	3											
MED												L 410	U L 400											
UQ												L 410	U L 410											
LQ												L 410	380											

IONOSPHERIC DATA

DEC. 1968 | foE (0.01) | 135° E Mean Time (G. M. T. + 9h)

Station WAKKANAI Lat. 45°23.6'N. Long. 141°41.1'E Sweep 1.0 Mc to 20.0 Mc in 20 sec in automatic operation

Hour / 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	200	265	295	300	300	295	270	205	A							
2								A	220	280	295	300	300	290	275	205	A							
3								A	225	270	290	300	295	290	255	185	S							
4								S	205	250	I A 270	285	290	270	260	S	E							
5								A	200	255	B	B	300	285	230	S	A							
6								A	200	240	285	290	300	290	250	195	A							
7								145	C	C	C	300	300	290	250	195	A							
8								A	A	250	290	300	295	285	260	205	E							
9								S	205	265	290	300	300	290	250	200	S							
10								A	A	A	A	300	A	A	A	200	E							
11								E	A	A	B	B	B	A	B	A	A							
12								A	215	I A 255	295	300	300	290	245	205	S							
13								A	A	A	I A 290	I A 295	300	295	A	A	A							
14								E	A	265	290	300	300	295	255	B	A							
15								A	225	280	300	300	300	300	I C 265	195	S							
16								C	C	C	C	290	295	A	A	R	S							
17								E	210	265	295	300	300	290	250	A	A							
18								S	B	B	B	B	C	290	240	B	S							
19								A	220	I A 255	290	I B 295	300	290	265	B	E							
20								A	A	265	I A 280	300	300	290	250	205	E							
21								A	A	A	A	300	I A 300	300	280	A	A							
22								A	A	A	290	300	300	300	255	S	S							
23								A	A	270	295	300	305	I C 295	255	A	A							
24								A	A	I C 250	I C 280	300	300	290	245	190	A							
25								A	B	B	B	B	B	B	B	B	B							
26								A	210	265	300	300	300	290	255	200	S							
27								S	225	290	300	305	300	300	280	200	S							
28								S	205	255	295	300	300	300	280	215	A							
29								125	200	260	290	300	305	300	270	205	S							
30								130	205	270	295	305	300	290	275	220	S							
31								125	205	265	295	300	300	295	265	200	A							
	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
CNT								7	17	22	23	27	27	27	26	18	5							
MED								125	205	265	290	300	300	290	255	200	E							
UQ								128	220	270	295	300	300	295	270	205	E							
LQ								E	205	255	290	300	300	290	250	195	E							

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IONOSPHERIC DATA

DEC. 1968 | foEs (0.1) | 135° E Mean Time (G. M. T. + 9h)

Station WAKKANAI Lat. 45° 23.6' N. Long. 141° 41.1' E Sweep 1.0 Mc to 20.0 Mc in 20 sec in automatic operation

Hour / 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	JX 25	18	JX 21	20	JX 25	JX 29	JX 23	JX 25	29	G	G	G 23	35	G	G	26	26	JX 40	JX 53	ES 15	ES 15	ES 15	15	ES 15
2	E	E	E	E	JX 20	JX 24	JX 31	23	G	G	G	G	G	G	33	27	30	JX 23	JX 23	JX 33	JX 29	JX 25	24	24
3	ES 15	18	JX 20	JX 61	JX 54	JX 82	JX 39	JX 30	G	G	G 23	G	G	G	30	JX 45	JX 25	JX 41	JX 53	JX 51	JX 35	JX 24	JX 31	JX 33
4	ES 17	20	E	E	17	JX 22	JX 24	ES 16	G	G 21	30	G	G	G	30	30	JX 51	JX 28	JX 24	18	JX 30	JX 24	30	E
5	E	E	E	11	18	JX 35	17	JX 23	G	G	EB 40	EB 41	G	G	G	25	JX 31	JX 63	ES 15	20	ES 17	20	15	22
6	JX 20	17	E	17	15	JX 23	JX 20	JX 24	G	G	G	G	G	G	G	22	JX 20	JX 30	JX 40	JX 35	JX 45	JX 24	JX 21	ES 12
7	JX 21	15	E	E	E	16	24	G	C	C	C	G	G	G	G	G	18	18	JX 33	E	JX 55	JX 21	21	ES 15
8	12	21	JX 23	18	E	JX 26	18	JX 23	JX 25	G	G 25	G	G	G	G	G	21	G 21	JX 33	JX 30	E	19	JX 24	14
9	18	JX 23	15	E	13	18	JX 25	ES 15	G	G	G	G	G	G	G	G	ES 15	ES 15	19	JX 30	JX 31	JX 30	24	JX 21
10	18	E	JX 43	18	E	16	18	JX 26	JX 34	38	39	JX 55	JX 54	JX 60	JX 33	G	JX 51	JX 75	41	JX 34	JX 34	JX 23	JX 23	JX 24
11	JX 21	E	13	JX 24	15	18	JX 24	JX 36	28	JX 45	EB 30	EB 32	EB 34	32	EB 27	24	JX 24	JX 36	JX 31	JX 35	JX 23	JX 40	JX 33	JX 41
12	ES 15	JX 25	JX 23	15	13	JX 25	JX 31	22	G	JX 70	G 25	G	G	G	G	G	ES 15	E	JX 23	E	18	JX 24	JX 20	JX 24
13	JX 23	E	E	E	JX 40	E	JX 23	15	JX 50	JX 73	38	JX 35	G 27	32	33	JX 53	JX 35	JX 23	JX 23	JX 65	JX 53	JX 33	JX 33	20
14	20	JX 25	JX 21	15	JX 25	17	JX 24	JX 30	JX 33	G	G	G	G	G	G	EB 23	17	JX 33	JX 40	JX 24	JX 33	JX 30	JX 23	ES 15
15	JX 23	JX 25	JX 23	JX 23	E	E	JX 23	JX 24	JX 36	JX 34	G 21	34	G 25	G	G 23	G	ES 13	ES 16	JX 83	JX 24	JX 40	DC 22	ES 17	ES 15
16	E	20	C	C	C	C	C	C	C	C	C	G	G	29	27	G	20	JX 31	15	E	JX 23	JX 23	JX 23	JX 23
17	JX 21	18	JX 21	20	JX 23	E	E	G	G	JX 33	G	G	G	32	32	25	JX 30	JX 35	JX 90	JX 25	C	JX 23	E	E
18	ES 15	E	E	E	15	E	16	G	G	EB 28	EB 30	EB 36	EC 32	36	38	JX 63	JX 35	JX 35	JX 30	24	E	ES 15	ES 15	E
19	E	E	E	E	E	JX 21	E	19	G	30	G	EB 30	G	G	G	27	JX 35	JX 64	20	17	ES 17	ES 15	E	ES 18
20	E	ES 15	E	E	E	JX 23	JX 21	JX 41	JX 31	28	JX 43	G	G	G	G	G	JX 50	JX 33	JX 25	JX 53	JX 70	JX 33	JX 23	JX 23
21	JX 25	E	JX 23	JX 25	14	E	E	18	JX 35	JX 41	JX 45	G	C	G 22	G	31	JX 74	JX 83	63	JX 31	JX 40	JX 28	JX 20	JX 21
22	JX 24	JX 28	E	E	20	E	JX 33	JX 70	JX 40	JX 40	G 27	G	G	G	G	26	JX 33	18	JX 34	JX 23	JX 24	JX 30	JX 30	ES 15
23	E	E	E	E	E	E	E	JX 40	JX 40	G 24	G	G	G	C	G	33	27	JX 31	JX 63	JX 63	JX 36	JX 33	JX 30	JX 45
24	JX 35	JX 43	20	15	JX 25	JX 33	JX 28	DC 25	26	EC 34	EC 43	G	G	G	G	22	18	E	E	JX 33	JX 26	ES 15	20	ES 16
25	ES 17	E	ES 15	E	E	ES 15	JX 34	18	EB 24	EB 30	EB 35	EB 35	EB 40	EB 36	EB 30	EB 24	EB 16	ES 16	21	JX 26	E	ES 15	JX 25	JX 24
26	20	ES 16	JX 23	JX 25	JX 51	E	JX 44	JX 33	24	G	G	G	G	G	G	G	ES 16	ES 15	ES 15	JX 53	JX 30	JX 35	E	ES 16
27	EC 31	E	E	E	E	JX 24	ES 16	ES 15	G	G	G	G	G	G	G	G	ES 16	ES 15	20	JX 30	JX 55	JX 25	JX 33	JX 21
28	E	E	E	E	E	E	15	ES 15	G	G	G	G	G	G	G	G	22	ES 13	ES 15	ES 16	JX 23	E	JX 24	ES 15
29	E	E	E	E	JX 21	E	E	G	G	G	G	G	G	G	G	G	ES 18	ES 16	F	ES 16	ES 16	E	E	E
30	E	E	E	E	E	E	E	G	25	30	32	33	33	31	G	G 18	ES 16	JX 25	20	18	ES 16	E	ES 15	E
31	E	E	E	13	13	E	E	G	G	G	G	33	G	G	G	G	28	JX 25	JX 25	JX 30	JX 23	JX 23	JX 21	ES 15
	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
CNT	31	31	30	30	30	30	30	30	29	29	29	31	30	30	31	31	31	31	31	31	30	31	31	31
MED	EE 17	EE 15	E	EE 11	14	16	JX 22	22	24	EG 24	EG 23	G	G	G	G	U 20	24	JX 25	JX 25	JX 26	JX 28	JX 24	JX 23	EE 16
UQ	JX 21	20	JX 21	18	JX 21	JX 24	JX 25	JX 28	JX 31	34	U 28	EG 32	EG 25	U 26	26	26	JX 32	JX 35	JX 40	JX 34	JX 36	JX 29	JX 24	JX 23
LQ	E	E	E	E	E	E	EE 15	EG 15	G	G	G	G	G	G	G	G	18	16	20	18	17	17	16	ES 14

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f_bEs (0.1)

135° E Mean Time (G. M. T. + 9 h)

Station WAKKANAI Lat. 45°23.6'N, Long. 141°41.1'E Sweep 1.0 Mc to 20.0 Mc in 20 sec in automatic operation

Hour / 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	16	15	16	E	18	20	15	18	G 18	G	G	G 19	G 20	G	G	G 13	24	30	20	E	E	E	E	E
2	E	E	E	E	17	17	17	19	G	G	G	G	G	G	G	G	20	18	16	20	19	20	E S 18	E S 19
3	E	17	16	A	30	A	17	20	G	G	G 19	G	G	G	G	41	22	38	30	20	14	17	18	19
4	E	12	E	E	14	17	17	E	G	G 21	30	G	G	G	G	G	36	17	16	15	15	18	15	E
5	E	E	E	E	14	11	12	18	G	G	E B 40	E B 41	G	G	G	23	19	40	E	16	E	16	15	E
6	14	E	E	12	E	12	15	18	G	G	G	G	G	G	G	G	15	17	18	20	A	20	18	E
7	15	12	E	E	E	E	E S 15	G	C	C	C	G	G	G	G	G	16	15	21	E	18	17	17	E
8	E	E	12	11	E	18	E	17	20	G	G 20	G	G	G	G	G	17	E	17	18	E	15	18	14
9	E	14	E	E	E	15	16	E S 15	G	G	G	G	G	G	G	G	E S 15	E	15	12	20	17	E S 15	12
10	15	E	16	12	E	14	12	20	22	35	35	23	31	32	27	G	18	20	25	17	18	14	15	16
11	15	E	12	20	12	E	17	25	23	23	E B 30	E B 32	E B 34	31	E B 27	23	19	33	20	17	16	18	25	23
12	E	13	12	E	E	15	20	20	G	50	G 22	G	G	G	G	G	E S 15	E	16	E	17	15	16	17
13	16	E	E	E	E	E	15	15	23	42	30	31	G 27	26	30	30	30	18	17	20	21	20	18	15
14	15	17	E	E	17	15	20	24	24	G	G	G	G	G	G	E B 23	16	15	19	15	18	18	17	E
15	E S 15	16	12	12	E	E	15	15	15	25	G 20	G	G 24	G	G 22	G	E S 13	E	15	18	20	17	E	E
16	E	14	C	C	C	C	C	C	C	C	C	G	G	29	27	G	17	31	E	E	17	15	17	19
17	17	13	15	E	E	E	E	G	G	20	G	G	G	G	G	24	27	18	A	16	C	E	E	E
18	E	E	E	E	13	E	14	G	G	E B 28	E B 30	E B 36	E C 32	G	38	24	28	20	20	20	E	E	E	E
19	E	E	E	E	E	15	E	16	G	29	G	E B 30	G	G	G	G	33	23	19	15	E	E	E	E
20	E	E	E	E	E	15	18	22	26	22	39	G	G	G	G	G	43	20	20	A	A	17	15	16
21	17	E	E	15	12	E	E	17	24	29	35	G	C	G 21	G	27	20	16	20	17	20	16	17	E
22	21	20	E	E	16	E	29	A	24	27	G 25	G	G	G	G	G	24	E	19	12	16	20	16	E
23	E	E	E	E	E	E	E	29	35	G 20	G	G	G	C	G	23	18	28	21	A	19	20	20	20
24	18	20	E	E	E	18	17	A	23	E C 34	E C 43	G	G	G	G	G	14	E	E	17	15	E	16	E
25	E	E	E	E	E	E	16	16	E B 24	E B 30	E B 35	E B 35	E B 40	E B 36	E B 30	E B 24	E B 16	E	18	A	E	E	19	14
26	16	E	13	14	11	E	18	15	19	G	G	G	G	G	G	G	E S 16	E	E	15	16	20	E	E
27	E C 31	E	E	E	E	E	E	E S 15	G	G	G	G	G	G	G	G	E S 16	E	16	E S 15	18	16	18	E S 16
28	E	E	E	E	E	E	12	E S 15	G	G	G	G	G	G	G	G	19	E	E S 15	E S 16	E	E	15	E
29	E	E	E	E	E	E	E	G	G	G	G	G	G	G	G	G	E S 18	E	E	E	E	E	E	E
30	E	E	E	E	E	E	E	G	G	G	G	G	G 21	G	G	G 18	E S 16	16	16	15	E	E	E	E
31	E	E	E	E	E	E	E	G	G	G	G	G	G	G	G	G	18	17	15	16	16	18	17	E
	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
CNT	31	31	30	30	30	30	30	30	29	29	29	31	30	30	31	31	31	31	31	31	30	31	31	31
MED	E	E	E	E	E	E	15	16	G	E G 20	E G 19	G	G	G	G	G	18	17	17	16	16	16	16	E
UQ	16	14	12	11	13	15	17	20	23	U 26	U 25	E G 19	E G 20	G	G	22	23	20	20	19	19	18	18	17
LQ	E	E	E	E	E	E	E	15	G	G	G	G	G	G	G	G	E E 15	E	15	14	E	E	E E 15	E

IONOSPHERIC DATA

DEC. 1968 | f-min (0.1) | 135° E Mean Time. (G. M. T. + 9h)

Station WAKKANAI Lat. 45°23.6'N. Long. 141°41.1'E Sweep 1.0 Mc to 20.0 Mc in 20 sec in automatic operation

Hour / 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	E	E	E	E	E	E	E	E	11	12	12	12	12	11	E	E	E	E	ES 15	ES 15	ES 15	E	ES 12
2	E	E	E	E	E	E	E	E	12	16	17	16	18	19	20	17	E	E	ES 15	ES 15	E	ES 15	ES 18	ES 19
3	ES 15	E	E	E	E	E	E	11	16	17	17	19	20	12	15	17	ES 16	E	E	ES 12	ES 13	ES 16	E	ES 12
4	ES 17	E	E	E	E	E	E	ES 16	17	18	20	23	23	20	20	ES 19	E	E	E	E	E	E	E	E
5	E	E	E	E	E	E	E	E	17	20	40	41	23	20	20	ES 18	E	E	ES 15	E	ES 17	E	E	E
6	E	E	E	E	E	E	E	E	17	20	20	23	22	20	19	17	E	E	E	E	ES 15	E	E	ES 12
7	E	E	E	E	E	E	ES 14	E	C	C	C	22	20	19	17	12	E	E	E	E	E	E	E	ES 15
8	ES 12	E	E	E	E	E	E	E	E	16	11	18	17	15	14	12	E	E	E	E	E	E	E	E
9	E	E	E	E	E	E	E	ES 15	15	17	20	20	20	20	18	12	ES 15	ES 15	E	E	E	E	ES 15	E
10	E	E	E	E	E	E	E	E	E	17	18	17	16	16	17	18	E	E	E	E	E	E	E	E
11	E	E	E	E	E	E	E	E	16	20	30	32	34	25	27	18	E	E	E	E	ES 15	E	E	E
12	ES 15	E	E	E	E	E	E	E	17	17	20	28	24	21	21	18	ES 15	E	E	E	E	E	E	E
13	E	E	E	E	E	E	E	E	13	19	18	20	21	19	17	E	E	E	E	E	E	ES 17	E	E
14	E	E	E	E	E	E	E	E	11	18	21	26	23	22	20	23	E	E	E	E	E	E	ES 15	ES 15
15	ES 15	E	E	E	E	E	E	E	E	E	16	21	19	21	17	16	ES 13	ES 16	E	E	ES 15	E	ES 17	ES 15
16	E	E	C	C	C	C	C	C	C	C	C	20	20	18	18	17	ES 12	E	E	E	E	E	E	E
17	ES 15	E	E	E	E	E	E	E	16	11	21	22	20	20	20	17	E	E	E	E	C	E	E	E
18	ES 15	E	E	E	E	E	E	ES 11	20	28	30	36	EC 32	27	21	18	ES 15	ES 15	ES 14	E	E	ES 15	ES 15	E
19	E	E	E	E	E	E	E	E	18	18	23	30	26	23	20	18	E	E	E	E	ES 17	ES 15	E	ES 18
20	E	ES 15	E	E	E	E	E	E	E	15	17	21	20	21	20	17	E	E	E	E	E	E	E	ES 15
21	E	E	E	E	E	E	E	E	E	16	17	20	C	15	20	18	E	E	E	ES 15	E	E	E	E
22	E	E	E	E	E	E	E	E	E	18	20	24	23	23	20	ES 19	ES 12	E	E	E	E	E	E	ES 15
23	E	E	E	E	E	E	E	E	16	17	20	20	20	C	18	12	E	E	E	E	E	E	E	E
24	E	E	E	E	E	E	E	E	11	EC 34	EC 43	21	25	22	20	16	E	E	E	E	E	ES 15	E	ES 16
25	ES 17	E	ES 15	E	E	ES 15	E	E	24	30	35	35	40	36	30	24	16	ES 16	E	E	E	ES 15	E	E
26	E	ES 16	E	E	E	E	E	E	15	18	20	20	20	24	20	17	ES 16	ES 15	ES 15	E	E	E	E	ES 16
27	EC 31	E	E	E	E	E	ES 16	ES 15	17	18	20	20	21	20	20	16	ES 16	ES 15	ES 15	ES 15	E	E	E	ES 16
28	E	E	E	E	E	E	E	ES 15	15	17	19	20	21	23	21	17	14	ES 13	ES 15	ES 16	E	E	E	ES 15
29	E	E	E	E	E	E	E	E	E	19	20	20	20	20	19	18	ES 18	ES 16	E	E 16	E 16	E	E	E
30	E	E	E	E	E	E	E	E	E	16	19	20	16	19	19	12	ES 16	E	E	E	ES 16	E	E 15	E
31	E	E	E	E	E	E	E	E	16	17	20	18	20	24	19	16	E	E	E	E	E	E 15	E 16	E 15
	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
CNT	31	31	30	30	30	30	30	30	29	29	29	31	30	30	31	31	31	31	31	31	30	31	31	31
MED	E	E	E	E	E	E	E	E	15	17	20	20	20	20	20	17	E	E	E	E	E	E	E	E
UQ	EE 14	E	E	E	E	E	E	E	17	18	20	24	23	23	20	18	ES 15	EE 13	E	E	ES 15	ES 15	E	ES 15
LQ	E	E	E	E	E	E	E	E	E	16	18	20	20	19	18	16	E	E	E	E	E	E	E	E

IONOSPHERIC DATA

DEC. 1968

M(3000)F2(0.01)

135° E Mean Time (G. M. T. + 9 h)

Station WAKKANAI Lat. 45°23.6'N, Long. 141°41.1'E Sweep 1.0 Mc to 20.0 Mc in 20 sec in automatic operation

Hour / 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	265	U F 255	F 270	280	285	290	290	325	340	H 310	340	320	345	325	325	310	340	315	305	315	275	265	265	265
2	255	260	255	280	280	310	285	335	340	340	335	330	345	H 310	320	350	330	315	310	320	285	270	280	275
3	270	270	265	I A 265	U S 275	I A 280	300	320	320	325	330	330	320	320	H 290	320	335	315	345	U S 295	275	270	U S 270	F 265
4	280	270	265	265	280	280	335	315	335	340	325	335	320	330	315	355	355	310	315	330	315	320	305	255
5	260	265	255	250	260	270	315	325	340	335	R	R	335	340	305	330	310	320	325	300	255	285	270	290
6	275	255	250	255	250	250	265	300	315	330	325	330	340	325	340	330	325	310	335	315	I A 280	F 275	F 295	F 275
7	F 280	280	280	280	F 270	285	290	335	C	C	C	350	335	340	345	335	315	320	335	330	295	290	295	F 300
8	F 265	U F 290	300	270	275	295	305	320	325	340	340	360	335	340	330	340	320	310	340	305	290	300	320	295
9	275	270	275	295	295	270	265	330	340	345	345	330	345	325	340	335	330	315	320	315	310	305	325	300
10	275	275	270	270	280	290	305	325	340	345	345	350	345	340	335	340	340	310	335	315	275	280	300	310
11	F	F 290	F 320	F 295	U F 285	270	280	315	335	340	335	310	330	345	345	340	330	315	335	310	285	280	270	270
12	295	280	U F 285	F	F 300	295	285	330	335	335	330	330	320	310	310	310	310	320	315	320	265	275	265	270
13	285	275	270	295	315	295	280	325	335	335	320	340	335	325	350	340	335	340	325	275	F 260	F	F	F 300
14	285	F	F	F	270	300	315	300	330	340	335	340	320	335	325	320	330	320	315	300	285	275	280	280
15	295	275	275	280	300	295	310	330	330	345	345	345	345	335	355	335	335	325	325	320	295	I C 270	285	270
16	F	U F 280	C	C	C	C	C	C	C	C	C	345	335	320	335	335	315	315	335	290	260	270	280	285
17	F 275	270	F	U F 255	F 290	F	F 295	310	340	345	335	330	330	335	285	340	315	305	I A 320	305	I C 280	280	290	270
18	270	275	290	295	295	305	305	330	335	340	345	335	340	345	340	325	335	315	315	310	270	270	265	270
19	270	275	295	290	310	320	245	300	330	345	330	320	340	330	315	315	330	305	320	310	275	280	270	265
20	270	275	285	300	F	F 280	305	315	350	350	345	350	325	325	335	320	325	330	325	I A 315	I A 295	290	290	280
21	275	275	270	280	325	310	310	310	340	335	350	340	I C 330	335	335	330	330	335	305	280	270	F 275	F 265	F 275
22	F 275	270	290	F 270	F 275	F 275	325	I A 320	330	345	320	340	325	325	320	320	335	325	315	300	280	290	330	300
23	265	260	275	265	255	275	295	330	340	325	320	330	345	I C 320	335	325	315	335	335	I A 295	275	290	F 260	275
24	250	260	F 280	F 305	285	295	280	I C 300	320	325	330	340	305	330	325	315	320	320	250	255	275	F 275	275	290
25	280	275	275	260	275	285	300	290	335	345	335	330	340	315	315	325	295	310	315	I A 285	265	255	270	275
26	285	295	290	275	260	260	280	315	330	340	335	350	320	320	335	340	315	315	335	300	260	270	265	275
27	275	275	290	265	275	285	305	300	320	340	340	345	315	305	325	315	315	315	310	275	275	250	265	280
28	295	300	285	300	260	265	265	285	320	325	335	325	325	325	335	330	330	310	325	280	290	275	290	280
29	265	265	270	290	270	280	295	325	335	U C 345	345	345	330	325	320	355	285	315	320	305	280	275	285	270
30	275	275	295	295	265	255	290	315	340	325	335	320	320	320	315	335	310	305	330	305	270	265	270	265
31	260	270	300	275	265	265	275	295	345	335	325	330	330	320	I C 320	335	335	330	330	310	260	280	275	260
	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
CNT	29	30	28	28	29	29	30	30	29	29	28	30	31	31	31	31	31	31	31	31	31	30	30	31
MED	275	275	278	280	275	285	295	318	335	340	335	335	330	325	325	330	330	315	325	305	275	275	278	275
UQ	280	275	290	295	290	295	305	325	340	345	342	345	340	335	335	340	335	320	335	315	285	285	290	288
LQ	265	270	270	265	270	270	280	300	330	335	330	330	320	320	318	320	315	310	315	295	270	270	270	270

The Radio Research Laboratories, Japan

IONOSPHERIC DATA

DEC. 1968

M(3000)F1(0.01)

135° E Mean Time (G. M. T. + 9 h)

Station WAKKANAI Lat. 45° 23.6' N. Long. 141° 41.1' E Sweep 1.0 Mc to 20.0 Mc in 20 sec in automatic operation

Day \ Hour	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											L	L												
3											L	405	415											
4												L												
5											B	B												
6											L	L												
7										C	C													
8													L											
9																								
10													L											
11																								
12																								
13										A														
14																								
15																								
16										C	C	L 405	U L 420											
17													L											
18																								
19																								
20																								
21													C											
22													U L 385											
23																								
24																								
25											L	L 400	B											
26												U L 395												
27												U L 400												
28												L												
29												L												
30																								
31												L	L											
	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
CNT												5	3											
MED												L 400	U L 415											
UQ												L 405	418											
LQ												U L 400	400											

The Radio Research Laboratories, Japan

IONOSPHERIC DATA

DEC. 1968 | h'F2 (km) | 135° E Mean Time (G. M. T. + 9h)

Station WAKKANAI Lat. 45°23.6'N. Long. 141°41.1'E Sweep 1.0 Mc to 20.0 Mc in 20 sec in automatic operation

Hour / 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											250	240												
3											240	220	240											
4												240												
5											245	225												
6											240	240												
7										C	C													
8													L											
9																								
10													240											
11																								
12																								
13										245														
14																								
15																								
16										C	C	225	235											
17													240											
18																								
19																								
20																								
21													C											
22													245											
23																								
24																								
25											225	230	235											
26												230												
27												230												
28												225												
29												225												
30																								
31												225	225											

	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
CNT										1	5	12	7											
MED										245	240	228	240											
UQ											245	235	240											
LQ											240	225	235											

The Radio Research Laboratories, Japan

IONOSPHERIC DATA

DEC. 1968 | h'F (km) | 135° E Mean Time (G. M. T. + 9h)

Station WAKKANAI Lat. 45° 23.6' N, Long. 141° 41.1' E Sweep 1.0 Mc to 20.0 Mc in 20 sec in automatic operation

Day \ Hour	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	350	340	320	275	340	295	265	240	215	210	240	235	225	235	240	225	235	250	255	260	295	340	310	325
2	325	325	315	280	295	245	270	245	245	240	240	225	245	240	225	220	210	250	240	260	305	330	305	315
3	320	320	340	I A 315	365	I A 300	270	225	220	225	225	225	215	240	240	235	230	255	250	305	305	310	350	350
4	305	320	335	340	315	310	240	245	220	235	220	235	220	240	240	235	A 230	245	250	245	245	250	260	315
5	345	305	350	360	330	325	250	245	220	225	B	B	220	235	220	215	210	A 260	245	260	325	280	310	265
6	250	310	330	325	320	310	350	265	250	245	240	245	235	235	245	215	220	210	245	265	I A 300	315	280	275
7	275	265	275	260	275	260	260	240	C	C	C	220	245	230	225	230	220	240	250	245	295	285	290	275
8	310	275	255	285	275	290	245	240	225	225	230	230	220	230	230	220	215	220	235	255	290	275	260	270
9	300	300	295	260	265	315	300	245	220	230	230	220	220	230	230	225	225	215	240	250	290	285	250	250
10	300	300	335	310	300	275	245	250	220	220	235	235	240	245	235	230	225	260	245	250	325	310	255	250
11	345	255	250	265	270	310	300	250	240	225	230	220	230	245	225	225	235	A 275	250	280	310	340	A 350	340
12	275	275	275	300	250	295	260	220	215	A 245	240	230	220	245	230	220	210	220	220	245	345	310	320	300
13	295	285	265	265	240	240	300	240	240	I A 225	225	220	230	240	240	225	225	225	240	315	350	310	275	245
14	275	310	325	295	315	245	255	225	225	235	245	230	230	240	240	220	230	235	250	255	320	325	310	300
15	285	300	310	290	265	250	260	225	235	240	240	225	225	240	E C 250	220	220	225	240	250	310	325	315	335
16	315	310	C	C	C	C	C	C	C	C	C	215	220	240	230	240	235	250	215	200	325	310	300	295
17	305	275	305	275	250	250	275	240	225	220	235	240	240	240	225	225	225	250	I A 255	250	I C 315	300	285	260
18	305	300	265	260	270	250	250	220	220	225	240	225	240	240	235	225	210	245	255	300	300	325	340	340
19	305	310	280	255	250	240	255	260	225	230	245	235	240	235	240	230	235	250	240	240	300	300	300	340
20	300	340	290	250	300	270	260	255	225	235	250	225	225	245	225	240	A 250	245	240	I A 270	I A 290	305	300	290
21	325	300	300	295	250	240	260	250	220	240	240	225	I C 230	240	235	225	250	230	275	300	355	300	305	315
22	350	350	260	275	345	275	300	I A 260	245	245	235	230	215	220	225	220	225	225	250	250	310	320	250	265
23	300	300	300	310	300	280	230	240	220	220	245	235	230	I C 240	225	215	235	245	250	A	330	325	360	330
24	350	375	300	245	250	A 290	330	I A 260	220	220	235	225	235	230	240	220	225	225	220	A	330	320	315	265
25	300	300	305	300	300	295	245	240	245	245	235	220	I B 230	240	245	225	235	215	250	A	345	345	350	300
26	300	260	275	290	320	305	300	245	235	240	235	230	245	245	240	220	220	225	230	270	350	320	305	310
27	E C 320	290	260	260	275	270	240	240	225	235	230	230	245	240	240	225	225	220	240	285	335	345	310	290
28	240	260	275	240	275	280	300	265	225	230	235	225	225	240	220	220	225	220	225	270	300	300	270	295
29	300	300	285	250	290	280	260	235	220	210	235	225	215	235	240	210	240	220	240	265	285	300	280	305
30	320	275	260	250	305	300	275	240	240	225	240	225	235	230	245	240	225	240	230	245	325	330	300	315
31	300	300	250	250	300	305	275	250	230	220	235	225	220	225	235	230	220	230	235	260	350	310	300	335
	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
CNT	31	31	30	30	30	30	30	30	29	29	28	30	31	31	31	31	31	31	31	28	31	31	31	31
MED	302	300	292	275	292	280	260	242	225	230	235	225	225	240	235	225	225	235	240	260	310	310	300	300
UQ	320	310	315	300	315	300	300	250	235	240	240	230	232	240	240	230	235	250	250	270	330	325	312	320
LQ	300	280	265	260	265	250	250	240	220	225	232	225	220	235	225	220	220	222	238	250	300	300	280	272

IONOSPHERIC DATA

DEC. 1968

h'Es (km)

135° E Mean Time (G. M. T. + 9 h)

Station WAKKANAI Lat. 45°23.6'N. Long. 141°41.1'E Sweep 1.0 Mc to 20.0 Mc in 20 sec in automatic operation

Hour / 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	105	100	110	110	110	110	110	110	G	G	105	135	G	G	140	110	110	110	S	S	S	100	S
2	E	E	E	E	110	110	110	110	G	G	G	G	G	G	145	135	115	105	110	105	105	105	100	105
3	S	115	110	135	120	115	115	110	G	G	110	G	G	G	150	115	115	115	110	105	105	105	105	105
4	S	100	E	E	115	110	105	S	G	105	105	G	G	G	145	120	110	110	110	110	105	105	105	E
5	E	E	E	110	110	110	105	105	G	G	B	B	G	G	G	115	110	110	S	110	S	105	105	105
6	100	100	E	110	110	110	110	105	G	G	G	G	G	G	G	135	110	110	110	105	105	105	105	S
7	105	100	E	E	E	110	110	G	C	C	C	G	G	G	G	G	110	110	105	E	105	105	105	S
8	S	100	100	105	E	110	110	105	100	G	105	G	G	G	G	G	115	110	110	110	E	105	105	100
9	105	100	100	E	110	110	110	S	G	G	G	G	G	G	G	G	S	S	105	110	105	105	105	105
10	105	E	100	100	E	110	110	105	105	100	100	100	100	100	100	G	115	115	110	110	110	110	110	105
11	110	E	130	115	115	115	110	105	110	105	B	B	B	105	B	105	105	110	110	105	120	105	100	100
12	S	100	100	100	100	110	110	110	G	100	105	G	G	G	G	G	S	E	110	E	110	110	110	110
13	105	E	E	E	100	E	110	110	105	105	105	105	105	105	105	100	105	105	110	110	110	110	105	105
14	105	105	105	100	100	105	110	110	105	G	G	G	G	G	G	B	105	115	110	110	105	105	105	S
15	100	100	100	100	E	E	110	105	100	100	105	125	100	G	100	G	S	S	110	105	100	105	S	S
16	E	100	C	C	C	C	C	C	C	C	C	G	G	110	110	G	110	110	105	E	100	100	100	100
17	100	100	100	100	110	E	E	G	G	100	G	G	G	140	120	115	110	110	105	105	C	105	E	E
18	S	E	E	E	110	E	110	G	G	B	B	B	C	130	115	115	110	110	110	105	E	S	S	E
19	E	E	E	E	E	110	E	110	G	105	G	B	G	G	G	115	110	110	110	105	S	S	E	S
20	E	S	E	E	E	110	110	105	105	105	105	G	G	G	G	G	105	105	110	105	105	105	105	105
21	100	E	100	100	100	E	E	105	100	100	100	G	C	100	G	115	110	110	125	105	105	105	105	105
22	100	100	E	E	110	E	110	105	100	100	100	G	G	G	G	120	110	110	105	105	100	100	100	S
23	E	E	E	E	E	E	E	105	105	105	G	G	G	C	G	100	110	110	110	105	105	105	100	105
24	105	100	105	115	115	110	105	105	105	C	C	G	G	G	G	125	115	E	E	105	105	S	105	S
25	S	E	S	E	E	S	105	110	B	B	B	B	B	B	B	B	B	S	110	105	E	S	100	100
26	100	S	100	100	100	E	110	110	105	G	G	G	G	G	G	G	S	S	S	110	105	105	E	S
27	C	E	E	E	E	110	S	S	G	G	G	G	G	G	G	G	S	S	110	110	105	105	105	105
28	E	E	E	E	E	E	110	S	G	G	G	G	G	G	G	G	105	S	S	S	100	E	105	S
29	E	E	E	E	100	E	E	G	G	G	G	G	G	G	G	G	S	S	E	S	S	E	E	E
30	E	E	E	E	E	E	E	G	150	140	140	125	125	120	G	100	S	100	100	100	S	E	S	E
31	E	E	E	100	100	E	E	G	G	G	G	130	G	G	G	G	105	100	110	110	105	100	105	S
	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
CNT	14	14	13	15	19	17	22	20	14	13	11	6	5	8	9	16	23	22	26	25	22	23	24	15
MED	105	100	100	100	110	110	110	105	105	105	105	115	105	108	115	115	110	110	110	105	105	105	105	105
UQ	105	100	105	110	110	110	110	110	105	105	105	125	125	125	145	122	110	110	110	110	105	105	105	105
LQ	100	100	100	100	100	110	110	105	100	100	102	105	100	102	105	110	108	110	110	105	105	105	100	102

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IONOSPHERIC DATA

DEC. 1968

Types of Es

135° E Mean Time (G. M. T. + 9 h)

Station WAKKANAI Lat. 45° 23.6' N, Long. 141° 41.1' E Sweep 1.0 Mc to 20.0 Mc in 20 sec in automatic operation

Hour / 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 2	F 1	F 2	F 1	F 3	F 3	F 1	L 1	L 1			L 1	HL 11			HL 11	L 1	F 2	F 2				F 1	
2					F 2	F 2	F 2	L 1							H 1	H 1	CL 11	F 2	F 1	F 2	F 2	F 1	F 1	F 1
3		F 1	F 1	FF 51	F 4	F 2	F 2	L 1			L 1				H 1	C 2	L 4	F 4	F 5	F 2	F 1	F 1	F 2	F 2
4		F 1			F 2	F 2	F 1			L 1	L 1				H 1	C 1	C 4	F 1	F 1	F 1	F 1	F 1	F 1	
5				F 1	F 1	F 2	F 1	L 1								C 1	L 1	F 3		F 1		F 1	F 1	F 1
6	F 1	F 1		F 2	F 1	F 1	F 1	L 1								H 1	L 1	F 1	F 2	F 2	F 3	F 3	F 2	
7	F 1	F 1				F 1	F 1										L 1	F 1	F 4		F 1	F 1	F 1	
8		F 1	F 1	F 1		F 2	F 1	L 1	L 1		L 1						C 1	F 1	F 1	F 2		F 1	F 1	F 1
9	F 1	F 1	F 1		F 1	F 1	F 1												F 1	F 1	F 2	F 1	F 1	F 1
10	F 1		F 1	F 1		F 1	F 1	L 1	L 1	L 1	L 1	L 1	L 1	L 1	L 1		C 2	F 2	F 2	F 1	F 2	F 1	F 1	F 1
11	F 1		F 1	F 2	F 1	F 1	F 2	L 2	L 1	L 1				L 1		L 1	L 1	F 3	F 2	F 2	F 1	F 3	F 2	F 2
12		F 2	F 1	F 1	F 1	F 2	F 2	L 2		L 2	L 1								F 1		F 1	F 1	F 1	F 1
13	F 1				F 1		F 1	L 1	L 1	L 2	L 1	L 1	L 1	L 1	L 1	L 2	L 3	F 1	F 1	F 2	F 2	F 2	F 2	F 1
14	F 1	F 2	F 2	F 1	F 3	F 2	F 2	L 2	L 1								L 1	F 1	F 1	F 1	F 2	F 2	F 1	
15	F 1	F 1	F 1	F 1			F 1	L 2	L 1	L 1	L 1	C 1	L 1		L 1				F 1	F 2	F 2	F 1		
16		F 1												L 1	L 1		L 1	F 4	F 1		F 1	F 1	F 1	F 1
17	F 1	F 1	F 1	F 1	F 1					L 1				H 1	C 1	L 1	L 2	F 2	F 3	F 1		F 1		
18					F 1		F 1							H 1	C 1	C 1	C 1	F 1	F 2	F 2				
19						F 2		L 1		L 1						C 1	C 3	F 4	F 1	F 1				
20						F 2	F 1	L 3	L 2	L 1	L 2						L 3	F 2	F 2	F 2	F 2	F 2	F 1	F 1
21	F 1		F 1	F 1	F 1			L 1	L 2	L 1	L 2			L 1		L 1	L 2	F 1	FF 11	F 2	F 3	F 1	F 1	F 2
22	F 2	F 2			F 3		F 3	L 5	L 2	L 1	L 1					C 1	C 1	F 1	F 2	F 1	F 1	F 1	F 1	
23								L 2	L 2	L 1						L 1	L 1	F 2	F 2	F 4	F 3	F 2	F 2	F 2
24	F 1	F 3	F 2	F 1	F 1	F 2	F 2	L 6	L 1							C 1	L 1			F 2	F 1		F 1	
25							F 1	L 1											F 2	F 1			F 1	F 1
26	F 1		F 1	F 1	F 1		F 2	L 1	L 1											F 2	F 2	F 3		
27						F 1													F 1	F 1	F 2	F 1	F 2	F 1
28							F 1										L 1				F 1		F 1	
29					F 1																			
30									H 1	H 1	H 1	C 1	CL 11	C 1		L 1		F 1	F 1	F 1				
31				F 1	F 1							H 1					L 1	F 1	F 1	F 1	F 1	F 1	F 1	

	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
CNT																								
MED																								
UQ																								
LQ																								

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IONOSPHERIC DATA

DEC. 1968 | foF2 (0.1) | 135° E Mean Time (G. M. T. + 9h)

Station AKITA Lat. 39°43.5'N. Long. 140° 8.2'E Sweep 1.0 Mc to 20.0 Mc in 15 sec in automatic operation

Hour / 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	33	33	34	35	35	39	39	73	87	91	100	112	102	101	97	96	73	65	44	34	33	31	33	32
2	34	36	36	36	36	36	I R 37	63	95	112	115	108	101	102	97	89	72	57	57	43	40	38	34	36
3	36	36	36	37	39	39	36	71	94	I R 124	141	132	109	I R 109	111	104	81	72	56	42	28	30	33	34
4	34	34	33	34	35	32	41	65	101	121	134	126	121	103	107	104	84	56	63	61	44	31	29	I A 28
5	I A 30	32	30	29	30	26	33	71	I R 111	121	134	113	109	106	102	87	76	56	47	33	28	36	33	32
6	31	26	27	31	28	26	26	71	116	119	142	122	108	98	100	93	79	I A 72	34	34	33	34	38	37
7	35	34	33	33	34	34	35	72	I R 98	98	114	92	86	86	86	73	68	51	47	41	36	36	I R 34	I A 34
8	37	38	37	33	36	35	41	58	92	106	125	100	90	84	84	88	71	61	56	43	34	38	38	29
9	28	31	28	31	30	30	33	67	102	118	125	106	101	93	102	91	81	68	55	51	51	41	I R 34	I A 30
10	28	29	26	29	29	27	33	60	Z 89	113	116	115	104	94	94	82	76	61	A	A	A	I R 37	38	37
11	34	31	33	31	29	28	30	67	105	121	120	115	101	95	97	75	62	68	47	31	30	F	37	38
12	40	38	33	F	36	F	37	69	84	R 106	124	128	131	105	105	90	81	56	42	33	32	36	34	35
13	35	36	36	36	36	33	27	57	81	113	117	101	102	86	91	86	68	50	37	33	I A 36	F	44	F
14	37	F 41	F	F	F	F	S 41	58	83	97	123	107	88	89	90	76	62	68	56	36	31	I A 31	34	36
15	35	34	33	33	36	37	33	57	81	93	97	94	86	82	83	71	61	58	52	31	31	30	32	33
16	F	F	F	F	F	33	25	51	79	87	I R 110	I R 100	88	87	91	84	76	71	53	33	28	32	36	37
17	33	32	38	41	44	37	44	66	88	96	118	105	99	104	96	74	68	59	61	A	A	I C 30	I A 31	32
18	30	31	32	32	35	31	32	61	77	89	108	97	86	86	82	68	66	48	I C 40	33	28	30	31	33
19	35	33	32	35	37	26	25	52	86	95	I R 110	101	91	95	84	79	74	I A 60	49	41	27	30	31	32
20	34	33	36	36	34	35	36	61	84	94	113	104	88	92	83	73	76	63	48	32	30	33	34	33
21	31	31	31	31	34	26	28	56	80	93	111	97	88	89	82	73	65	66	39	28	33	39	33	34
22	36	35	37	30	29	31	42	52	90	119	I R 121	118	97	92	80	79	80	57	40	33	34	37	38	37
23	27	26	C	C	C	C	C	C	C	C	113	113	100	92	89	78	71	65	A	A	27	[illegible] 27	I R 32	36
24	29	F	S 32	33	30	28	25	60	102	109	130	128	102	100	91	82	72	56	46	27	28	34	35	36
25	32	32	31	27	31	28	30	51	81	127	124	102	91	81	76	76	I C 65	I C 70	42	I A 30	I A 26	28	31	34
26	36	28	26	24	27	26	31	57	81	I R 110	I C 118	I C 101	91	87	87	77	61	54	42	31	F	F	F	F
27	F	S 39	39	31	31	31	30	58	78	111	I C 103	I C 96	96	85	87	77	71	55	40	33	35	35	40	37
28	30	26	25	27	26	28	28	51	90	113	134	118	106	94	96	89	76	67	54	44	42	41	39	37
29	36	40	39	36	35	35	38	58	81	108	101	104	91	94	92	83	57	65	56	41	39	37	41	C
30	C	C	C	C	C	C	C	C	C	C	I C 104	97	74	85	80	84	69	51	51	39	31	30	35	35
31	34	36	34	29	31	31	32	56	93	116	120	123	101	108	83	75	73	63	47	35	28	31	33	33
	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
CNT	28	28	27	26	27	27	29	29	29	29	31	31	31	31	31	31	31	31	29	28	28	28	30	28
MED	34	33	33	32	34	31	33	60	88	110	118	106	99	93	91	82	72	61	47	34	32	34	34	34
UQ	36	36	36	35	36	35	37	67	95	118	124	116	102	100	97	88	76	66	55	41	36	37	38	36
LQ	30	31	31	30	30	28	30	57	81	96	110	100	89	86	84	76	67	56	42	32	28	30	33	32

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IONOSPHERIC DATA

DEC. 1968 | foF1 (0.01) | 135° E Mean Time (G. M. T. + 9h)

Station AKITA Lat. 39°43.5'N, Long. 140° 8.2'E Sweep 1.0 Mc to 20.0 Mc in 15 sec in automatic operation

Day \ Hour	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 390	L	L	L	L										
2										L	L	L	L	L										
3										L	L	L	L	L										
4											L	L	L											
5											L	L	L	L										
6											L	L	L											
7											L	L	L	U L 360										
8											L	L	U L 410	L										
9											L	L	L	L										
10										L	L	L	U L 400											
11											L	L	L	L										
12										L	L	L	L	L	L									
13									L		L	H 600	L	L										
14											L	L	L	U L 400										
15											L	L	L	L										
16											L	L	L	L										
17										L	L	L	L	L										
18											L	L	L	L										
19											L	L	L	L										
20										L	L	L	L	L										
21											L	L	L	L										
22											L	L	L	L										
23											L	L	L	L										
24										L	L	L	L	L										
25											L	L	L	L										
26											C	C	L	L										
27											C	C	L											
28										L	L	L	L	L										
29										L	L	L	L	L										
30											C	L	L	L										
31											L	L	L	L										

	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
CNT										1		1	2	2										
MED										L 390		H 600	U L 405	U L 380										
UQ																								
LQ																								

The Radio Research Laboratories, Japan

IONOSPHERIC DATA

DEC. 1968 | foE (0.01) | 135° E Mean Time (G. M. T. + 9 h)

Station AKITA Lat. 39°43.5'N. Long. 140° 8.2'E Sweep 1.0 Mc to 20.0 Mc in 15 sec in automatic operation

Hour / 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	230	295	315	325	I A 330	320	285	A	A							
2								B	255	295	315	320	A 330	325	290	245	A							
3								A	260	305	320	I A 325	I A 335	330	A 320	A	A							
4								A	235	285	310	325	330	I A 305	I A 275	A	A							
5								A	A	A	A	A	330	325	295	A	A							
6								A	230	285	310	325	330	320	A 300	A	A							
7								B	240	285	315	325	325	315	285	235	180							
8								A	240	285	305	315	320	310	275	I A 240	190							
9								A	235	290	310	325	335	325	290	240	190							
10								A	225	290	310	325	330	320	280	240	185							
11								A	A	I A 280	305	325	330	A	A	A	A							
12								A	255	I A 280	310	320	325	I R 310	B	B	B							
13								A	255	285	310	R 320	330	320	300	I A 255	A							
14								A	A	290	310	I B 320	I B 325	I B 320	290	250	B							
15								B	245	295	315	325	335	325	295	I B 245	B							
16								170	250	290	I A 305	315	325	315	285	255	B							
17								B	250	285	310	325	330	325	300	A	A							
18								B	245	290	315	I B 330	335	315	A	A	A							
19								175	255	295	315	I B 325	330	320	305	250	A							
20								185	260	I A 290	310	330	330	320	300	245	A							
21								B	245	290	310	325	335	320	A	A	S							
22								175	240	285	I R 310	315	I A 320	320	295	260	200							
23								C	C	C	315	325	330	320	295	250	A							
24								A	A	A	310	I R 325	330	320	300	I B 250	195							
25								A	C	C	C	C	C	C	C	C	C							
26								S	230	285	I C 310	I C 320	330	320	295	250	180							
27								A	250	295	I C 310	I C 325	340	330	305	260	200							
28								B	A	I A 295	325	330	320	310	I A 280	235	185							
29								170	240	295	315	330	335	325	I A 300	A	A							
30								C	C	C	I C 310	325	I A 330	320	300	I A 260	B							
31								S	230	290	310	325	I A 325	325	295	R 250	A							
	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
CNT								5	23	26	29	29	30	29	26	19	9							
MED								175	245	290	310	325	330	320	295	250	190							
UQ								175	252	295	315	325	330	325	300	252	195							
LQ								170	235	285	310	320	325	320	285	242	185							

The Radio Research Laboratories, Japan

IONOSPHERIC DATA

DEC. 1968 | foEs (0.1) | 135° E Mean Time (G. M. T. + 9 h)

Station AKITA Lat. 39° 43.5' N. Long. 140° 8.2' E Sweep 1.0 Mc to 20.0 Mc in 15 sec in automatic operation

Day \ Hour	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 S 14	E S 13	J X 13	J X 13	J X 18	J X 24	J X 26	J X 29	G	G	J G 30	35	39	G	33	33	J X 26	J X 40	J X 25	J X 29	E S 13	E S 13	E S 13	E S 13
2	E S 14	J X 14	E	E	J X 20	J X 39	J X 39	J X 40	J X 28	G	G	36	39	G	36	31	J X 28	J X 29	J X 25	J X 21	J X 38	J X 26	E S 13	E S 13
3	E S 14	J X 24	J X 28	J X 28	J X 44	J X 59	J X 50	J X 44	G	37	G	J X 38	40	G	33	31	J X 46	J X 52	J X 105	J X 24	J X 24	J X 34	J X 20	E S 14
4	J X 14	J X 36	J X 34	J X 27	J X 22	E S 14	J X 21	J X 25	G	G	G	G	G	J X 33	33	J X 58	J X 41	J X 53	J X 64	J X 75	J X 35	J X 34	J X 24	J X 34
5	J X 44	J X 18	J X 20	J X 26	J X 26	J X 43	J X 43	J X 28	J X 39	J X 48	J X 43	J X 44	G	G	G	J X 30	J X 64	J X 63	J X 35	J X 29	J X 19	J X 20	J X 23	J X 28
6	E S 14	E S 14	J X 16	J X 18	J X 22	J X 18	J X 29	J X 25	G	G	G	G	G	G	34	J X 50	J X 29	J X 138	J X 106	J X 43	J X 33	J X 28	E S 14	J X 19
7	E S 14	J X 18	E	J X 23	J X 13	J X 18	J X 19	E B 20	G	G	G	G	G	G	G	G	G	E S 14	J X 20	E S 14	E S 14	J X 63	J X 55	J X 43
8	J X 28	E	E	J X 28	J X 13	J X 20	J X 19	J X 20	G	G	G	G	G	G	G	29	G	J X 22	J X 19	J X 21	J X 29	J X 20	J X 20	E S 14
9	J X 20	J X 16	M 17	E	E	M 19	J X 20	J X 24	G	G	G	G	G	G	G	G	G	J X 25	E S 14	J X 24	J X 44	J X 43	J X 60	J X 62
10	J X 23	J X 18	J X 18	J X 18	E	M 19	J X 20	J X 20	G	G	G	G	G	G 28	J X 38	G	G	J X 53	J X 80	J X 108	J X 88	J X 55	J X 21	J X 23
11	J X 25	J X 25	J X 20	J X 24	J X 20	J X 29	J X 34	J X 55	J X 48	J X 39	G	G	G	J X 63	J X 70	J X 37	J X 75	J X 34	J X 33	J X 53	J X 32	J X 20	J X 34	J X 44
12	J X 34	J X 24	J X 22	J X 20	J X 19	J X 20	J X 28	J X 30	J X 32	J X 48	G	G	G	G	E B 31	E B 24	E B 20	J X 23	E S 14	J X 48	E S 14	J X 23	J X 28	E S 14
13	E S 14	J X 18	E	E	E	E S 14	E S 14	J X 26	G	G	J X 33	G	G	G	G	29	J X 30	J X 19	J X 31	J X 48	J X 49	J X 46	J X 41	J X 42
14	J X 32	J X 30	J X 30	J X 23	J X 18	J X 20	J X 25	J X 41	J X 30	G	J G 28	E B 34	E B 36	E B 33	G	G	E B 21	E S 14	J X 70	J X 43	J X 64	J X 53	J X 43	J X 29
15	J X 20	J X 24	J X 23	J X 23	J X 26	J X 19	E S 14	E B 18	G	G	J G 29	J X 40	G	G	G	E B 26	E B 20	J X 29	E S 14	J X 24	J X 30	J X 29	J X 34	J X 20
16	E S 14	J X 19	J X 13	E	E	E S 13	E S 14	G	J X 26	G	J X 38	J X 34	G 29	G	G	G	E B 19	J X 25	J X 27	J X 42	J X 26	J X 21	J X 23	J X 29
17	J X 20	J X 33	J X 20	E S 13	E	E S 13	E S 14	E B 19	G	G	35	G	G	G	G	J X 32	J X 58	J X 44	J X 25	J X 80	J X 53	C	J X 33	J X 30
18	E S 14	E S 14	E S 14	E S 13	E	J X 22	J X 22	J X 23	G	G	G	E B 34	G	G	33	35	J X 35	J X 36	C	J X 35	J X 28	J X 32	J X 24	J X 24
19	E S 14	J X 15	J X 18	E	E	E S 13	E B 17	G	J G 19	G	G	E B 34	G	G	G	G	J X 29	J X 75	J X 29	J X 28	E S 14	J X 24	J X 28	E S 14
20	E S 14	E S 13	E	E	J X 19	J X 18	J X 24	J X 23	J X 33	J X 33	G	G 30	G	G	J G 30	J X 33	J X 28	J X 25	J X 43	J X 40	J X 29	J X 27	J X 30	J X 29
21	E S 14	E	E	E	E	E S 13	E S 14	G	G	G	G	G	G	G	J G 29	J G 25	E B 20	J X 25	J X 65	E S 13	J X 20	J X 28	J X 41	J X 33
22	J X 26	J X 18	E	E	E	E S 14	E S 14	G	G 22	G	G	34	35	G	G	G	G	J X 33	J X 30	J X 33	J X 53	J X 49	J X 23	J X 25
23	J X 23	E S 14	C	C	C	C	C	C	C	C	G	G	G	J X 34	G	G	J X 28	J X 138	J X 78	J X 63	J X 43	J X 60	J X 52	J X 25
24	E	E	E	E	J X 16	J X 48	J X 35	J X 35	J X 35	J X 36	G	G	G	G	G	E B 26	G	J X 28	J X 30	J X 50	J X 34	J X 25	J X 24	E S 14
25	E S 14	E S 14	J X 14	E S 14	E S 14	E S 14	E S 14	J X 34	E C 26	E C 34	E C 33	E C 33	E C 34	E C 33	E C 31	E C 27	C	C	J X 19	J X 57	J X 53	J X 24	J X 23	E S 14
26	J X 24	J X 20	J X 23	E S 14	E	E S 14	J X 18	J X 53	G	J G 24	C	C	G	G	G	G	G	J X 29	J X 24	J X 19	J X 20	J X 34	J X 31	J X 23
27	J X 23	J X 24	J X 14	J X 23	J X 21	E	E	J X 19	G	G	C	C	G	G	G	G	G	J X 20	E S 14	E	E S 14	J X 40	J X 29	J X 21
28	J X 20	J X 20	J X 19	E S 13	E S 14	E	E S 14	E S 14	J X 26	G	G	G	G	G	G	G	J G 19	J X 20	J X 24	J X 20	E S 14	E S 14	E S 14	E B 18
29	J X 18	E	E S 14	E S 14	E S 14	E	E S 12	G	G	G	G	G	G	G	J X 43	J X 42	J X 33	J X 18	E S 14	E S 14	E S 14	E S 14	E S 14	C
30	C	C	C	C	C	C	C	C	C	C	C	G	35	G	G	28	E B 23	E B 18	E S 14	E S 14	E S 14	J X 28	E S 14	J X 23
31	E S 14	E S 14	E	E S 14	E	E	E S 12	E S 14	G	G	G	G	37	G	J X 30	G	24	J X 25	J X 24	E S 14	E S 13	E S 13	E S 14	E S 14
	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
CNT	30	30	29	29	29	29	29	29	29	29	28	29	31	31	31	31	30	30	30	31	31	30	31	30
MED	J X 16	J X 18	J X 14	14	J X 14	18	J X 19	J X 23	G	G	G	G	G	G	G	E G 26	24	J X 28	J X 26	J X 29	J X 29	J X 28	J X 24	J X 23
UQ	J X 23	J X 24	J X 20	J X 23	J X 20	J X 20	J X 26	J X 30	J X 26	E G 24	E G 28	34	E G 32	G	33	32	J X 30	J X 44	J X 43	J X 48	J X 40	J X 40	J X 34	J X 29
LQ	E S 14	14	E	E	E	E S 13	E S 14	E G 18	G	G	G	G	G	G	G	G	G	J X 22	J X 19	J X 20	E S 14	J X 21	J X 20	E S 14

The Radio Research Laboratories, Japan

IONOSPHERIC DATA

DEC. 1968 | f_bEs (0.1) | 135° E Mean Time (G. M. T. + 9h)

Station AKITA Lat. 39°43.5'N. Long. 140° 8.2'E Sweep 1.0 Mc to 20.0 Mc in 15 sec in automatic operation

Hour / 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 S 14	E S 13	E	E	17	22	15	22	G	G	G 27	G	36	G	33	31	25	29	21	19	E S 13	E S 13	E S 13	E S 13
2	E S 14	E	E	E	13	24	24	29	23	G	G	34	37	G	35	30	23	18	18	16	23	E	E S 13	E S 13
3	E S 14	E	15	15	29	22	24	29	G	37	G	36	36	G	G	30	40	36	21	20	18	22	16	E S 14
4	E	17	15	25	20	E S 14	18	22	G	G	G	G	G	33	32	40	35	22	28	42	25	22	E	A
5	A	15	13	15	E	E	20	23	28	35	33	34	G	G	G	27	34	21	18	19	E	E	E	E
6	E S 14	E S 14	E	E	13	E	18	20	G	G	G	G	G	G	32	27	22	A	23	E	23	21	E S 14	16
7	E S 14	15	E	E	E	E	18	E B 20	G	G	G	G	G	G	G	G	G	E S 14	E	E S 14	E S 14	19	29	A
8	E	E	E	E	E	16	16	19	G	G	G	G	G	G	G	28	G	18	16	E	21	E	E	E S 14
9	E	E	E	E	E	E	16	20	G	G	G	G	G	G	G	G	G	20	E S 14	18	20	24	34	A
10	E	E	E	13	E	E	E	19	G	G	G	G	G	G 27	24	G	G	21	A	A	A	21	E	E
11	E	E	17	E	E	17	18	28	27	31	G	G	G	33	36	28	22	E	21	22	E	E	E	32
12	22	18	14	E	E	14	18	21	24	39	G	G	G	G	E B 31	E B 24	E B 20	16	E S 14	21	E S 14	18	15	E S 14
13	E S 14	13	E	E	E	E S 14	E S 14	20	G	G	29	G	G	G	G	29	23	17	23	20	A	22	23	24
14	24	18	15	E	E	E	20	24	28	G	G 28	E B 34	E B 36	E B 33	G	G	E B 21	E S 14	24	17	19	A	26	19
15	E	17	15	15	16	16	E S 14	E B 18	G	G	G 28	28	G	G	G	E B 26	E B 20	19	E S 14	19	E	18	18	18
16	E S 14	E	13	E	E	E S 13	E S 14	G	23	G	38	23	G 29	G	G	G	E B 19	E	23	23	E	E	18	19
17	E	17	E	E S 13	E	E S 13	E S 14	E B 19	G	G	34	G	G	G	G	31	56	20	18	A	A	C	A	19
18	E S 14	E S 14	E S 14	E S 13	E	16	15	E	G	G	G	E B 34	G	G	33	34	33	25	C	24	E	23	21	E
19	E S 14	15	16	E	E	E S 13	E B 17	G	G 19	G	G	E B 34	G	G	G	G	28	A	25	23	E S 14	E	E	E S 14
20	E S 14	E S 13	E	E	E	17	18	18	20	31	G	G 27	G	G	27	22	21	17	22	24	23	20	22	20
21	17	16	17	E	14	E B 14	E S 14	E B 19	G	G	G 25	G	G	35	31	29	22	18	E S 13	18	E S 14	E S 14	E	24
22	23	E	E	E	E	E S 14	E S 14	G	G 19	G	G	34	34	G	G	G	G	E	17	24	17	24	18	18
23	19	E S 14	C	C	C	C	C	C	C	C	G	G	G	28	G	G	21	30	A	A	E	24	24	E
24	E	E	E	E	E	15	18	28	18	31	G	G	G	G	G	E B 26	G	18	E C 24	18	22	16	E	E S 14
25	E S 14	E S 14	15	E S 14	E S 14	E S 14	E S 14	23	E C 26	E C 34	E C 33	E C 33	E C 34	E C 33	E C 31	E C 27	C	C	E	A	A	18	20	E S 14
26	E	15	16	E S 14	E	E S 14	E	25	G	G 23	C	C	G	G	G	G	G	18	18	16	14	16	18	15
27	19	18	E	15	14	E	E	17	G	G	C	C	G	G	G	G	G	19	E S 14	E	E S 14	24	20	18
28	18	18	17	E S 13	E S 14	E	E S 14	E S 14	18	G	G	G	G	G	G	G	G 19	20	18	E	E S 14	E S 14	E S 14	E B 18
29	17	E	E S 14	E S 14	E S 14	E	E S 12	G	G	G	G	G	G	G	32	27	21	16	E S 14	E S 14	E S 14	E S 14	E S 14	C
30	C	C	C	C	C	C	C	C	C	C	C	G	35	G	G	28	E B 23	E B 18	E S 14	E S 14	E S 14	E	E S 14	E
31	E S 14	E S 14	E	E S 14	E	E	E S 12	E S 14	G	G	G	G	36	G	25	G	22	19	18	E S 14	E S 13	E S 13	E S 14	E S 14
	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
CNT	30	30	29	29	29	29	29	29	29	29	28	29	31	31	31	31	30	30	30	31	31	30	31	30
MED	14	14	E E 13	E	E	14	15	20	G	G	G	G	G	G	G	E G 26	21	18	18	19	14	18	15	E E 16
UQ	17	16	15	14	14	16	18	23	20	E G 23	G 27	E G 33	E G 32	G	31	28	23	21	23	24	22	22	20	19
LQ	E	E	E	E	E	E	E S 14	E G 17	G	G	G	G	G	G	G	G	G	16	14	15	E S 14	E E 13	E E 13	E S 14

IONOSPHERIC DATA

DEC. 1968 | f min (0.1) | 135° E Mean Time (G. M. T. + 9 h)

Station AKITA Lat. 39° 43.5' N. Long. 140° 8.2' E Sweep 1.0 Mc to 20.0 Mc in 15 sec in automatic operation

Hour / 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 S 14	E S 13	E	E	E	15	14	15	15	19	21	22	19	17	14	15	14	E S 14	E S 13	E S 14	E S 13	E S 13	E S 13	E S 13
2	E S 14	E	E	E	E	E	14	23	16	17	22	19	23	18	18	14	14	E S 13	E S 13	E S 13	E S 13	E S 14	E S 13	E S 13
3	E S 14	E	E	E	E	E S 14	14	14	18	22	22	18	18	23	23	19	14	E S 14	E S 13	E S 12	E S 13	E S 14	E S 14	E S 14
4	E S 13	E	E	E	E	E S 14	E	13	15	18	23	24	23	22	22	23	18	E S 14	E S 14	E S 14	E S 12	E	E S 13	E
5	E S 13	E	E	E	E	E S 14	E	13	14	20	24	23	25	23	22	21	14	E S 14	E S 14	E S 14	E S 13	E S 14	E S 13	E S 13
6	E S 14	E S 14	E	E	E	E	E S 14	14	20	21	22	23	22	18	14	16	14	E S 14	E S 14	E S 14	E S 13	E S 13	E S 14	E S 13
7	E S 14	E	E	E	E	14	12	20	16	22	23	23	24	22	19	14	14	E S 14	E S 14	E S 14	E S 14	E S 13	E S 14	E S 14
8	E S 13	E	E	E	E	E	14	14	18	21	22	22	22	20	14	16	14	E S 14	E S 14	E S 14	E S 14	E S 14	E S 14	E S 14
9	E S 14	E	E	E	E	14	12	14	16	19	21	20	19	18	18	17	14	E S 13	E S 14	E S 14	E S 13	E S 14	E S 14	E S 14
10	E S 14	E	E	E	E	E S 13	E S 14	E S 14	16	19	20	17	21	19	18	15	14	E S 14	E S 14	E S 13	E S 14	E S 14	E S 14	E S 13
11	E S 14	E S 13	E	E	E	E S 14	15	15	15	17	25	24	23	22	23	23	14	E S 14	E S 14	E S 14	E S 14	E S 13	E S 14	E S 14
12	E S 14	E S 13	E	E	E	E	E S 14	14	18	20	26	25	25	28	31	24	20	E S 14	E S 14	E S 14	E S 14	E S 14	E S 14	E S 14
13	E S 14	E	E	E	E	E S 14	E S 14	E S 14	20	22	22	24	25	25	24	18	17	E S 14	E S 14	E S 13	E S 14	E S 14	E S 14	E S 14
14	E S 14	E	E	E S 13	E	E S 13	E S 14	E S 14	17	23	24	34	36	33	24	22	21	E S 14	E S 14	E S 14	E S 14	E S 14	E S 14	E S 14
15	E S 14	E S 13	E	E	E	E S 13	E S 14	18	16	17	20	20	23	18	25	26	20	E S 14	E S 14	E S 14	E S 14	E S 14	E S 14	E S 14
16	E S 14	E S 14	E	E	E	E S 13	E S 14	14	16	18	18	23	21	23	20	18	19	E S 14	E S 14	E S 14	E S 14	E S 13	E S 14	E S 13
17	E S 14	E	E S 14	E S 13	E	E S 13	E S 14	19	18	19	21	23	27	25	22	19	18	E S 12	E S 14	E S 14	E S 14	C	E S 14	E S 14
18	E S 14	E S 14	E S 14	E S 13	E	E	E S 13	19	19	22	25	34	28	25	27	23	20	E S 14	C	E S 14	E S 14	E S 14	E S 14	E S 14
19	E S 14	E	E	E	E	E S 13	17	15	18	23	27	34	26	26	21	20	16	E S 14	E S 14	E S 14	E S 14	E S 14	E S 14	E S 14
20	E S 14	E S 13	E	E	E	E	E S 14	16	16	21	23	20	20	18	18	16	15	E S 13	E S 14	E S 14	E S 14	E S 14	E S 14	E S 14
21	E S 14	E	E	E S 14	E	14	E S 14	19	18	20	18	24	19	24	22	18	E S 14	E S 14	E S 13	E S 14	E S 14	E S 14	E S 14	E S 14
22	E S 14	E	E	E	E	E S 14	E S 14	14	17	18	25	25	24	24	20	22	15	E S 14	E S 14	E S 14	E S 14	E S 14	E S 14	E S 14
23	E S 14	E S 14	C	C	C	C	C	C	C	C	20	24	24	21	22	20	14	E S 14	E S 14	E S 14	E S 14	E S 14	E S 14	E S 14
24	E	E	E	E	E	E	E	E S 13	17	19	24	28	26	24	24	26	18	E S 14	E C 24	E	E S 14	E S 12	E S 14	E S 14
25	E S 14	E S 14	E	E S 14	E S 14	E S 14	E S 14	14	E C 26	E C 34	E C 33	E C 33	E C 34	E C 33	E C 31	E C 27	C	C	E S 13	E S 14	E S 14	E S 14	E S 14	E S 14
26	E S 14	E	E	E S 14	E	E S 14	E S 16	E S 14	18	18	C	C	23	23	22	18	16	E	E S 14	E S 14	E	E	E S 14	E S 14
27	E S 14	E	E	E	E	E	E	12	15	20	C	C	26	27	23	18	19	E S 14	E S 14	E	E S 14	E	E S 13	E S 14
28	E	E	E	E S 13	E S 14	E	E S 14	E S 14	14	14	18	21	23	20	22	20	15	E S 13	E S 13	E S 13	E S 14	E S 14	E S 14	18
29	E	E	E S 14	E S 14	E S 14	E	E S 12	E S 14	14	18	22	24	22	18	17	13	14	E	E S 14	E S 14	E S 14	E S 14	E S 14	C
30	C	C	C	C	C	C	C	C	C	C	C	20	20	19	15	19	23	18	E S 14	E S 14	E S 14	E S 14	E S 14	E S 14
31	E S 14	E S 14	E	E S 14	E	E	E S 12	E S 14	17	18	20	23	22	20	18	18	14	E S 14	E S 14	E S 14	E S 13	E S 13	E S 14	E S 14
	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
CNT	30	30	29	29	29	29	29	29	29	29	28	29	31	31	31	31	30	30	30	31	31	30	31	30
MED	E S 14	E	E	E	E	E E 13	E S 14	14	16	19	22	23	23	22	22	18	15	E S 14	E S 14	E S 14	E S 14	E S 14	E S 14	E S 14
UQ	E S 14	E S 13	E	E S 13	E	E S 14	E S 14	15	18	21	24	24	25	24	23	22	18	E S 14	E S 14	E S 14	E S 14	E S 14	E S 14	E S 14
LQ	E S 14	E	E	E	E	E	E S 12	E S 14	16	18	20	21	22	19	18	16	14	E S 14	E S 14	E S 14	E S 13	E S 13	E S 14	E S 14

The Radio Research Laboratories, Japan

IONOSPHERIC DATA

DEC. 1968

M(3000)F2(0.01)

135° E Mean Time (G. M. T. +9h)

Station AKITA Lat. 39° 43.5' N, Long. 140° 8.2' E Sweep 1.0 Mc to 20.0 Mc in 15 sec in automatic operation

Hour / 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	275	275	270	275	285	295	350	355	340	330	330	325	315	330	335	325	340	320	280	290	290	275	265
2	270	280	265	280	280	305	I R 320	325	335	330	335	335	315	335	325	315	335	315	320	305	325	310	265	275
3	275	270	265	275	280	310	310	340	330	I R 315	325	330	320	I R 310	320	335	335	325	340	340	305	275	280	280
4	280	280	270	265	280	275	305	345	330	325	330	325	320	315	315	325	335	305	325	345	335	290	310	I A 285
5	I A 270	285	260	260	265	275	305	340	I R 330	325	345	320	330	330	335	345	315	335	335	335	310	295	305	300
6	300	260	265	260	280	250	255	305	330	325	330	325	325	325	330	330	320	I A 335	325	325	305	290	305	315
7	295	295	305	285	290	290	310	335	I R 345	335	350	340	340	340	335	345	340	325	325	320	330	315	I R 305	I A 285
8	300	305	325	275	275	285	315	345	335	330	340	340	340	335	340	340	320	320	320	325	310	320	325	300
9	295	290	285	275	285	275	290	330	335	335	335	340	325	315	325	330	325	325	320	315	320	320	I R 310	I A 295
10	285	305	270	270	285	295	310	335	Z 335	345	335	335	320	320	325	330	335	330	A	A	A	I R 285	285	315
11	300	290	310	305	310	290	275	330	330	330	325	330	325	320	330	335	325	330	320	325	280	F	295	290
12	305	310	305	F	300	F	305	335	335	315 R	315	315	320	315	310	320	325	330	335	315	285	285	295	275
13	295	285	300	295	325	305	280	310	315	335	335	320	345	325	340	340	340	335	355	315	I A 285	F	325	F
14	295	F 295	F	F	F	F	S 340	335	340	325	330	340	330	325	335	345	325	340	340	325	325	I A 290	295	305
15	305	295	290	295	295	305	305	335	345	325	330	335	340	340	335	345	325	320	330	315	310	290	280	285
16	F	F	F	F	F	335	330	325	340	340	I R 365	I R 340	345	315	340	345	335	325	325	360	285	280	275	315
17	290	295	290	280	305	290	300	325	330	330	330	335	325	325	340	350	340	320	335	A	A	I C 300	I A 300	305
18	275	290	305	285	310	305	300	335	350	330	335	335	330	330	330	340	340	320	I C 340	335	295	275	290	285
19	285	275	270	290	325	310	280	310	335	325	I R 330	325	310	330	335	320	325	I A 330	325	315	265	275	280	270
20	295	280	295	300	290	285	305	330	345	340	340	335	340	325	340	330	320	335	350	335	305	285	295	290
21	270	280	290	300	325	300	320	330	360	340	335	340	340	340	340	355	335	340	345	300	280	310	285	275
22	275	280	315	265	265	290	335	325	335	335	I R 330	345	340	325	315	330	330	315	315	310	295	295	305	320
23	295	290	C	C	C	C	C	C	C	C	340	335	330	340	335	345	340	335	A	A	295	I R 280	I R 280	305
24	295	F	S 285	305	320	285	280	310	335	330	325	340	325	320	345	340	320	325	325	300	270	285	305	295
25	285	280	290	265	265	275	300	325	310	355	365	325	325	335	315	325	I C 335	I C 335	325	I A 330	I A 270	265	270	300
26	335	335	315	260	250	250	305	325	320	I R 335	I C 340	I C 350	340	340	345	350	345	315	330	295	F	F	F	F
27	F	S 295	315	300	290	270	290	310	345	350	I C 340	I C 335	345	335	335	340	325	325	325	320	290	280	285	315
28	315	290	280	295	290	275	285	305	325	315	340	340	330	350	335	340	330	330	320	320	300	295	310	290
29	285	300	295	295	280	285	305	330	345	345	335	335	325	330	335	345	335	325	345	310	305	285	295	C
30	C	C	C	C	C	C	C	C	C	C	I C 345	330	325	315	325	340	345	315	335	315	315	265	290	285
31	280	305	330	275	265	275	290	310	325	345	325	340	315	325	335	325	335	335	340	320	320	295	290	295
	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
CNT	28	28	27	26	27	27	29	29	29	29	31	31	31	31	31	31	31	31	29	28	28	28	30	28
MED	292	290	290	280	285	285	305	330	335	330	335	335	325	325	335	340	335	325	325	320	302	290	295	292
UQ	298	295	305	295	302	302	310	335	345	340	340	340	340	335	338	345	335	335	340	328	312	295	305	305
LQ	278	280	272	270	278	275	290	325	330	325	330	330	325	320	325	330	325	320	325	312	285	280	280	285

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IONOSPHERIC DATA

DEC. 1968

M(3000)F1(0.01)

135° E Mean Time (G. M. T. + 9 h)

Station AKITA Lat. 39° 43.5' N. Long. 140° 8.2' E Sweep 1.0 Mc to 20.0 Mc in 15 sec in automatic operation

Day \ Hour	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										
2										L	L	L	L	L										
3										L	L	L	L	L										
4											L	L	L											
5											L	L	L	L										
6											L	L	L											
7											L	L	L	U L 420										
8											L	L	U L 390	L										
9											L	L	L	L										
10										L	L	L	U L 385											
11											L	L	L	L										
12										L	L	L	L	L	L									
13									L		L	H 370	L	L										
14											L	L	L	U L 375										
15											L	L	L	L										
16											L	L	L	L										
17										L	L	L	L	L										
18											L	L	L	L										
19											L	L	L	L										
20										L	L	L	L	L										
21											L	L	L	L										
22											L	L	L	L										
23											L	L	L	L										
24										L	L	L	L	L										
25											L	L	L	L										
26											C	C	L	L										
27											C	C	L											
28										L	L	L	L	L										
29										L	L	L	L	L										
30											C	L	L	L										
31											L	L	L	L										

	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
CNT										1		1	2	2										
MED										L 410		H 370	U L 388	U L 398										
UQ																								
LQ																								

IONOSPHERIC DATA

DEC. 1968 | h'F2 (km) | 135° E Mean Time (G. M. T. + 9 h)

Station AKITA Lat. 39° 43.5' N. Long. 140° 8.2' E Sweep 1.0 Mc to 20.0 Mc in 15 sec in automatic operation

Hour / 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										225	245	250	235	250										
2										250	235	230	240	240										
3										250	250	235	250	255										
4											230	230	230											
5											235	220	235	230										
6											235	230	225											
7											230	220	230	235										
8											240	225	230	245										
9											240	230	240	235										
10										235	250	250	240											
11											235	240	235	235										
12										245	250	250	240	240	245									
13									235		230	260	230	230										
14											250	230	240	240										
15											240	235	235	240										
16											240	230	235	240										
17										230	240	230	240	245										
18											240	240	235	250										
19											250	240	250	250										
20										240	255	235	240	245										
21											250	230	230	245										
22											240	235	230	240										
23											245	240	235	245										
24										235	250	230	230	235										
25											230	250	245	235										
26											I C 240	I C 235	245	240										
27											C	C	250											
28										250	245	230	230	220										
29										220	240	230	230	240										
30											I C 230	245	230	285										
31											250	240	235	250										

	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
CNT									1	10	30	30	31	27	1									
MED									235	238	240	235	235	240	245									
UQ										250	250	240	240	245										
LQ										230	235	230	230	235										

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IONOSPHERIC DATA

DEC. 1968

h'F (km)

135° E Mean Time (G. M. T. + 9 h)

Station AKITA Lat. 39°43.5'N. Long. 140° 8.2'E Sweep 1.0 Mc to 20.0 Mc in 15 sec in automatic operation

Hour / 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	300	300	290	290	290	245	235	220	295	230	230	230	220	235	240	220	235	230	290	270	280	285	320
2	320	305	305	290	280	305	250	220	235	230	235	230	245	230	240	215	205	230	245	220	255	245	315	310
3	290	300	310	295	I A 295	280	280	220	230	230	240	235	230	230	235	230	230	235	220	230	265	I A 315	300	290
4	300	300	335	I A 340	320	305	255	220	220	225	220	230	215	225	240	240	220	225	250	245	230	A 260	250	A
5	A	300	340	355	330	330	285	230	220	235	235	220	210	205	230	215	230	215	230	245	250	290	250	265
6	270	320	300	320	330	340	I A 330	260	235	230	230	215	215	230	230	230	220	I A 225	230	240	280	295	280	250
7	245	280	250	260	280	290	245	230	230	225	230	220	225	210	235	225	215	220	225	235	235	250	I A 270	I A 285
8	280	255	220	265	290	300	240	220	230	230	235	220	200	230	230	240	220	230	240	240	270	245	240	245
9	290	280	265	270	290	300	300	230	225	230	230	225	230	220	235	230	230	225	220	250	245	250	I A 260	I A 270
10	290	295	290	320	290	305	265	220	215	235	230	230	215	230	240	230	230	230	A	A	A	315	270	245
11	245	270	265	250	255	310	315	245	230	230	235	230	230	I A 230	245	220	220	230	235	255	295	290	245	I A 290
12	280	260	255	305	245	305	255	230	215	240	240	225	240	225	240	230	235	215	230	I A 240	270	310	265	280
13	255	270	250	235	230	245	270	240	225	240	230	H 215	230	220	240	225	215	220	230	255	I A 275	300	250	A
14	315	280	265	245	270	260	200	235	230	230	240	230	215	220	240	225	230	225	235	235	255	A	A	280
15	275	290	290	280	285	265	250	245	225	230	230	230	225	230	230	225	215	230	230	260	250	290	320	310
16	325	295	255	290	285	230	220	225	225	225	I A 235	215	225	225	240	230	225	220	220	230	295	300	305	270
17	285	270	285	295	260	250	255	245	230	200	240	230	230	230	230	215	I A 230	230	230	A	A	C	I A 290	280
18	290	290	265	255	250	240	265	235	220	230	230	225	225	235	230	215	220	230	I C 235	245	290	I A 320	320	320
19	305	315	330	280	225	230	F B 280	250	230	230	235	235	225	235	235	230	225	I A 240	240	240	235	305	290	310
20	290	290	265	250	280	290	265	225	230	235	235	235	230	220	240	225	245	220	225	255	I A 260	310	305	290
21	310	305	300	270	245	B 230	265	240	225	235	235	230	230	240	230	220	220	230	210	260	305	255	285	I A 315
22	I A 310	290	240	290	320	290	230	210	245	235	230	220	225	230	220	230	225	210	220	I A 255	270	295	290	245
23	I A 260	285	C	C	C	C	C	C	C	C	235	235	230	230	230	225	225	240	A	A	300	I A 305	I A 330	265
24	260	320	290	265	240	300	A	245	235	230	235	230	220	220	225	225	220	210	C 220	240	I A 305	295	270	265
25	270	270	260	300	305	300	270	230	230	240	230	220	225	225	230	230	I C 230	I C 225	220	I A 240	A	A	325	270
26	245	240	240	E S 340	325	340	295	240	220	240	I C 230	I C 230	230	235	235	220	205	235	220	280	340	310	315	285
27	290	285	240	245	265	290	245	245	220	235	I C 230	I C 220	220	230	235	225	230	215	225	240	265	I A 290	290	245
28	250	300	I A 260	280	260	300	275	H 230	235	230	230	215	220	220	215	230	220	220	225	230	250	270	230	270
29	290	265	270	270	305	280	255	220	220	220	215	205	215	230	220	230	210	245	215	240	255	275	270	C
30	C	C	C	C	C	C	C	C	C	C	I C 230	230	220	220	250	245	225	220	230	215	240	330	300	290
31	295	270	230	285	330	305	280	230	230	225	235	235	215	230	220	230	220	215	215	220	245	290	270	260
	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
CNT	29	30	29	29	29	29	28	29	29	29	31	31	31	31	31	31	31	31	29	28	28	28	30	28
MED	290	288	265	280	285	290	262	230	230	230	230	230	225	230	235	230	220	225	230	240	265	292	285	280
UQ	300	300		295	305	305	280	240	230	235	235	230	230	230	240	230	230	230	230	255	285	308	305	290
LQ	270	270	255	265	260	265	248	225	220	230	230	220	218	220	230	225	220	220	220	235	250	274	265	265

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IONOSPHERIC DATA

DEC. 1968 | h'Es (km) | 135° E Mean Time (G. M. T. + 9 h)

Station AKITA Lat. 39°43.5'N. Long. 140° 8.2'E Sweep 1.0 Mc to 20.0 Mc in 15 sec in automatic operation

Hour / 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	110	120	115	115	110	110	G	G	105	150	140	G	140	130	115	110	110	110	S	S	S	S
2	S	105	E	E	115	115	105	105	105	G	G	150	125	G	150	130	105	105	110	105	105	105	S	S
3	S	110	110	115	110	115	110	105	G	E G 175	G	115	125	G	E G 170	120	110	105	110	105	105	100	100	S
4	105	105	105	115	110	S	115	110	G	G	G	G	G	110	140	120	115	110	110	105	105	100	105	105
5	100	105	115	110	110	110	105	100	100	105	105	100	G	G	G	125	110	110	110	110	110	110	105	105
6	S	S	110	110	110	120	110	115	G	G	G	G	G	G	130	110	115	110	110	105	105	105	S	105
7	S	100	E	100	115	115	110	B	G	G	G	G	G	G	G	G	G	S	110	S	S	105	100	100
8	105	E	E	115	110	110	110	110	G	G	G	G	G	G	G	130	G	115	110	115	105	105	105	S
9	105	105	100	E	E	130	110	105	G	G	G	G	G	G	G	G	G	105	S	110	105	105	100	100
10	100	100	100	100	E	130	120	110	G	G	G	G	G	105	110	G	G	115	110	110	105	105	105	105
11	105	105	105	100	100	115	115	110	110	105	G	G	G	105	105	115	115	115	110	105	105	110	105	100
12	100	100	100	100	105	110	110	110	105	110	G	G	G	G	B	B	B	110	S	105	S	110	110	S
13	S	100	E	E	E	S	S	110	G	G	105	G	G	G	G	130	115	105	110	105	105	105	105	105
14	105	100	105	105	100	120	115	105	105	G	105	B	B	B	G	G	B	S	110	105	105	105	105	100
15	105	105	105	100	100	100	S	B	G	G	100	100	G	G	G	B	B	100	S	105	105	105	105	105
16	S	100	100	E	E	S	S	G	105	G	105	100	110	G	G	G	B	115	105	100	100	105	100	100
17	100	100	100	S	E	S	S	B	G	G	E G 170	G	G	G	G	115	105	110	105	105	100	C	100	100
18	S	S	S	S	E	110	105	100	G	G	G	B	G	G	130	115	110	105	C	105	110	100	100	100
19	S	100	100	E	E	S	B	G	105	G	G	B	G	G	G	G	110	105	105	105	S	100	100	S
20	S	S	E	E	100	100	115	115	105	105	G	105	G	G	100	105	140	110	105	105	105	105	105	100
21	100	100	100	100	105	B	S	B	G	G	105	G	G	150	140	115	105	105	S	100	S	S	105	100
22	100	100	E	E	E	S	S	G	105	G	G	135	130	G	G	G	G	105	105	105	100	100	100	100
23	100	S	C	C	C	C	C	C	C	C	G	G	G	100	G	G	110	105	105	105	100	100	100	110
24	E	E	E	E	115	110	105	105	105	100	G	G	G	G	G	B	G	105	105	105	105	100	105	S
25	S	S	100	S	S	S	S	100	C	C	C	C	C	C	C	C	C	C	110	100	105	100	105	S
26	100	100	100	S	E	S	115	110	G	105	C	C	G	G	G	G	G	100	100	100	110	105	100	100
27	100	100	100	100	100	E	E	105	G	G	C	C	G	G	G	G	G	100	S	E	S	100	100	100
28	100	100	100	S	S	E	S	S	105	G	G	G	G	G	G	G	100	100	100	100	S	S	S	B
29	100	E	S	S	S	E	S	G	G	G	G	G	G	G	100	100	100	100	S	S	S	S	S	Y
30	C	C	C	C	C	C	C	C	C	C	C	G	130	G	G	130	B	B	S	S	S	110	S	105
31	S	S	E	S	E	E	S	S	G	G	G	G	130	G	100	G	105	105	100	S	S	S	S	S
	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
CNT	17	20	19	14	16	16	17	19	11	7	8	8	7	5	12	15	17	27	23	26	21	25	24	20
MED	100	100	100	102	110	115	110	110	105	105	105	110	130	105	125	120	110	105	110	105	105	105	105	100
UQ	105	105	105	115	112	118	115	110	105	106	105	142	130	110	140	130	115	110	110	105	105	105	105	105
LQ	100	100	100	100	100	110	110	105	105	105	105	100	125	105	102	115	105	105	105	105	105	100	100	100

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IONOSPHERIC DATA

DEC. 1968 | Types of Es | 135° E Mean Time (G. M. T. + 9h)

Station AKITA Lat. 39°43.5'N, Long. 140°8.2'E Sweep 1.0 Mc to 20.0 Mc in 15 sec in automatic operation

Hour / 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			F1	F1	F2	F2	F1	L1			L1	H1	H1		HL21	HL21	C3	F4	F2	F2				
2		F1			F3	F3	F3	L3	L1			HL11	H2		H2	HL32	L2	F2	F1	F1	F2	F1		
3		F1	F2	F3	F5	F3	F4	L3		H1		C1	H1		H1	C3	L3	F4	F2	F2	F2	F2	F1	
4	F1	F3	F2	F5	F3		F2	L1						C2	H2	C3	C3	F2	F3	F3	F4	F2	F1	F2
5	F3	F2	F2	F2	F2	F2	F2	L2	L1	L1	L1	L1				C2	C2	F2	F1	F2	F1	F1	F2	F1
6			F1	F1	F2	F1	F2	C1							H2	C2	C1	F5	F2	F2	F2	F2		F1
7		F1		F1	F1	F1	F1												F1			F2	F3	F3
8	F1			F1	F1	F2	F1	L1								C3		F1	F1	F1	F2	F1	F1	
9	F1	F2	F1			F1	F1	L1										F2		F2	F2	F3	F3	F4
10	F2	F2	F1	F1		F1	F1	L1						L2	L1			F3	F3	F5	F4	F3	F1	F2
11	F2	F2	F3	F2	F2	F2	F2	L3	L1	L1				L1	L1	C1	C2	F1	F2	F3	F2	F1	F2	F4
12	F2	F2	F1	F1	F1	F1	F2	L2	L1	L2								F1		F2		F1	F1	
13		F1						L1			L1					H2	C1	F1	F2	F2	F5	F2	F2	F2
14	F2	F2	F1	F1	F1	F1	F2	L3	L1		L1								F2	F2	F2	F3	F3	F2
15	F2	F1	F2	F1	F2	F1					L1	L1						F1		F1	F1	F2	F2	F2
16		F1	F1						L1		L2	L1	L1					F1	F2	F3	F1	F1	F2	F2
17	F2	F2	F1								H1					C3	L3	F2	F2	F4	F3		F2	F2
18						F1	F1	L1							H1	C2	C2	F2		F2	F1	F2	F1	F1
19		F1	F1						L1								C3	F3	F3	F1		F1	F1	
20					F1	F2	F1	L1	L1	L1		L1			L1	L1	HL11	F1	F2	F3	F2	F2	F2	F2
21	F1	F2	F1	F1	F1						L1			H1	H1	C2	L2	F1		F1			F1	F2
22	F2	F1							L1			H1	H1					F1	F1	F2	F2	F2	F1	F1
23	F1													L1			L1	F5	F3	F3	F2	F3	F2	F1
24					F1	F2	F3	L5	L2	L1								F1	F1	F1	F2	F1	F1	
25			F1					L2											F1	F2	F2	F1	F1	
26	F1	F1	F1				F1	L2		L1								F2	F3	F1	F1	F3	F3	F2
27	F1	F1	F1	F1	F1			L1										F1				F2	F1	F2
28	F1	F2	F1						L1								L1	F2	F1	F1				
29	F1														L2	L2	L2	F1						
30													H1			H1						F2		F1
31													H1		L1		L1	F1	F2					
	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
CNT																								
MED																								
UQ																								
LQ																								

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IONOSPHERIC DATA

DEC. 1968 | foF2 (0.1) | 135° E Mean Time (G. M. T. + 9 h)

Station KOKUBUNJI TOKYO Lat. 35° 42.4' N. Long. 139° 29.3' E Sweep 1.0 Mc to 20.0 Mc in 20 sec in automatic operation

Hour / 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	31	31	34	33	32	36	43	J S 77	83	93	111	106	120	103	113	90	J R 77	66	61	35	39	37	J R 38	34
2	35	36	37	37	36	37	A	69	85	101	129	112	108	103	J R 107	101	88	61	53	54	47	33	31	32
3	33	33	34	37	40	38	42	R	95	118	138	135	122	113	115	108	91	67	64	43	A	A	38	38
4	34	35	31	34	35	39	39	71	99	130	139	120	H 117	106	115	J R 105	I R 96	69	58	63	61	36	30	J R 27
5	27	I R 30	28	27	30	26	A	R	118	126	126	116	111	108	107	92	83	75	53	39	37	33	36	25
6	24	21	23	24	24	22	28	I R 78	128	136	144	128	126	113	112	J R 105	84	82	52	R 31	37	34	37	39
7	32	30	27	30	30	28	33	I R 73	104	121	112	95	89	R 86	84	80	69	53	48	45	36	35	R 28	28
8	33	36	30	30	34	34	40	67	U S 77	R 108	125	101	90	85	89	84	78	62	57	58	45	44	39	29
9	29	30	28	30	30	29	31	76	J R 103	114	120	108	99	96	J R 106	J R 106	84	76	60	65	J R 62	54	44	40
10	38	36	28	I A 28	28	26	32	72	90	112	108	110	109	101	100	91	72	67	I A 53	A	A	I R 38	I A 39	39
11	38	35	A	27	28	I S 27	28	65	106	128	130	120	116	106	101	84	70	70	A	A	A	56	R	R
12	R	I R 36	29	30	J R 36	30	29	J R 72	96	116	128	141	150	133	113	118	84	68	42	40	39	40	42	38
13	33	31	33	31	29	31	28	60	89	118	126	105	110	89	80	92	74	53	49	37	34	40	44	30
14	30	34	34	37	J R 39	R 38	39	59	82	108	127	110	98	95	95	84	60	S 74	68	47	38	37	39	37
15	34	I A 30	31	32	32	33	31	57	84	103	106	90	91	86	88	78	53	63	57	31	32	30	31	32
16	34	34	34	34	37	36	29	58	81	97	121	95	83	86	96	88	R 76	63	49	45	30	31	33	35
17	37	30	30	33	A	36	38	64	96	114	132	113	101	106	J R 104	90	J R 74	60	64	J R 54	A	I A 29	30	31
18	31	30	31	28	32	27	I A 30	61	87	94	114	111	96	84	90	80	68	58	46	35	31	30	31	32
19	35	33	31	36	33	29	28	59	95	100	J R 105	100	90	98	93	80	77	70	55	51	31	31	32	32
20	36	36	36	31	31	32	36	I R 63	J R 83	99	111	116	100	91	95	80	70	I R 77	61	41	30	30	31	33
21	I A 32	34	32	31	31	28	28	69	83	98	108	106	92	87	89	79	66	64	62	38	35	40	38	34
22	35	35	32	28	29	30	36	66	90	124	132	123	92	101	95	80	83	73	U R 49	38	40	38	37	40
23	31	28	26	28	29	30	35	64	90	102	118	117	113	98	89	78	71	68	61	43	34	31	30	35
24	39	30	35	31	30	27	25	65	107	125	146	140	118	101	100	84	75	70	52	R 39	35	40	43	41
25	38	33	32	26	30	27	28	J R 68	88	124	136	126	116	93	84	83	74	74	59	37	28	34	I A 32	39
26	35	26	24	A	24	24	29	65	96	118	132	106	95	91	87	80	63	55	48	33	R 35	U R 42	U R 54	U R 54
27	R 52	60	J R 52	R 30	R	25	U R 28	61	U R 88	C	109	101	104	96	86	84	68	69	40	36	34	36	40	40
28	33	A	A	24	23	27	28	56	88	117	130	117	111	89	92	95	73	68	63	56	I R 50	45	50	37
29	37	43	40	36	34	32	34	70	J R 81	108	99	105	108	107	92	86	71	60	70	61	53	52	56	51
30	37	43	39	27	28	I R 29	30	60	I R 81	108	112	91	90	83	92	91	80	52	48	43	I A 36	31	36	38
31	37	40	30	27	30	30	30	J R 64	C	113	116	131	119	116	C	C	C	C	53	44	31	30	35	36
	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
CNT	30	30	29	30	29	31	29	29	30	30	31	31	31	31	30	30	30	30	30	29	27	30	30	30
MED	34	34	31	30	30	30	30	65	90	114	125	111	108	98	95	85	74	68	54	43	36	36	37	36
UQ	37	36	34	33	34	34	36	70	96	121	131	120	116	106	106	92	83	70	61	51	40	40	40	39
LQ	32	30	29	28	29	27	28	61	83	102	112	105	94	89	89	80	70	61	49	37	33	31	31	32

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IONOSPHERIC DATA

DEC. 1968

foF1 (0.01)

135° E Mean Time (G. M. T. + 9 h)

Station KOKUBUNJI TOKYO Lat. 35°42.4'N. Long. 139°29.3'E Sweep 1.0 Mc to 20.0 Mc in 20 sec in automatic operation

Hour / 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	L	L		L	L		A								
2													L	L		A								
3									L		A	L	L											
4												L			L									
5										L	L	L	L	L	L									
6								L		L	I	L	L											
7										L	L	L	L	L										
8									L	L	L	L	L	L	L									
9									L	L	L	L	L	L	L									
10											L		L	L										
11												L	L		L									
12										L	L	L	L	L										
13										L	L	L	L		L	L								
14										L	L	L	L	L	L	L	L							
15										L	L													
16											L		L	L	L									
17										L			L	L		L								
18												L												
19										L	L	L	L	L	L									
20									L		L	L	L											
21											L	L	L											
22										L	L	L	L	L	L									
23										L	L	L	L	L										
24												L	L	L	L									
25										L	L	L	L	L	L									
26										L	L	L	L											
27										C	L	L	L	L	L									
28									L	L	L	L	L	L	L									
29										L	L	L	L	L										
30											L	L		L	L									
31									C		L	L	L	L	C	C	C							

	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
CNT																								
MED																								
UQ																								
LQ																								

The Radio Research Laboratories, Japan

IONOSPHERIC DATA

DEC. 1968 | foE (0.01) | 135° E Mean Time (G. M. T. + 9 h)

Station KOKUBUNJI TOKYO Lat. 35°42.4' N. Long. 139°29.3' E Sweep 1.0 Mc to 20.0 Mc in 20 sec in automatic operation

Hour / 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								200	A	280	330	330	335	I A 330	I A 310	A	A							
2								A	A	I A 300	I A 325	A	A	A	I A 300	265	A							
3								A	A	A	A	360	340	330	310	260	A							
4								A	280	R	330	R	A	A	R	A	A							
5								A	A	320	330	R	R	R	A	A	A							
6								A	I R 265	310	325	345	R	R	R	A	A							
7								A	R	310	R 330	345	I R 335	330	R 280	R	180							
8								B	240	280	320	340	340	340	300	R 255	190							
9								B	I A 260	305	330	350	350	I A 340	320	I A 250	190							
10								A	I A 270	310	330	335	345	R	A	A	195							
11								B	A	300	A	A	A	A	A	A	R							
12								A	275	300	335	I R 340	345	335	320	B	I R 210							
13								170	I R 260	I A 310	345	U R 335	350	I B 330	305	I B 240	A							
14								220	I A 270	300	320	I B 335	345	I R 330	300	B	A							
15								B	R	300	I R 320	350	360	I R 340	305	I R 250	A							
16								B	R	A	A	A	R	I R 335	A	A	A							
17								190	A	R	A	A	A	A	A	A	A							
18								A	A	I A 325	335	345	350	I R 335	325	245	A							
19								B	R	300	I B 325	R	R 350	U R 330	310	R	R							
20								195	A	310	325	R	A	R	305	A	A							
21								B	270	300	335	345	I A 340	330	A	A	A							
22								180	250	290	320	330	335	325	315	I A 270	195							
23								180	A	310	330	350	350	R 340	320	270	A							
24								B	A	A	A	R	350	I R 335	R	B	B							
25								B	A	A	R 330	B	B	335	B	B	215							
26								190	A	305	325	U C 340	345	I R 340	320	B	B							
27								B	R	C	330	R 345	350	I R 350	330	B	A							
28								B	250	315	330	350	355	I R 350	320	R	A							
29								B	A	310	320	345	350	350	325	R	U R 230							
30								B	250	I A 310	I R 335	340	345	340	R	R	R							
31								B	C	R	325	335	350	335	C	C	C							
	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
CNT								8	12	23	26	21	22	23	19	9	8							
MED								190	262	305	330	345	348	U 335	310	255	195							
UQ								198	270	310	330	345	350	U R 340	320	265	212							
LQ								180	250	300	325	335	340	330	305	U 250	190							

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IONOSPHERIC DATA

DEC. 1968 | foEs (0.1) | 135° E Mean Time (G. M. T. + 9 h)

Station KOKUBUNJI TOKYO Lat. 35° 42.4' N. Long. 139° 29.3' E Sweep 1.0 Mc to 20.0 Mc in 20 sec in automatic operation

Hour / 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	22	23	M 21	E B 12	22	J X 30	J X 29	J X 25	60	G 22	37	39	40	35	J X 35	54	35	J X 29	20	E S 15	E S 15	E S 15	E S 15	E S 15
2	E S 15	E B 13	E S 15	E B 13	22	J X 28	J X 108	J X 77	J X 44	J X 54	J X 37	35	J X 37	35	40	J X 57	J X 28	J X 36	23	M 22	E S 16	21	E S 16	E S 17
3	E S 16	E S 16	E S 16	E S 15	22	J X 25	J X 29	J X 51	J X 41	J X 54	J X 71	G 29	41	J X 44	36	29	J X 54	J X 53	J X 42	J X 42	J X 54	J X 54	J X 46	J X 42
4	J X 30	J X 29	21	J X 23	J X 25	M 18	E S 16	J X 40	G	G	G	G 22	36	J X 51	G	J X 57	J X 74	J X 110	J X 54	J X 64	J X 29	J X 25	23	E S 15
5	E S 16	E S 15	M 20	J X 25	21	J X 25	J X 54	J X 41	J X 37	J G 29	J G 26	J G 29	G	G	36	J X 37	J X 60	J X 53	J X 41	J X 25	J X 29	M 21	21	E S 16
6	E S 16	E S 17	E S 16	E B 13	22	J X 26	J X 26	21	G	G	J G 29	G	J G 29	G	G	J X 60	J X 62	J X 25	J X 61	J X 133	J X 24	22	E S 16	21
7	21	E B 14	E S 16	20	M 21	22	M 22	J X 24	G 21	G	G	G	G	G	G	G	20	30	E S 16	E S 16	E S 16	E S 16	E S 16	E S 16
8	18	E S 18	E S 16	E S 16	19	23	22	22	G	G 20	G	G	G	G	G	G	G	J X 17	M 35	J X 25	J X 26	30	J X 22	23
9	J X 19	21	E S 16	E B 11	E	E S 15	E S 16	19	35	G 29	J G 25	G	G 20	G 22	J G 29	J X 36	G	E S 16	J X 29	J X 25	J X 36	J X 25	M 21	E S 15
10	21	22	29	J X 52	E B 14	E S 15	23	25	J X 29	G	G	G	G	G 31	35	J X 26	G	E S 16	J X 85	J X 53	J X 52	J X 61	J X 95	J X 25
11	J X 29	J X 26	J X 37	J X 25	22	E S 18	23	24	36	J X 51	42	J X 62	J X 53	34	36	34	G	J X 41	J X 105	J X 121	J X 51	36	J X 51	J X 38
12	35	21	21	21	E B 13	E S 16	21	J X 25	G	J G 29	G	G	G	G	G	E B 32	G	E S 15	21	J X 30	J X 30	24	22	E S 15
13	23	M 20	M 21	M 20	E S 15	E S 15	M 23	G	G	J X 42	G 31	G	G	E B 40	G	E B 26	24	E B 14	M 21	21	22	M 36	J X 40	J X 26
14	J X 28	E S 15	E S 15	E	J X 21	E B 13	E S 15	G	J X 39	34	36	E B 37	G	G	G	E B 25	20	23	J X 28	M 35	J X 54	J X 51	21	J X 28
15	M 35	J X 36	J X 26	E S 15	J X 22	21	E S 15	E B 15	G 22	G	G	G	G	G	G	G	23	21	21	21	E S 16	J X 25	J X 25	J X 25
16	21	J X 25	21	21	19	20	21	E B 19	G 24	J X 36	J X 34	42	G 31	G	J X 36	J X 36	J X 41	J X 38	22	J X 25	22	E S 16	E S 16	E S 16
17	21	23	20	21	J X 33	22	E S 16	G	J X 29	J G 29	34	43	43	33	J X 42	J X 36	J X 37	J X 37	J X 29	J X 30	36	J X 30	J X 29	M 23
18	22	22	C	E S 16	21	J X 25	J X 42	J X 28	J X 29	J X 42	G 30	G 30	G	G	G	33	J X 25	J X 52	J X 44	J X 29	J X 29	J X 25	J X 27	J X 25
19	23	21	E S 16	20	E B 11	E S 15	E S 16	E B 16	G	G	E B 37	G 31	G	G	G	G	21	J X 22	22	J X 29	E S 16	E S 16	E S 26	E S 16
20	E S 16	E B 12	E B 13	E S 16	E S 15	E S 16	E S 16	G	J X 29	G	G	G 32	36	G	G	30	26	J X 91	J X 23	E S 16	E S 16	J X 23	21	J X 25
21	42	21	E S 16	E S 15	E B 11	E B 12	E S 15	E B 16	G	32	36	39	J X 43	J X 42	J X 42	J X 42	J X 108	J X 29	J X 24	J X 24	E S 15	E S 15	E S 15	E S 16
22	E S 15	J X 25	E B 12	20	E B 12	E S 16	E S 15	G	G	G	34	39	G 19	G 20	G	M 35	21	J X 24	M 22	J X 24	E S 15	E S 15	E S 15	E S 15
23	M 20	M 20	17	M 21	E	E S 15	J X 18	J X 25	J X 28	G	J G 29	G 31	J G 29	G	G	36	J X 29	J X 50	J X 79	J X 41	J X 25	J X 25	J X 23	21
24	E S 16	E S 16	E	E	E B 12	J X 30	J X 40	J X 42	J X 52	J X 36	J X 57	G	G	G	G	E B 27	E B 26	21	J X 35	J X 29	J X 29	J X 25	M 21	20
25	22	19	E B 11	E B 12	E S 16	E B 13	E S 16	J X 36	J X 29	M 47	G	E B 37	E B 36	G	E B 33	E B 30	29	22	J X 21	35	J X 42	J X 38	J X 43	J X 29
26	22	23	J X 24	J X 36	J X 24	19	25	J X 30	J X 39	G	G 30	J G 29	G	G	J G 30	E B 26	21	32	J X 23	E S 16	18	J X 24	J X 28	30
27	30	E S 17	E S 16	E S 18	E S 17	E S 17	E S 17	19	28	C	G	G	G	G	G	E B 25	23	E B 19	J X 18	M 21	20	M 20	M 35	J X 24
28	J X 24	J X 26	J X 25	J X 19	21	20	E S 15	E B 16	G	J G 29	G 30	G	G	G	J G 29	G 21	28	J X 25	J X 25	21	J X 29	J X 41	E S 16	21
29	J X 22	J X 28	J X 29	J X 25	J X 25	E S 16	E S 16	21	25	J G 29	G	G	G	G	G 23	G 21	G 20	20	E S 16	21	E S 16	E S 15	E S 16	E S 16
30	E S 16	E S 15	E B 13	21	21	E S 16	21	E B 18	G	32	G	G	G	G 21	G 21	G 21	G 21	J X 25	J X 29	20	42	J X 36	J X 33	E S 15
31	J X 25	21	E S 16	21	E S 16	E B 12	E S 16	E B 16	C	J G 26	G	G	G	G	C	C	C	C	22	E S 16	E S 15	E S 16	E S 16	E S 16
	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
CNT	31	31	30	31	31	31	31	31	30	30	31	31	31	31	30	30	30	30	31	31	31	31	31	31
MED	22	21	16	20	21	E 18	21	21	28	G 29	G 29	E G 29	G	G	E G 21	29	24	J X 25	J X 24	J X 25	25	25	22	21
UQ	24	23	21	21	22	22	24	J X 26	J X 36	J 36	34	U 34	36	U 29	35	J X 36	J X 35	J X 38	J X 38	J X 32	J X 33	J X 33	J X 28	J X 25
LQ	17	E E 16	E S 16	E E 15	E E 14	E S 15	E S 16	E G 16	G	G	G	G	G	G	G	E G 25	20	21	22	21	E S 16	18	E S 16	E S 16

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IONOSPHERIC DATA

DEC. 1968

fbEs (0.1)

135° E Mean Time (G. M. T. + 9 h)

Station KOKUBUNJI TOKYO Lat. 35°42.4'N. Long. 139°29.3'E Sweep 1.0 Mc to 20.0 Mc in 20 sec in automatic operation

Hour / 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	18	E	E	E B 12	E	18	16	18	56	G 20	37	39	39	34	32	53	27	20	E	E S 15	E S 15	E S 15	E S 15	E S 15
2	E S 15	E B 13	E S 15	E B 13	14	E	A	35	38	40	37	35	37	32	34	57	26	33	19	E	E S 16	E	E S 16	E S 17
3	E S 16	E S 16	E S 16	E S 15	E	20	25	46	40	41	57	G 27	41	44	34	29	46	27	39	31	A	A	24	26
4	27	E	E	17	23	E	E S 16	25	G	G	G	E R 22	34	46	G	27	61	35	26	41	28	E	E	E S 15
5	E S 16	E S 15	E	16	E	E	A	30	29	G 26	G 26	G 26	G	G	30	28	21	41	23	19	E	E	E	E S 16
6	E S 16	E S 17	E S 16	E B 13	E	E	E	18	G	G	G 27	G	G 25	G	G	28	26	20	40	26	21	E	E S 16	E
7	E	E B 14	E S 16	E	E	E	E	20	E R 21	G	G	G	G	G	G	G	E R 20	26	E S 16	E S 16	E S 16	E S 16	E S 16	E S 16
8	E	E S 18	E S 16	E S 16	E	E	E	16	G	G 17	G	G	G	G	G	G	G	E	32	17	E	28	E	E
9	E	E	E S 16	E B 11	E	E S 15	E S 16	19	27	G 19	G 25	G	E R 20	E R 22	G 27	26	G	E S 16	28	25	E	17	E	E S 15
10	E	E	25	A	E B 14	E S 15	E	19	26	G	G	G	G	E R 31	30	26	G	E S 16	A	A	A	28	A	19
11	28	26	A	18	E	E S 18	E	22	28	28	40	40	38	33	30	28	G	E	A	A	A	E	50	30
12	26	E	E	E	E B 13	E S 16	E	25	G	G 28	G	G	G	G	G	E B 32	G	E S 15	E	E	18	E	E	E S 15
13	E	E	15	E	E S 15	E S 15	E	G	G	34	G 30	G	G	E B 40	G	E B 26	24	E B 14	18	E	E	18	27	20
14	17	E S 15	E S 15	E	E	E B 13	E S 15	G	28	33	35	E B 37	G	G	G	E B 25	19	19	22	29	17	17	E	E
15	27	A	24	E S 15	15	E	E S 15	E B 15	E R 24	G	G	G	G	G	G	G	20	18	E	E	E S 16	E	19	21
16	16	20	E	E	E	E	E	E B 19	E R 24	32	33	38	E R 31	G	33	30	18	26	17	E	E	E S 16	E S 16	E S 16
17	E	17	E	E	A	E	E S 16	G	28	G 26	34	41	40	33	41	26	30	29	19	25	A	A	20	E
18	E	E	C	E S 16	E	E	A	18	26	33	G 26	G 26	G	G	G	33	25	20	E	26	25	19	25	19
19	E	E	E S 16	E	E B 11	E S 15	E S 16	E B 16	G	G	E B 37	E R 31	G	G	G	G	17	19	E	19	E S 16	E S 16	E S 26	E S 16
20	E S 16	E B 12	E B 13	E S 16	E S 15	E S 16	E S 16	G	27	G	G	E R 32	34	G	G	28	25	40	E	E S 16	E S 16	E	E	E
21	A	E	E S 16	E S 15	E B 11	E B 12	E S 15	E B 16	G	32	35	39	41	40	40	40	40	17	E	E	E S 15	E S 15	E S 15	E S 16
22	E S 15	E	E B 12	E	E B 12	E S 16	E S 15	G	G	G	34	38	G 19	G 19	G	32	17	E	E	E	E S 15	E S 15	E S 15	E S 15
23	E	E	E	E	E	E S 15	E	16	26	G	G 26	G 31	G 19	G	G	28	25	46	40	26	E	E	E	E
24	E S 16	E S 16	E	E	E B 12	20	E	28	30	33	53	G	G	G	G	E B 27	E B 26	16	26	25	26	25	E	E
25	E	E	E B 11	E B 12	E S 16	E B 13	E S 16	25	25	33	G	E B 37	E B 36	G	E B 33	E B 30	27	16	16	21	20	26	A	26
26	18	E	E	A	15	E	16	G	26	G	G 28	G 27	G	G	G 26	E B 26	E R 21	28	20	E S 16	18	19	26	26
27	25	E S 17	E S 16	E S 18	E S 17	E S 17	E S 17	E R 19	26	C	G	G	G	G	G	E B 25	22	E B 19	E	E	E	E	25	17
28	20	A	A	15	15	E	E S 15	E B 16	G	G 26	G 26	G	G	G	G 26	E R 21	26	20	20	21	26	25	E S 16	E
29	E	25	25	25	25	E S 16	E S 16	17	25	G 26	G	G	G	G	E R 23	E R 21	G 20	E	E S 16	19	E S 16	E S 15	E S 16	E S 16
30	E S 16	E S 15	E B 13	E	E	E S 16	E	E B 18	G	31	G	G	G	E R 21	E R 21	E R 21	E R 21	25	28	18	A	20	E	E S 15
31	E	E	E S 16	E	E S 16	E B 12	E S 16	E B 16	C	G	G	G	G	G	C	C	C	C	19	E S 16	E S 15	E S 16	E S 16	E S 16
	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
CNT	31	31	30	31	31	31	31	31	30	30	31	31	31	31	30	30	30	30	31	31	31	31	31	31
MED	16	E E 13	E E 15	E E 13	E E 12	E E 13	E E 15	17	26	G 26	G 26	E G 26	G	G	E G 21	26	21	20	19	19	16	16	E E 16	E E 16
UQ	18	E E 17	E S 16	E E 16	E E 15	E S 16	E S 16	21	28	32	34	U 32	U 32	U G 26	30	29	26	27	27	26	26	20	23	18
LQ	E	E	E	E	E	E	E	E G 16	G	G	G	G	G	G	G	E E 25	E G 18	E E 16	E	E E 15	E S 15	E	E	E E 15

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IONOSPHERIC DATA

DEC. 1968

f-min (0.1)

135° E Mean Time (G. M. T. + 9h)

Station KOKUBUNJI TOKYO Lat. 35° 42.4' N, Long. 139° 29.3' E Sweep 1.0 Mc to 20.0 Mc in 20 sec in automatic operation

Hour / 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	14	13	ES 15	12	11	ES 15	14	14	14	13	16	17	18	16	14	17	12	ES 16	ES 15	ES 15	ES 15	ES 15	ES 15	ES 15
2	ES 15	13	ES 15	13	10	ES 15	ES 16	15	14	16	16	14	12	11	16	16	16	ES 16	ES 16	ES 16	ES 16	ES 16	ES 16	ES 17
3	ES 16	ES 16	ES 16	ES 15	ES 15	ES 16	ES 16	16	16	16	18	18	17	26	16	17	15	ES 15	ES 16	ES 17	ES 16	ES 16	ES 16	ES 16
4	ES 16	13	ES 16	ES 16	ES 16	ES 16	ES 16	15	16	16	16	16	16	16	16	16	16	ES 16	ES 15	ES 16	ES 16	ES 16	ES 16	ES 15
5	ES 16	ES 15	ES 16	10	ES 16	ES 16	ES 16	15	16	16	16	18	26	25	16	16	15	ES 16	ES 15	ES 16	ES 16	ES 16	ES 16	ES 16
6	ES 16	ES 17	ES 16	13	ES 15	ES 15	ES 16	16	16	18	16	26	18	19	16	16	13	ES 15	ES 16	ES 16	ES 16	ES 16	ES 16	ES 16
7	ES 16	14	ES 16	14	14	14	ES 16	16	16	18	25	26	25	25	15	16	16	16	16	ES 16	ES 16	ES 16	ES 16	ES 16
8	ES 16	ES 18	ES 16	ES 16	ES 16	ES 16	ES 17	15	16	15	16	25	19	25	16	16	15	ES 16	ES 17	ES 15	ES 15	ES 15	ES 15	ES 15
9	ES 16	ES 15	ES 16	11	10	ES 15	ES 16	16	14	16	14	16	15	19	16	14	16	ES 16	ES 16	ES 16	ES 16	ES 16	ES 16	ES 15
10	ES 16	ES 16	14	ES 15	14	ES 15	ES 16	16	15	16	16	18	26	26	16	16	16	ES 16	ES 16	ES 16	ES 16	ES 16	ES 16	ES 16
11	ES 16	ES 15	ES 16	ES 16	ES 16	ES 18	ES 16	16	16	16	18	19	19	26	18	16	16	ES 16	ES 16	ES 16	ES 16	ES 16	ES 16	ES 16
12	ES 16	ES 16	ES 16	ES 16	13	ES 16	ES 16	16	16	22	27	26	26	26	26	32	15	ES 15	ES 15	ES 16	ES 16	ES 15	ES 15	ES 15
13	ES 15	12	10	ES 15	ES 15	ES 15	ES 15	16	16	18	26	29	28	40	26	26	16	14	ES 16	ES 16	ES 15	ES 15	ES 15	ES 15
14	ES 15	ES 15	ES 15	10	11	13	ES 15	16	16	19	27	37	28	27	26	25	16	ES 16	ES 16	ES 16	ES 15	ES 16	ES 15	ES 15
15	ES 15	ES 15	12	ES 15	10	12	ES 15	15	16	24	19	27	26	26	26	16	16	ES 15	ES 16	ES 16	ES 16	ES 15	ES 16	ES 16
16	ES 15	ES 15	ES 16	14	ES 16	ES 15	ES 16	19	16	15	18	19	16	16	16	16	16	ES 16	ES 16	ES 16	ES 16	ES 16	ES 16	ES 16
17	ES 16	12	ES 16	ES 16	ES 16	ES 16	ES 16	17	16	16	26	19	25	19	19	16	16	ES 16	ES 16	ES 16	ES 16	ES 16	ES 16	ES 16
18	ES 16	ES 16	ES 16	ES 16	ES 16	ES 16	ES 15	16	14	16	16	16	26	26	26	16	16	ES 16	ES 16	ES 16	ES 16	ES 17	ES 16	ES 16
19	ES 16	ES 16	ES 16	ES 16	11	ES 15	ES 16	16	18	26	37	28	27	26	16	16	15	ES 16	ES 16	ES 16	ES 16	ES 16	26	ES 16
20	ES 16	12	13	ES 16	ES 15	ES 16	ES 16	17	16	20	15	25	26	27	16	16	16	ES 16	ES 16	ES 16	ES 16	ES 16	ES 16	ES 16
21	ES 16	ES 16	ES 16	ES 15	11	12	ES 15	16	17	26	26	26	25	26	19	15	15	11	ES 15	ES 15	ES 15	ES 15	ES 15	ES 16
22	ES 15	ES 15	12	10	12	ES 16	ES 15	15	15	19	19	15	14	16	16	16	16	ES 15	ES 15	ES 15	ES 15	ES 15	ES 15	ES 15
23	ES 16	ES 15	ES 15	12	10	ES 15	ES 15	15	16	18	16	25	18	27	27	17	15	ES 16	ES 16	ES 16	ES 16	ES 16	ES 16	ES 16
24	ES 16	ES 16	10	10	12	13	ES 16	16	16	18	19	25	26	26	28	27	26	12	ES 16	ES 16	ES 16	ES 16	ES 16	ES 16
25	ES 16	ES 16	11	12	ES 16	13	ES 16	16	16	18	27	37	36	27	33	30	16	12	12	13	ES 15	14	ES 15	ES 15
26	ES 15	ES 16	ES 15	10	10	ES 15	12	16	15	19	19	16	26	26	16	26	15	ES 16	ES 16	ES 16	ES 16	ES 16	ES 16	ES 16
27	ES 16	ES 17	ES 16	ES 18	ES 17	ES 17	ES 17	17	18	C	26	26	26	26	26	25	15	19	13	ES 15	ES 15	ES 15	ES 15	ES 15
28	ES 15	13	12	12	12	ES 15	ES 15	16	16	14	19	25	26	28	25	16	14	ES 15	ES 16	ES 16	ES 16	ES 16	ES 16	ES 16
29	ES 16	ES 15	ES 16	ES 16	ES 16	ES 16	ES 16	16	16	17	25	25	26	26	16	16	15	ES 16	ES 16	ES 16	ES 16	ES 15	ES 16	ES 16
30	ES 16	ES 15	13	13	ES 16	ES 16	ES 16	18	16	16	16	16	19	18	18	16	17	ES 16	ES 16	ES 16	ES 16	ES 16	ES 16	ES 15
31	ES 15	ES 15	ES 16	ES 15	ES 16	12	ES 16	16	C	16	16	18	26	25	C	C	C	C	ES 15	ES 16	ES 15	ES 16	ES 16	ES 16
	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
CNT	31	31	31	31	31	31	31	31	30	30	31	31	31	31	30	30	30	30	31	31	31	31	31	31
MED	ES 16	ES 15	ES 16	ES 15	ES 15	ES 15	ES 16	16	16	16	18	25	26	26	16	16	16	ES 16	ES 16	ES 16	ES 16	ES 16	ES 16	ES 16
UQ	ES 16	ES 16	ES 16	ES 16	ES 16	ES 16	ES 16	16	16	19	26	26	26	26	26	17	16	ES 16	ES 16	ES 16	ES 16	ES 16	ES 16	ES 16
LQ	ES 15	EE 13	U 12	12	11	ES 15	ES 15	16	16	16	16	18	18	19	16	16	15	ES 15	ES 15	ES 16	ES 15	ES 15	ES 15	ES 15

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DEC. 1968 | M(3000)F2(0.01) | 135° E Mean Time (G. M. T. + 9 h)

Station KOKUBUNJI TOKYO Lat. 35° 42.4' N. Long. 139° 29.3' E Sweep 1.0 Mc to 20.0 Mc in 20 sec in automatic operation

Hour / 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	275	275	290	275	280	310	J S 345	350	340	340	315	325	325	335	330	J R 335	325	350	315	280	280	J R 290	280
2	260	280	275	280	275	275	A	350	340	315	320	315	325	310	J R 325	320	325	315	315	320	330	310	295	275
3	280	280	280	275	300	270	280	R	315	310	305	310	310	300	300	315	340	330	330	335	A	A	295	290
4	270	295	275	290	280	295	330	370	320	325	330	305	290 H	320	320	J R 335	I R 335	320	315	335	330	285	295	J R 290
5	280	I R 270	260	255	255	290	A	R	335	335	330	335	315	320	320	315	325	345	325	315	295	285	335	290
6	290	275	270	275	265	265	270	I R 310	330	330	315	310	315	315	315	J R 335	320	305	345	R 290	305	290	295	315
7	315	300	280	275	260	270	310	I R 325	330	355	350	340	340	R 330	325	345	330	320	325	345	325	315	R 325	275
8	290	325	335	265	275	285	325	330	U S 330	R 335	345	335	320	330	325	335	335	320	335	335	330	320	330	305
9	295	295	270	270	275	270	275	340	J R 360	340	335	320	320	315	J R 315	J R 325	325	315	315	310	J R 315	320	310	305
10	280	305	280	I A 270	270	285	320	350	335	345	340	330	325	315	310	330	330	315	I A 330	A	A	I R 295	I A 280	290
11	285	295	A	280	280	I S 280	280	325	325	330	325	325	310	320	315	335	315	300	A	A	A	270	R	R
12	R	I R 300	275	265	J R 290	275	285	J R 315	330	320	315	305	300	315	305	320	330	325	320	310	290	280	320	305
13	305	290	290	325	280	310	290	345	340	320	345	325	335	350	300	335	340	320	325	320	305	315	325	300
14	285	290	290	275	J R 270	R 300	310	340	340	325	340	335	325	325	330	335	350	S 315	350	335	300	285	295	310
15	275	I A 285	290	285	285	305	305	335	340	340	340	320	340	325	340	335	330	325	335	315	305	295	285	275
16	280	265	295	290	280	305	315	315	330	330	335	345	325	330	330	320	R 330	315	325	315	275	285	270	285
17	305	285	280	280	A	295	285	315	325	320	330	320	310	320	J R 325	335	J R 315	275	330	J R 330	A	I A 285	265	295
18	290	295	315	285	325	295	I A 290	345	345	320	335	300	330	315	320	325	325	330	335	310	300	290	275	290
19	280	280	270	305	335	280	280	310	335	330	J R 325	330	320	320	335	325	310	330	310	335	315	265	290	280
20	285	285	300	310	285	290	300	I R 330	J R 320	320	320	330	320	315	325	325	315	I R 320	325	345	310	295	295	265
21	I A 270	275	305	315	310	295	290	320	335	350	335	340	325	320	340	355	335	315	340	330	275	300	290	275
22	285	285	315	270	255	280	330	340	320	335	350	340	325	315	325	325	325	340	U R 345	295	300	300	295	325
23	320	285	290	265	265	265	310	340	355	320	320	315	325	315	315	320	325	310	345	335	290	305	280	265
24	290	280	265	315	305	290	300	295	345	320	310	310	295	305	320	325	325	330	325	R 330	255	285	310	315
25	295	290	300	275	260	270	315	J R 325	340	330	350	340	335	315	320	315	320	310	325	325	265	245	I A 265	290
26	315	300	315	A	255	265	280	330	335	330	350	340	330	330	325	340	340	330	335	300	R 295	U R 265	U R 290	U R 280
27	R 285	290	J R 335	R 280	R	275	U R 300	335	U R 350	C	340	330	325	330	315	335	325	330	305	305	295	285	275	330
28	300	A	A	275	295	260	280	320	320	325	325	325	325	305	315	315	330	310	335	320	I R 310	290	305	305
29	280	305	320	270	265	270	295	315	J R 340	350	335	320	310	310	310	305	325	305	315	310	300	285	290	295
30	280	280	310	275	270	I R 270	275	315	I R 320	325	330	310	300	300	315	310	315	325	315	300	I A 305	285	250	285
31	290	325	300	280	260	260	275	J R 335	C	320	300	315	310	295	C	C	C	C	320	330	325	260	290	295
	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
CNT	30	30	29	30	29	31	29	29	30	30	31	31	31	31	30	30	30	30	30	29	27	30	30	30
MED	285	288	290	278	275	280	295	330	335	330	335	325	325	315	320	325	325	320	325	320	300	285	292	290
UQ	295	295	305	290	285	292	310	340	340	335	340	335	325	325	325	335	335	330	335	335	312	300	305	305
LQ	280	280	275	270	265	270	280	315	325	320	322	315	310	315	315	320	325	315	320	310	292	285	280	280

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M(3000)F1(0.01)

135° E Mean Time (G. M. T. + 9h)

Station KOKUBUNJI TOKYO Lat. 35° 42.4' N. Long. 139° 29.3' E Sweep 1.0 Mc to 20.0 Mc in 20 sec in automatic operation

Hour / 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	L	L		L	L		A								
2													L	L		A								
3									L		A	L	L											
4												L			L									
5										L	L	L	L	L	L									
6								L		L	L	L	L											
7										L	L	L	L	L										
8									L	L	L	L	L	L	L									
9									L	L	L	L	L	L	L									
10											L		L	L										
11												L	L		L									
12										L	L	L	L	L										
13										L	L	L	L		L	L								
14										L	L	L	L	L	L	L	L							
15										L	L													
16											L		L	L	L									
17										L			L	L		L								
18												L												
19										L	L	L	L	L	L									
20									L		L	L	L											
21											L	L	L											
22										L	L	L	L	L	L									
23										L	L	L	L	L										
24												L	L	L	L									
25										L	L	L	L	L	L									
26										L	L	L	L											
27										C	L	L	L	L	L									
28									L	L	L	L	L	L	L									
29										L	L	L	L	L										
30											L	L		L	L									
31									C		L	L	L	L	C	C	C							

	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
CNT																								
MED																								
UQ																								
LQ																								

The Radio Research Laboratories, Japan

IONOSPHERIC DATA

DEC. 1968

h'F2 (km)

135° E Mean Time (G. M. T. + 9h)

Station KOKUBUNJI TOKYO Lat. 35°42.4'N. Long. 139°29.3'E Sweep 1.0 Mc to 20.0 Mc in 20 sec in automatic operation

Hour / 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									230	230	250		250	225		240								
2													245	250		I A 250								
3									250		250	240	240											
4												240			265									
5										240	245	245	245	245	245									
6								240		240	240	240	250											
7										240	225	220	240	235										
8									220	245	240	225	230	250	245									
9									225	245	245	245	240	240	265									
10											245		250	250										
11												250	250		250									
12										255	260	260	245	235										
13										255	240	250	255		225	250								
14										245	245	240	240	240	245	225	220							
15										250	250													
16											250		250	250	265									
17										250			250	260		240								
18												245												
19										240	250	250	250	250	250									
20									245		250	250	240											
21											240	250	250											
22										250	240	230	215	255	250									
23										245	250	250	250	245										
24												245	240	250	250									
25										250	240	245	240	240	240									
26										255	240	240	245											
27										C	240	240	250	245	240									
28									250	255	250	250	250	250	245									
29										245	240	275	250	265										
30											250	240		275	270									
31									C		245	260	250	250	C	C	C							

	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
CNT								1	6	18	25	25	27	21	15	5	1							
MED								240	238	245	245	245	250	250	250	240	220							
UQ									250	250	250	250	250	250	258	250								
LQ									225	240	240	240	240	240	245	240								

IONOSPHERIC DATA

DEC. 1968 | h'F (km) | 135° E Mean Time (G. M. T. + 9 h)

Station KOKUBUNJI TOKYO Lat. 35° 42.4' N. Long. 139° 29.3' E Sweep 1.0 Mc to 20.0 Mc in 20 sec in automatic operation

Hour / 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	305	295	270	300	310	250	225	I A 210	205	240	235	240	210	245	I A 225	210	220	205	225	270	275	255	270
2	320	310	305	305	270	295	A	220	230	240	250	245	235	220	250	I A 240	220	245	245	250	280	245	290	310
3	300	310	300	300	280	300	A 300	A 250	235	245	A	235	235	230	245	230	230	235	A 245	E A 270	A	A	E A 340	310
4	E A 340	290	320	360	E A 350	310	260	215	230	245	245	215	H 220	250	245	250	E A 250	250	270	250	230	250	245	340
5	350	310	360	390	390	320	A	240	235	220	230	230	210	230	210	225	220	240	250	240	250	310	225	260
6	330	375	375	350	390	300	350	210	245	225	210	230	220	240	250	220	220	230	250	I A 265	255	260	275	250
7	250	250	275	300	330	330	250	230	240	230	225	210	210	225	225	225	215	220	220	220	230	245	230	320
8	280	250	225	320	315	305	250	220	215	H 210	240	210	210	220	230	230	230	210	245	240	245	250	225	260
9	250	280	290	290	300	330	300	225	220	240	235	210	225	225	235	250	220	220	240	245	245	245	250	245
10	265	260	I A 300	I A 320	320	340	250	245	230	240	225	250	220	235	240	250	215	210	A	A	A	330	I A 300	295
11	A 300	A 290	A	310	300	340	305	240	240	245	240	230	240	250	240	230	230	250	A	A	A	310	A	A 290
12	260	265	260	340	260	300	280	230	240	225	240	240	225	245	225	240	220	220	210	250	270	290	245	255
13	255	280	270	245	300	275	250	225	225	240	240	225	240	230	220	H 205	225	205	220	240	245	255	250	A 300
14	300	275	260	295	275	260	250	220	220	240	225	225	225	205	240	245	190	245	220	A 240	250	260	255	250
15	I A 285	I A 300	E A 350	280	290	260	250	225	240	240	225	245	245	250	250	230	210	250	225	215	250	250	300	350
16	310	360	275	300	275	250	250	235	235	240	220	240	200	220	230	240	240	230	215	240	260	260	320	300
17	250	285	300	290	A	300	290	250	245	240	240	245	240	240	250	215	230	250	250	230	A	I A 295	320	290
18	300	275	265	295	250	290	I A 305	245	225	240	250	205	245	235	245	230	220	215	215	285	E A 310	300	390	340
19	300	310	340	265	230	250	300	250	245	235	235	230	240	230	240	220	230	230	240	230	245	315	I S 290	300
20	300	275	250	260	290	310	275	230	230	245	235	245	230	250	245	230	240	250	215	210	220	290	290	315
21	A	305	290	255	235	255	290	230	235	235	220	230	240	230	A 245	220	A 240	245	215	240	300	250	260	290
22	295	260	240	295	350	305	225	230	245	240	230	220	215	220	H 220	225	240	215	210	250	245	255	275	255
23	235	270	295	320	320	320	240	240	230	240	240	240	240	230	250	230	230	A	A 250	240	275	260	320	300
24	275	340	300	235	265	340	300	260	250	245	245	225	225	225	225	240	230	210	245	250	A	310	275	260
25	250	285	255	310	320	340	275	250	230	210	220	245	210	210	210	240	225	240	210	250	A 360	A	A	A 300
26	240	260	240	A	390	355	300	240	240	240	240	220	245	245	240	240	220	A 230	225	245	260	325	300	275
27	300	270	235	340	310	345	290	235	230	C	225	230	225	240	220	230	260	220	210	250	250	270	A 340	240
28	255	A	A	320	320	340	300	240	240	250	235	235	230	240	230	245	220	290	240	245	260	285	250	245
29	300	295	255	355	A 390	320	280	230	220	230	235	230	240	240	245	240	220	245	250	240	245	285	260	250
30	290	285	245	290	350	340	290	240	230	250	240	225	245	230	250	250	230	230	265	235	I A 250	270	360	300
31	295	250	265	295	350	320	300	245	C	245	230	245	220	220	C	C	C	C	240	240	250	350	295	275
	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
CNT	30	30	29	30	30	31	29	31	30	30	30	31	31	31	30	30	30	29	29	29	26	29	29	31
MED	294	285	275	300	302	310	280	235	232	240	235	230	225	230	240	230	224	230	240	240	250	270	275	290
UQ	300	305	300	320	350	335	300	242	240	245	240	240	240	240	245	240	230	245	245	250	265	300	300	300
LQ	255	270	255	290	275	298	250	225	230	230	225	225	220	222	225	225	220	220	215	240	245	255	250	258

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IONOSPHERIC DATA

DEC. 1968

h'Es (km)

135° E Mean Time (G. M. T. + 9h)

Station KOKUBUNJI TOKYO Lat. 35°42.4'N. Long. 139°29.3'E Sweep 1.0 Mc to 20.0 Mc in 20 sec in automatic operation

Hour / 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	110	110	110	B	110	110	110	105	105	105	180	150	145	105	105	115	115	100	100	S	S	S	S	S
2	S	B	S	B	115	115	110	105	105	100	100	100	100	100	120	130	120	110	100	100	S	110	S	S
3	S	S	S	S	110	110	110	105	105	105	100	100	130	115	160	130	105	105	105	100	100	100	100	100
4	100	105	110	105	110	115	S	105	G	G	G	100	100	110	G	125	115	110	110	110	110	100	100	S
5	S	S	110	110	110	110	105	100	100	100	100	100	G	G	130	110	110	110	110	105	100	100	100	S
6	S	S	S	B	105	110	110	100	G	G	110	G	100	G	G	110	110	110	105	100	100	100	S	100
7	100	B	S	115	110	110	110	105	105	G	G	G	G	G	G	G	180	110	S	S	S	S	S	S
8	140	S	S	S	110	110	105	100	G	100	G	G	G	G	G	G	G	120	110	105	105	105	100	100
9	100	100	S	B	E	S	S	150	105	100	105	G	100	100	100	100	G	S	110	100	105	105	100	S
10	100	100	110	110	B	S	110	110	115	G	G	G	G	110	110	110	G	S	110	105	105	105	100	100
11	100	100	100	100	100	S	110	115	110	105	105	105	100	100	105	105	G	110	105	105	100	100	100	100
12	100	100	100	100	B	S	110	110	G	105	G	G	G	G	G	B	G	S	110	105	105	105	105	S
13	105	100	100	100	S	S	115	G	G	105	105	G	G	B	G	B	150	B	110	110	100	100	105	100
14	100	S	S	E	100	B	S	G	110	140	140	B	G	G	G	B	105	110	110	105	105	105	100	100
15	100	100	100	S	100	100	S	B	115	G	G	G	G	G	G	G	130	105	100	100	S	105	100	100
16	100	100	100	100	100	100	100	B	110	110	110	110	110	G	110	110	110	110	110	100	100	S	S	S
17	100	100	100	110	105	100	S	G	110	110	110	110	110	110	110	110	105	105	100	100	100	100	100	100
18	100	100	C	S	110	100	100	100	100	100	100	100	G	G	G	110	110	110	105	100	100	100	100	100
19	100	100	S	100	B	S	S	B	G	G	B	120	G	G	G	G	110	105	100	100	S	S	S	S
20	S	B	B	S	S	S	S	G	110	G	G	110	110	G	G	115	150	105	105	S	S	100	100	100
21	100	100	S	S	B	B	S	B	G	160	150	130	115	115	125	115	105	105	100	100	S	S	S	S
22	S	115	B	130	B	S	S	G	G	G	150	140	100	100	G	115	110	110	110	105	S	S	S	S
23	100	100	100	100	E	S	120	120	110	G	100	100	100	G	G	130	110	105	105	100	100	100	100	100
24	S	S	E	E	B	110	110	105	105	100	100	G	G	G	G	B	B	110	100	100	100	100	100	100
25	100	100	B	B	S	B	S	105	100	100	G	B	B	G	B	B	130	110	110	105	105	105	100	100
26	100	100	105	100	100	105	120	110	105	G	105	100	G	G	105	B	100	100	100	S	100	105	100	100
27	100	S	S	S	S	S	S	150	150	C	G	G	G	G	G	B	100	B	105	100	100	100	100	100
28	100	100	100	100	100	100	S	B	G	105	110	G	G	G	110	100	100	100	100	100	105	105	S	110
29	110	100	100	100	100	S	S	100	110	110	G	G	G	G	100	100	100	100	S	100	S	S	S	S
30	S	S	B	100	100	S	100	B	G	115	G	G	G	100	100	100	100	100	100	115	105	105	105	S
31	100	100	S	100	S	B	S	B	C	100	G	G	G	G	C	C	C	C	100	S	S	S	S	S
	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
CNT	23	20	14	17	18	15	17	19	20	20	18	15	13	11	14	19	24	25	29	26	21	23	20	17
MED	100	100	100	100	105	110	110	105	108	105	105	105	100	105	110	110	110	110	105	100	100	100	100	100
UQ	100	100	110	110	110	110	110	110	110	110	110	115	110	110	120	115	118	110	110	105	105	105	100	100
LQ	100	100	100	100	100	100	105	102	105	100	100	100	100	100	105	108	105	105	100	100	100	100	100	100

IONOSPHERIC DATA

DEC. 1968

Types of Es

135° E Mean Time (G. M. T. + 9 h)

Station KOKUBUNJI TOKYO Lat. 35° 42.4' N. Long. 139° 29.3' E Sweep 1.0 Mc to 20.0 Mc in 20 sec in automatic operation

Hour / 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 2	F 2	F 1		F 2	F 2	F 3	L 2	L 3	L 1	H 1	H 1	H	L 2	L 2	C 1	CL 13	F 2	F 1					
2					F 1	F 2	F 3	L 3	L 3	L 2	L 1	L 1	L 2	L 1	H 1	H 2	H 1	F 3	F 2	F 2		F 1		
3					F 1	F 2	F 2	L 3	L 2	L 1	L 2	L 1	HL 11	C 1	H 1	H 1	L 2	F 3	F 3	F 5	F 3	F 2	F 2	F 2
4	F 1	F 2	F 1	F 2	F 2	F 1		L 1				L 1	L 1	CL 21		H 1	C 3	F 2	F 3	F 2	F 5	F 2	F 2	
5			F 2	F 3	F 1	F 2	F 3	L 2	L 2	L 1	L 1	L 1			H 1	C 1	L 2	F 2	F 2	F 2	F 2	F 1	F 1	
6					F 2	F 3	F 3	L 1			L 1		L 1			L 2	L 2	F 1	F 2	F 2	F 2	F 1		F 1
7	F 1			F 1	F 2	F 2	F 2	L 1	L 1								H 1	F 2						
8	F 1				F 1	F 2	F 2	L 1		L 1								F 1	F 3	F 3	F 2	F 4	F 2	F 2
9	F 2	F 2						H 1	L 2	L 1	L 1		L 1	L 1	L 2	L 2			F 1	F 2	F 2	F 2	F 2	
10	F 1	F 1	FF 31	F 2			F 2	L 2	L 1					L 1	L 1	L 1			F 3	F 4	F 5	F 3	F 3	F 2
11	F 3	F 2	F 2	F 1	F 1		F 2	L 1	L 2	L 1	L 2	L 2	L 2	L 1	L 1	L 1		F 1	F 3	F 3	F 2	F 2	F 2	F 1
12	F 2	F 1	F 2	F 1			F 1	L 1		L 1									F 1	F 2	F 2	F 2	F 2	
13	F 1	F 1	F 1	F 1			F 1			L 2	L 1						H 1		F 2	F 1	F 2	F 1	F 2	F 3
14	F 2				F 1				L 1	H 1	H 1						L 1	F 1	F 2	F 3	F 3	F 2	F 2	F 2
15	F 3	F 2	F 2		F 2	F 1			L 1								H 1	F 1	F 1	F 1		F 1	F 2	F 3
16	F 1	F 2	F 1	F 1	F 1	F 2	F 1		L 1	L 2	L 1	L 1	L 1		L 1	L 2	L 2	F 2	F 1	F 2	F 1			
17	F 2	F 1	F 1	F 1	F 3	F 1			L 1	L 1	L 1	L 2	L 1	L 1	C 1	L 1	L 2	F 2	F 2	F 2	F 3	F 2	F 3	F 2
18	F 2	F 2			F 1	F 1	F 3	L 2	L 2	L 2	L 1	L 1				CL 11	L 1	F 1	F 1	F 3	F 2	F 1	F 2	F 2
19	F 2	F 1		F 1								L 1					L 1	F 2	F 1	F 2				
20									L 1			L 1	L 1			C 1	HL 11	F 2	F 1			F 2	F 1	F 2
21	F 2	F 1								H 1	H 1	H 1	C 1	C 1	C 1	C 2	L 3	F 2	F 1	F 1				
22		F 1		F 1							H 1	HL 11	L 1	L 1		C 2	L 1	F 1	F 1	F 1				
23	F 1	F 1	F 1	F 1			F 1	L 1	L 2		L 1	L 1	L 1			H 1	C 2	F 2	F 2	F 2	F 2	F 2	F 1	F 1
24						F 5	F 2	L 2	L 2	L 1	L 1							F 1	F 3	F 3	F 2	F 2	F 1	F 1
25	F 1	F 1						L 2	L 1	L 1							H 1	F 1	F 1	F 3	F 2	F 3	F 2	F 2
26	F 1	F 1	F 1	F 4	F 1	F 1	F 1	L 1	L 2		L 1	L 1			L 1		L 1	F 3	F 2		F 1	F 1	F 2	F 1
27	F 2							H 1	H 1								L 1		F 1	F 1	F 1	F 1	F 2	F 2
28	F 2	F 2	F 2	F 1	F 2	F 1				L 1	L 1				L 1	L 1	L 1	F 2	F 1	F 1	F 2	F 2		F 1
29	F 1	F 2	F 2	F 2	F 2			L 1	L 1	L 1					L 1	L 1	L 1	F 1		F 1				
30				F 1	F 2		F 1			C 1				L 1	L 1	L 1	L 1	F 1	F 2	F 1	F 2	F 2	F 2	
31	F 2	F 1		F 1						L 1									F 2					
	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
CNT																								
MED																								
UQ																								
LQ																								

The Radio Research Laboratories, Japan

IONOSPHERIC DATA

DEC. 1968 | hpF2 (km) | 135° E Mean Time (G. M. T. + 9 h)

Station KOKUBUNJI TOKYO Lat. 35° 42.4' N. Long. 139° 29.3' E Sweep 1.0 Mc to 20.0 Mc in 20 sec in automatic operation

Day \ Hour	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	370	370	355	335	370	360	310	J S 255	245	260	270	270	295	295	285	285	J R 255	280	245	275	340	360	J R 345	345
2	400	370	380	375	360	365	A	250	260	300	300	300	290	305	J R 280	275	265	300	300	300	285	300	350	390
3	365	385	365	390	340	365	385	R	300	300	290	290	300	320	310	295	250	280	270	275	A	A	355	350
4	350	350	375	365	380	360	290	230	290	280	290	310	H 300	280	300	J R 275	I R 275	300	300	270	265	350	300	J R 370
5	400	I R 395	420	430	450	370	A	R	260	265	290	270	290	300	300	295	290	255	285	300	315	370	250	330
6	365	390	395	400	410	430	400	I R 320	275	290	290	310	300	300	300	J R 280	290	300	265	A	300	340	340	300
7	300	320	340	400	400	390	300	I R 280	270	255	255	255	260	R 270	280	250	270	285	280	250	280	290	R 280	370
8	340	280	260	390	370	350	280	270	U S 270	R 270	260	260	270	275	280	265	260	290	280	270	285	280	270	305
9	300	330	370	365	370	390	360	250	J R 250	265	265	290	290	295	J R 300	J R 290	260	290	300	290	J R 290	285	305	315
10	370	315	I A 380	I A 375	390	360	300	260	260	250	280	290	285	300	300	275	260	280	I A 270	A	A	I R 340	I A 350	340
11	360	300	A	375	360	I S 375	375	275	285	290	300	290	300	290	300	270	290	320	A	A	A	400	R	R
12	R	I R 320	370	400	J R 350	390	350	J R 290	260	300	305	305	305	300	305	290	270	265	295	305	330	355	295	300
13	300	345	320	290	355	300	305	255	260	295	295	290	285	250	305	280	260	290	265	280	300	305	285	320
14	355	325	315	355	J R 355	R 320	290	250	255	290	275	280	285	295	280	260	250	S 295	255	265	305	330	330	305
15	360	I A 350	I A 355	345	350	310	305	280	260	260	260	290	260	260	275	265	290	290	260	300	300	340	370	390
16	380	400	330	370	350	300	320	300	265	280	275	250	290	290	290	275	R 275	290	260	300	400	370	400	350
17	315	350	365	375	A	335	365	300	285	290	280	290	305	300	J R 290	275	J R 290	340	275	J R 260	A	I A 360	400	350
18	340	350	300	350	290	340	I A 345	265	260	290	275	290	275	300	285	265	290	275	265	300	325	365	390	370
19	375	365	400	320	275	370	365	300	275	275	J R 290	290	300	285	280	290	295	290	300	265	310	390	350	365
20	360	340	310	315	365	350	330	I R 260	J R 290	295	290	280	290	295	290	280	300	I R 290	290	260	300	350	360	400
21	I A 400	390	315	310	300	340	350	290	265	255	260	285	285	290	260	250	260	290	260	255	360	310	340	355
22	350	340	290	345	400	370	260	250	290	275	260	260	280	300	290	270	290	255	U R 260	305	300	310	345	300
23	270	310	305	390	395	390	290	255	250	285	290	290	295	300	300	280	280	300	265	265	340	320	390	400
24	320	400	400	300	340	350	350	310	270	300	300	300	340	300	295	275	280	275	290	R 290	410	350	330	310
25	315	330	320	390	400	380	315	J R 285	265	290	260	260	265	280	285	280	280	300	270	275	395	440	I A 395	325
26	280	300	270	A	400	390	350	280	260	295	255	260	290	270	275	255	255	270	260	310	R 330	U R 390	U R 340	U R 360
27	R 350	340	J R 260	R 360	R	370	U R 315	260	U R 240	C	255	270	290	270	280	260	270	260	290	290	305	340	365	265
28	295	A	A	365	350	390	355	280	290	285	290	290	290	300	300	300	285	300	280	290	I R 305	350	310	320
29	370	330	310	400	410	390	330	290	J R 260	265	265	300	300	300	300	300	280	320	300	300	320	380	350	310
30	380	350	295	380	400	I R 395	380	290	I R 285	290	285	300	315	310	300	310	280	290	310	330	I A 315	380	430	380
31	350	390	350	370	410	410	390	J R 250	C	290	310	310	300	335	C	C	C	C	300	290	300	420	340	330

	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
CNT	30	30	29	30	29	31	29	29	30	30	31	31	31	31	30	30	30	30	30	28	27	30	30	30
MED	352	342	340	370	370	370	330	275	265	288	280	290	290	295	290	275	278	290	278	290	305	350	345	342
UQ	370	370	370	390	400	390	360	290	285	290	290	295	300	300	300	290	290	300	295	300	330	370	365	370
LQ	315	320	310	345	350	350	305	255	260	265	262	270	285	282	280	265	260	280	265	268	300	320	310	310

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IONOSPHERIC DATA

DEC. 1968 | YpF2 (km) | 135° E Mean Time (G. M. T. + 9h)

Station KOKUBUNJI TOKYO Lat. 35°42.4'N. Long. 139°29.3'E Sweep 1.0 Mc to 20.0 Mc in 20 sec in automatic operation

Hour / 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	80	85	90	65	85	85	80	J S 60	60	65	55	85	65	70	50	65	J R 95	75	65	80	70	95	J R 60	75
2	95	85	75	80	95	90	A	55	85	100	100	90	70	95	J R 110	105	135	100	90	90	115	80	90	100
3	65	75	75	100	70	125	105	R	100	75	75	75	85	70	80	65	85	60	70	65	A	A	75	70
4	80	90	85	95	80	60	75	60	60	100	60	100	H 90	110	80	J R 85	I R 95	90	90	90	125	140	90	J R 120
5	90	I R 100	100	90	90	90	A	R	100	75	70	80	70	90	60	95	100	85	105	100	85	80	100	130
6	95	100	85	90	80	90	110	I R 90	65	70	70	90	90	60	100	J R 80	100	100	85	A	100	70	70	100
7	90	100	110	110	110	130	90	I R 110	90	45	50	70	80	R 75	90	60	80	65	80	90	110	100	R 120	120
8	90	60	130	110	70	80	70	70	U S 80	R 75	60	85	125	80	75	80	60	65	75	85	70	90	85	95
9	100	75	85	95	85	65	90	70	J R 50	75	85	70	100	75	J R 60	J R 100	115	110	100	110	J R 70	85	105	85
10	120	75	I A 115	I A 95	110	100	60	80	100	90	90	70	75	90	100	85	100	80	I A 125	A	A	I R 70	I A 85	100
11	120	100	A	135	110	I S 105	115	115	65	70	90	70	60	140	90	90	100	100	A	A	A	100	R	R
12	R	I R 90	130	110	J R 100	100	110	J R 150	90	55	75	65	85	95	95	65	85	90	65	90	75	100	60	100
13	85	55	80	65	90	65	95	70	55	65	50	65	60	95	105	65	90	65	90	75	95	95	70	85
14	65	80	85	100	J R 95	R 75	65	60	55	105	70	70	75	75	75	85	95	S 75	50	90	95	75	70	90
15	105	I A 100	I A 90	100	95	95	95	70	60	90	90	100	100	90	75	115	100	80	80	90	100	110	120	100
16	70	90	80	90	100	100	130	140	95	110	75	100	60	70	70	115	R 115	110	100	90	150	130	90	90
17	105	155	115	105	A	75	125	100	105	70	70	70	95	70	J R 70	125	J R 100	110	85	J R 130	A	I A 90	140	90
18	80	100	100	110	70	110	I A 95	95	110	100	75	60	95	60	85	115	100	85	125	100	95	105	70	70
19	85	85	80	70	85	80	115	100	85	115	J R 60	70	100	95	80	130	95	80	90	125	110	100	70	85
20	100	80	90	85	85	70	70	I R 80	J R 80	95	70	70	100	95	70	100	90	I R 105	100	100	200	110	90	90
21	I A 110	100	85	90	100	110	110	100	95	50	85	70	75	80	60	55	85	65	85	90	95	90	80	100
22	95	60	80	100	95	85	85	55	65	65	85	85	85	95	65	85	65	50	U R 85	100	95	90	70	60
23	85	90	95	105	100	105	75	50	45	105	90	100	65	80	100	110	110	90	85	95	100	80	100	100
24	80	90	90	100	100	110	100	130	70	110	110	100	70	110	65	85	70	85	100	R 100	90	100	80	80
25	95	80	90	90	110	100	95	J R 95	95	65	50	60	80	90	75	80	80	95	95	80	100	60	I A 70	85
26	65	70	90	A	100	105	95	65	85	55	50	60	60	85	75	60	55	60	80	90	R 70	U R 100	U R 90	U R 90
27	R 90	110	J R 70	R 90	R	70	U R 75	70	U R 60	C	65	75	80	80	90	90	90	85	105	80	90	75	105	90
28	100	A	A	90	75	105	90	95	65	65	90	70	60	90	100	120	105	90	90	100	I R 115	90	110	70
29	80	70	90	100	90	100	70	110	J R 80	75	125	90	90	100	100	110	70	110	90	120	100	110	120	100
30	80	130	95	120	110	I R 115	130	120	I R 90	100	65	100	125	90	90	80	120	110	100	100	I A 105	110	90	110
31	90	70	100	120	120	90	100	J R 90	C	70	105	80	110	95	C	C	C	C	100	110	90	100	70	110
	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
CNT	30	30	29	30	29	31	29	29	30	30	31	31	31	31	30	30	30	30	30	28	27	30	30	30
MED	90	88	90	98	95	95	95	90	80	75	75	75	80	90	80	85	95	85	90	90	95	95	88	90
UQ	100	100	100	105	100	105	110	100	95	100	90	90	95	95	95	110	100	100	100	100	108	100	100	100
LQ	80	75	85	90	85	80	75	70	60	65	62	70	70	75	70	80	85	75	80	90	90	80	70	85

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IONOSPHERIC DATA

DEC. 1968 | foF2 (0.1) | 135° E Mean Time (G. M. T. + 9h)

Station YAMAGAWA Lat. 31° 12.1' N. Long. 130° 37.1' E Sweep 1.0 Mc to 20.0 Mc in 20 sec in automatic operation

Hour / 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	31	30	29	30	27	28	32	54	86	S 93	98	106	S 117	I S 117	129	110	106	J S 105	79	70	55	60	51	47
2	39	36	F 35	36	36	34	35	S 56	S 96	117	U S 115	124	110	U S 105	103	S 110	101	U S 86	57	S 68	68	53	U S 40	38
3	S 36	S 36	35	35	37	34	33	58	J S 98	U S 118	139	S 157	U S 156	S	151	J S 151	S 125	95	S 74	67	U S 60	I S 53	56	57
4	J S 50	U S 46	S 33	31	33	34	35	J S 62	S 97	127	127	135	128	R 128	117	J S 123	J S 123	U S 98	S 64	79	88	54	35	32
5	32	31	30	30	30	31	U S 35	S 75	S 114	125	130	134	140	128	122	S 116	107	S 94	J S 78	S 64	62	F 63	S 76	S 55
6	S 23	I A 22	S 24	24	26	27	23	52	U S 126	135	145	144	154	150	152	144	123	85	72	58	54	55	51	52
7	47	23	22	23	24	24	22	S 54	S 106	129	S 116	114	109	113	S 111	108	91	79	65	59	62	58	41	28
8	25	27	26	26	30	30	34	57	76	90	124	120	107	97	98	101	100	S 100	70	J S 74	67	66	S 46	3[illegible]
9	34	26	25	26	28	30	29	S 53	100	95	S 107	104	107	102	108	S 116	S 110	U S 88	83	79	77	67	S 49	35
10	32	30	27	27	28	28	31	58	J S 101	S 95	I C 106	114	S 119	R 125	126	J S 126	R 124	S	82	67	J S 63	56	42	37
11	34	32	24	F 23	F 24	F	S 25	J S 51	U S 93	111	I C 128	I C 132	J S 135	J R 125	S 116	S 109	J S 96	92	R 90	S 91	J S 84	U S 74	S 70	54
12	43	38	F 27	F 25	F 26	F 28	30	54	86	106	133	163	163	146	135	137	123	100	75	52	63	F 63	S 62	65
13	49	32	31	32	26	25	24	47	83	I C 92	I C 112	132	117	111	89	89	93	70	53	58	44	44	F 38	34
14	F 33	35	F 33	F 35	F 38	F 39	F 43	U S 56	S 83	100	136	135	125	135	138	135	J S 102	S 79	79	I S 91	S 85	61	I C 48	35
15	33	29	29	30	29	29	30	S 46	S 80	S 96	109	103	100	103	105	S 108	82	62	67	65	53	45	37	33
16	33	34	32	F 31	32	34	32	S 46	S 79	S 99	S 115	83	89	91	103	107	101	76	S 63	59	56	I A 45	J S 39	F
17	S 45	44	40	27	26	29	36	I S 46	79	U S 107	U S 151	113	109	111	127	128	R 114	S 92	R 87	75	S 66	J S 52	S 37	33
18	S 36	V 36	F 35	22	23	25	26	S 41	S 82	U S 112	U S 122	123	S 116	98	100	92	74	73	71	H 62	S 54	38	33	30
19	32	33	32	36	25	24	24	39	J S 86	S 101	105	96	116	115	116	104	S 92	S 81	79	74	H 52	41	44	44
20	S 43	46	S 47	31	25	29	31	S 48	74	87	112	127	125	105	106	118	85	75	79	72	53	S 48	42	38
21	S 27	30	S 31	30	27	29	31	S 47	S 88	I S 95	S 112	122	120	113	109	111	85	72	77	86	53	53	51	45
22	40	33	30	28	30	32	H 37	S 50	S 87	108	141	128	108	102	110	106	S 94	S 90	68	58	54	50	44	33
23	31	30	30	29	30	30	33	S 49	S 86	S 108	J S 125	134	138	S 136	S 117	104	92	82	S 77	68	51	S 48	44	39
24	38	30	32	34	23	25	27	44	J S 78	124	151	138	138	118	119	106	93	S 84	S 67	S 63	S 48	S 54	57	S 53
25	39	26	28	25	26	27	S 26	S 47	U S 93	S	131	130	J R 138	J S 162	144	126	J S 120	J S 98	81	68	J S 54	I A 38	S 41	47
26	49	28	19	16	18	20	21	48	S 92	J S 115	135	S 120	114	108	110	112	S 98	73	63	60	S 63	S 61	S 56	48
27	44	46	45	31	25	27	25	S 46	S 96	S	108	117	132	R 142	S	J S 121	J S 110	J S 81	72	68	56	J S 49	J S 48	49
28	33	25	24	22	23	24	25	S 40	77	S 100	S 122	116	106	96	97	S 98	92	79	79	78	67	S 59	46	S 42
29	41	43	43	31	F 29	F 32	28	S 50	S 93	84	103	S 117	146	U S 155	148	145	S 138	112	S 99	S 113	J S 104	S 83	78	S 76
30	56	43	44	35	28	30	31	J S 52	S 89	J S 111	135	J S 122	J S 122	J S 131	110	S 107	101	83	56	54	60	S 55	43	S 43
31	36	F 37	36	33	28	30	S 32	S 49	85	91	116	138	129	131	122	99	87	78	75	52	48	42	37	41
	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
CNT	31	31	31	31	31	30	31	31	31	29	31	31	31	30	30	31	31	30	31	31	31	31	31	30
MED	36	32	31	30	27	29	31	S 50	S 87	106	122	123	120	116	116	110	101	84	75	68	60	54	44	42
UQ	43	36	35	32	30	31	33	S 54	S 96	115	134	134	136	131	127	124	112	S 94	79	74	66	60	51	49
LQ	32	30	27	26	25	27	26	S 46	82	95	112	115	110	105	106	106	92	78	67	60	54	48	40	34

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IONOSPHERIC DATA

DEC. 1968 | foF1 (0.01) | 135° E Mean Time (G. M. T. + 9 h)

Station YAMAGAWA Lat. 31° 12.1' N. Long. 130° 37.1' E Sweep 1.0 Mc to 20.0 Mc in 20 sec in automatic operation

Hour / 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 340	L	L	L	L	L	A								
2										L	L	L	A	A	A	L								
3											L	L	L	L	L	L								
4									L	320	L	L	L	L	L	L								
5										A	L	L	L	A	L	L	A							
6										L	L	L	L	L	L	L	L							
7										L	L	L	L	L	L	L	L 310							
8										L	L	L	L	L	L	L								
9										L	L	U L 450	U L 470	L	L	L								
10										L	C	L	L	L	A	L								
11										L	C	C	L	L	L		L							
12										A	L	L	L	L	L	L								
13										C	C	L	L	L	L	L 400								
14										L	L	L	L	L	L	L								
15										L	L	L	L	L	L	L								
16										L	L	L	L	L	U L 450	L								
17										L	L 430	U L 450	L 490	L	L	L	300							
18										L	L	L	L	L	L	L								
19											L	L	L	L			L							
20										L	L	L	L	L	L	L								
21											L	L	L	A	A	L								
22										L	L	L 450	L	L	L									
23										L	L	L	L	L	L	L	290							
24										L	L	L	L	L	L	L								
25										L	L 430	L	L	L	L	L								
26										L	L	L	L	L	L	L	L							
27										L	L	L	L	L	L	L								
28											L	L	L	L	L	L	L							
29											L	L	L	L	L	L	L							
30											L	L	L	L	L	L								
31											L	L	L	L	L	L	L							

	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
CNT										2	2	3	2		1	1	3							
MED										330	L 430	U L 450	L 480		U L 450	L 400	300							
UQ												U L 450					305							
LQ												L 450					295							

IONOSPHERIC DATA

DEC. 1968 | foE (0.01) | 135° E Mean Time (G. M. T. + 9h)

Station YAMAGAWA Lat. 31° 12.1' N. Long. 130° 37.1' E Sweep 1.0 Mc to 20.0 Mc in 20 sec in automatic operation

Hour / 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	230	290	315	335	340	330	320	295	240	S						
2								S	220	290	320	H 340	340	I A 335	325	A	A	A						
3								S	250	300	325	I A 330	340	350	330	300	240	S						
4								S	215	280	315	A	A	A	A	290	230	S						
5								S	A	A	320	330	340	340	I A 325	290	230	S						
6								S	240	300	320	340	350	350	340	I A 280	235	S						
7								S	A	285	305	320	340	330	315	290	240	B						
8								S	230	280	310	330	335	H 340	330	290	H 240	S						
9								S	I A 230	295	320	330	340	345	330	290	H 250	S						
10								S	A	285	I C 320	340	A	A	A	A	A	S						
11								S	210	A	C	C	350	A	A	F 300	250	S						
12								S	A	A	320	A	A	A	330	300	240	S						
13								S	230	I C 290	I C 320	H 345	350	350	340	300	H 250	S						
14								S	240	I A 280	320	340	340	340	330	300	240	S						
15								S	220	I A 270	320	340	350	340	H 330	295	250	A						
16								S	H 220	275	300	330	A	A	A	300	230	S						
17								S	220	I A 285	325	340	I A 340	I A 335	320	300	250	A						
18								S	240	285	315	330	340	335	330	300	245	A						
19								S	220	290	310	330	340	345	335	300	250	S						
20								S	200	I A 280	310	330	340	350	I A 335	300	H 260	160						
21								S	200	H 280	320	340	350	350	330	A	A	S						
22								S	H 240	H 280	310	320	340	330	330	I A 310	A	S						
23								S	220	290	320	340	350	350	330	310	260	S						
24								S	A	280	320	340	I A 350	350	340	310	250	S						
25								S	220	285	I A 310	I A 325	340	340	330	290	A	S						
26								A	230	I A 275	320	340	350	360	330	310	250	S						
27								S	230	290	320	345	355	355	340	310	260	A						
28								S	H 230	280	320	340	350	360	330	310	I A 250	A						
29								S	A	280	320	340	360	350	330	300	270	S						
30								S	200	290	I A 310	340	345	350	340	320	280	S						
31								S	200	270	I A 315	330	350	350	340	310	270	180						
	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
CNT									25	28	30	28	27	26	27	28	26	2						
MED									220	285	320	340	340	348	330	300	250	170						
UQ									230	290	320	340	350	350	332	310	250							
LQ									220	280	310	330	340	340	330	292	240							

IONOSPHERIC DATA

DEC. 1968

foEs (0.1)

135° E Mean Time (G. M. T. + 9 h)

Station YAMAGAWA Lat. 31°12.1'N, Long. 130°37.1'E Sweep 1.0 Mc to 20.0 Mc in 20 sec in automatic operation

Hour / 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	J X 21	E S 14	E B 14	21	J X 18	22	21	J X 21	J G 20	J G 26	J X 40	38	36	G 26	41	J X 50	J X 41	J X 28	J X 34	J X 24	E S 15	E S 13	E S 15	E S 14
2	E S 13	E S 11	E	20	J X 23	22	23	J X 25	J X 36	J X 37	J G 29	38	J X 54	J X 55	J X 57	J X 41	J X 38	J X 25	17	J X 23	17	E S 15	E S 15	E S 15
3	E S 14	E S 15	E B 12	E B 12	18	J X 33	24	22	G	G	J X 35	J X 45	39	G	G	37	J X 37	M 71	J X 85	J X 62	J X 61	J X 29	J X 16	J X 17
4	E S 15	E S 15	19	18	J X 19	J X 30	J X 25	J X 40	J X 22	J X 29	G	J X 51	J X 39	J X 51	35	G	30	22	J X 74	J X 52	E S 15	J X 27	J X 21	18
5	20	18	22	J X 24	17	J X 29	J X 36	J X 36	J X 84	J X 66	34	J X 40	44	J X 75	J X 65	36	J X 62	J X 52	J X 75	J X 40	J X 31	J X 29	23	23
6	22	J X 28	J X 28	J X 18	24	20	J X 31	J X 25	G	G	G 23	G 27	G 20	J X 37	J X 38	32	J X 43	J X 28	J X 28	J X 33	J X 28	J X 22	J X 28	23
7	24	E B 12	E	E	E	21	J X 30	J X 25	J X 43	J X 33	G 30	J G 23	G 18	G	G	G 25	G 19	E B 15	J X 34	17	19	23	E S 14	E S 13
8	E S 12	19	J X 20	16	E	E B 15	21	22	J G 21	J G 24	33	36	36	G	G	G	G	G	19	21	J X 25	J X 29	J X 26	20
9	J X 18	19	E B 11	E	E	E B 15	E S 15	J X 21	J X 37	J X 32	J X 39	M 47	G 29	G 27	G 28	G 27	G 23	J X 23	J X 18	J X 21	J X 24	J X 24	J X 18	J X 21
10	20	E S 15	23	E B 11	E	E B 15	19	J X 63	J X 33	J X 39	C	J G 32	J X 45	43	J X 51	J X 46	J X 32	J X 37	J X 16	19	J X 21	J X 22	18	E S 13
11	18	23	E B 11	19	E B 14	E	E S 15	23	M 37	J X 34	C	C	J G 33	37	J X 51	J X 34	28	36	J X 31	J X 64	J X 50	J X 29	J X 25	E S 15
12	E S 15	E S 13	E B 13	E B 11	E B 13	E B 11	J X 18	J X 25	J X 29	J X 53	J X 35	J X 40	J X 64	J X 36	J X 34	36	J X 35	J X 27	J X 34	E S 13	J X 31	J X 39	J X 26	J X 26
13	23	E S 15	E B 11	E B 11	E	E	E S 14	24	27	C	C	G	G 30	G	G	G 25	G 21	23	J X 25	J X 29	J X 21	J X 51	J X 26	E S 15
14	23	23	J X 17	J X 23	19	E B 13	24	J X 26	26	J X 43	J X 37	J G 28	G 28	G 23	G	G 22	28	J X 30	J X 39	J X 25	24	25	C	23
15	22	E S 15	E B 15	E B 11	E	E B 14	J X 25	23	24	31	G	G 31	G 33	G 29	G	J G 20	J G 20	J X 20	23	22	J X 33	23	20	J X 26
16	23	E S 14	23	E B 12	E B 11	E B 12	E S 15	E S 15	23	J X 39	31	J X 36	34	37	J X 37	31	38	J X 61	J X 29	J X 62	J X 62	J X 84	J X 61	J X 21
17	J X 17	E S 14	E B 13	E B 13	E B 15	E B 13	E S 15	E S 15	23	31	33	J X 54	J X 44	J X 50	G 31	J G 29	J G 25	J X 32	J X 22	E S 15	E S 14	E S 15	E S 15	E S 15
18	E S 15	21	J X 60	23	21	J X 21	23	J X 16	G	J G 28	G	G	G	G	G	J X 47	J X 39	35	J X 36	J X 29	23	E S 13	E S 15	E S 15
19	E S 15	E B 13	E B 16	E B 14	E B 12	E B 13	22	22	23	G	35	37	G 20	G 22	G 29	38	J X 50	J X 30	J X 24	J X 23	E S 15	E S 15	E B 13	21
20	23	23	18	22	E B 14	E B 13	E S 14	23	G	29	35	G	G	G	37	G 28	29	25	21	J X 18	J X 21	E S 14	E S 14	E S 15
21	E S 15	E S 14	E	E B 12	E	E S 15	E S 15	E S 15	G	G	38	38	46	50	J X 57	J X 48	J X 53	J X 40	J X 25	23	23	24	20	E S 15
22	E S 15	E B 11	E	E B 11	E	E X 14	E S 15	E S 15	G	G	34	34	37	36	G	J X 36	J X 36	J X 36	J X 33	J X 45	J X 30	J X 27	23	24
23	E S 15	J X 21	E B 13	E B 13	E	E B 11	E S 15	E S 15	J X 31	G	33	G 34	G	G 29	G 27	33	G	20	J X 24	J X 39	J X 37	J X 33	J X 33	J X 26
24	J X 22	J X 22	J X 24	E	E B 11	E B 12	J X 25	J X 54	J X 57	J G 28	J G 30	J X 35	J X 40	G 31	G	J X 31	J X 31	J X 33	J X 21	23	24	J X 24	E S 15	J X 34
25	J X 28	J X 25	23	E	E B 12	E B 11	27	23	J X 23	J X 39	J X 60	J X 53	J X 38	J G 28	G 27	G 29	J X 38	J X 37	J X 29	J X 98	J X 27	J X 99	J X 33	J X 36
26	J X 30	E B 14	14	E S 14	E	E B 12	E S 14	J X 34	J X 28	J X 49	J G 31	J G 34	J G 34	J G 30	J G 28	J X 33	J X 30	J X 29	18	J X 23	23	24	J X 18	J X 26
27	J X 28	J X 28	J X 31	J X 30	J X 30	J X 23	23	E S 14	J X 30	35	G	G	G 27	J G 28	J G 24	J X 34	J X 27	J X 29	J X 27	J X 25	26	J X 18	J X 21	J X 22
28	J X 28	23	23	J X 20	E B 16	E B 11	E B 12	E S 14	G	J X 28	J X 32	J G 28	J X 59	J G 35	J X 34	J X 34	J X 30	J X 29	J X 36	J X 31	J X 26	E S 15	E S 15	E S 13
29	J X 28	E S 13	E B 13	E	E B 11	J X 22	24	23	22	31	J X 34	J G 30	J G 32	J G 35	J G 31	J X 32	J X 28	23	J X 23	J X 30	J X 30	J X 21	22	J X 21
30	J X 21	E S 15	E	E	E	E B 12	E S 14	23	G	J X 29	37	J X 36	G	G 25	G	G	G	J X 29	J X 35	20	E S 16	E S 15	E S 13	J X 29
31	E S 12	J X 31	J X 33	J X 23	E B 17	E B 15	E B 15	24	G	28	J X 35	J X 34	G 34	G 27	G 22	G 20	G	G	E S 15	E S 11	E S 14	E S 14	E S 14	E S 13
	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
CNT	31	31	31	31	31	31	31	31	31	30	28	30	31	31	31	31	31	31	31	31	31	31	30	31
MED	20	E 15	E E 15	E E 13	E E 12	E B 14	21	23	23	J 30	34	J 34	G 34	G 29	G 28	32	J X 30	J X 29	J X 27	J X 24	J X 24	J X 24	19	21
UQ	23	22	23	20	18	21	24	J X 25	J X 30	J X 37	J X 35	J X 38	J 40	J 37	J X 37	J X 36	J X 38	J X 36	J X 34	J X 36	J X 30	J X 29	J X 25	J X 24
LQ	E S 15	E S 14	E B 12	E B 11	E	E B 12	E S 15	18	G	G 26	G 30	G 28	G 28	G	G	G 26	G 24	23	J X 22	21	20	E S 15	E S 15	E S 15

The Radio Research Laboratories, Japan

IONOSPHERIC DATA

DEC. 1968 | fbEs (0.1) | 135° E Mean Time (G. M. T. + 9h)

Station YAMAGAWA Lat. 31°12.1'N. Long. 130°37.1'E Sweep 1.0 Mc to 20.0 Mc in 20 sec in automatic operation

Hour / 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	E S 14	E B 14	E	15	14	E	G	G 16	G 24	28	G	G 26	G 26	39	47	36	23	22	E	E S 15	E S 13	E S 15	E S 14
2	E S 13	E S 11	E	E	E	E	E	G	20	21	G 25	37	E R 54	53	55	35	37	21	16	16	E	E S 15	E S 15	E S 15
3	E S 14	E S 15	E B 12	E B 12	E	E	16	G	G	G	G	38	G	G	G	36	32	69	48	48	47	28	E	E
4	E S 15	E S 15	E	E	13	15	22	18	G	24	G	41	36	46	33	G	29	22	47	24	E S 15	27	E	E
5	E	E	E	15	E	20	29	27	53	50	31	36	40	50	37	33	54	52	37	29	19	E	E	E
6	20	A	18	E	15	E	E	G	G	G	G 23	G 27	G 20	31	29	30	21	22	15	17	18	E	E	E
7	E	E B 12	E	E	E	E	E	20	24	22	G 22	G 20	G 18	G	G	G 25	G 19	E B 15	28	E	E	E	E S 14	E S 13
8	E S 12	E	E	E	E	E B 15	E	G	G 15	G 18	G	35	G	G	G	G	G	G	E	E	E	E	E	E
9	E	E	E B 11	E	E	E B 15	E S 15	G	22	24	25	30	G 29	G 27	G 28	G 26	G 22	17	E	19	15	19	E	E
10	E	E S 15	E	E B 11	E	E B 15	E	33	27	27	C	G 31	35	39	42	33	30	19	15	E	18	16	E	E S 13
11	E	E	E B 11	E	E B 14	E	E S 15	G	19	29	C	C	G 28	35	34	28	G	22	27	64	41	20	16	E S 15
12	E S 15	E S 13	E B 13	E B 11	E B 13	E B 11	E	G	24	35	26	35	37	35	27	25	21	19	18	E S 13	E	22	19	15
13	E	E S 15	E B 11	E B 11	E	E	E S 14	G	19	C	C	G	G 30	G	G	G 25	G 20	G	21	17	17	21	19	E S 15
14	E	14	E	11	E	E B 13	E	G	G	36	29	G 28	G 28	G 23	G	G 20	G 18	19	19	E	E	E	C	E
15	E	E S 15	E B 15	E B 11	E	E B 14	E	G	G	29	G	G 24	G 27	G 27	G	G 18	G 17	19	E	E	22	E	E	21
16	E	E S 14	E	E B 12	E B 11	E B 12	E S 15	E S 15	G	24	29	31	34	35	33	G	36	26	E	19	21	A	19	E
17	E	E S 14	E B 13	E B 13	E B 15	E B 13	E S 15	E S 15	G 18	30	31	32	44	40	G 30	G 25	G 22	27	16	E S 15	E S 14	E S 15	E S 15	E S 15
18	E S 15	13	18	15	E	15	E	G	G	G 27	G	G	G	G	G	32	36	18	26	15	E	E S 13	E S 15	E S 15
19	E S 15	E B 13	E B 16	E B 14	E B 12	E B 13	E	G	G	G	G 19	G 24	G 20	G 21	G 29	35	43	G	E	17	E S 15	E S 15	E S 13	E
20	E	E	E	15	E B 14	E B 13	E S 14	G	G	27	26	G	G	G	35	G 27	20	G	18	E	E	E S 14	E S 14	E S 15
21	E S 15	E S 14	E	E B 12	E	E S 15	E S 15	E S 15	G	G	37	37	45	48	50	41	26	16	E	E	E	19	E	E S 15
22	E S 15	E B 11	E	E B 11	E	E B 14	E S 15	E S 15	G	G	G	G	36	G	G	30	27	20	E	15	16	22	E	17
23	E S 15	18	E B 13	E B 13	E	E B 11	E S 15	E S 15	20	G	25	G 33	G	G 29	G 27	G 25	G	G	16	E	E	20	18	20
24	22	E	16	E	E B 11	E B 12	E	G	40	G 21	G 22	25	36	G 22	G	23	18	21	E	E	E	E	E S 15	25
25	19	16	E	E	E B 12	E B 11	E	G	16	27	36	33	28	G 27	G 25	G 27	32	29	E	22	E	A	20	26
26	24	E B 14	12	E S 14	E	E B 12	E S 14	18	17	32	G 25	G 26	G 28	G 25	G 21	21	18	15	17	21	E	E	E	E
27	19	18	22	18	17	16	E	E S 14	21	G	G	G	G 26	G 26	G 24	26	24	22	21	19	18	15	17	E
28	19	E	E	17	E B 16	E B 11	E B 12	E S 14	G	26	30	G 28	29	G 28	24	24	26	22	30	21	17	E S 15	E S 15	E S 13
29	E	E S 13	E B 13	E	E B 11	E	E	G	E R 22	25	28	G 26	G 27	G 30	G 26	26	23	G	18	17	E	16	E	E
30	E	E S 15	E	E	E	E X 12	E S 14	G	G	21	33	30	G	G 24	G	G	G	20	24	18	E S 16	E S 15	E S 13	E
31	E S 12	17	14	E	E B 17	E B 15	E B 15	G	G	G	32	30	G 28	G 27	G 22	G 20	G	G	E S 15	E S 11	E S 14	E S 14	E S 14	E S 13
	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
CNT	31	31	31	31	31	31	31	31	31	30	28	30	31	31	31	31	31	31	31	31	31	31	30	31
MED	E E 12	E E 14	E E 11	E E 11	E	E B 13	E E 12	G	G 16	24	25	G 29	G 28	G 27	G 26	26	22	19	17	16	E E 15	15	E E 14	E E 13
UQ	E S 15	E S 15	E B 14	E B 13	E B 14	E B 15	E S 15	15	20	27	30	33	35	35	33	31	31	22	23	19	18	20	E S 15	E S 15
LQ	E	E E 11	E	E	E	E E 11	E	G	G	G	E G 19	G 24	G 20	G 22	G	G 22	G 18	15	E	E	E	E E 13	E	E

IONOSPHERIC DATA

DEC. 1968 | f-min (0.1) | 135° E Mean Time (G. M. T. + 9 h)

Station YAMAGAWA Lat. 31° 12.1' N. Long. 130° 37.1' E Sweep 1.0 Mc to 20.0 Mc in 20 sec in automatic operation

Hour / 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 S 15	E S 14	14	E	E	E	E S 14	E S 15	11	14	15	15	15	15	14	12	11	E S 15	E S 14	E S 15	E S 15	E S 13	E S 15	E S 14
2	E S 13	E S 11	E	11	E	11	E H 15	E H 15	11	14	16	16	16	16	15	15	15	E S 15	E S 15	E S 15	E S 15	E S 15	E S 15	E S 15
3	E S 14	E S 15	12	12	E	12	E S 15	E S 15	14	14	15	15	16	16	16	15	15	E S 15	E S 15	E S 15	E S 15	E S 15	E S 15	E S 15
4	E S 15	E S 15	12	12	E	12	E S 15	E S 15	E S 15	15	15	15	15	15	16	15	15	E S 15	E S 15	E S 15	E S 15	E S 15	E S 15	E S 13
5	E S 15	12	E S 15	12	E	12	E S 15	E S 15	E S 15	15	15	15	17	16	15	15	13	E S 15	E S 13	E S 15	E S 15	E S 15	E S 15	E S 14
6	E S 14	12	12	13	E	E S 15	E S 15	E S 15	15	16	16	14	15	15	15	14	12	E S 15	E S 13	E S 15	E S 14	E S 15	E S 15	E S 15
7	E S 15	12	E	E	E	11	E S 15	E S 15	14	14	15	15	14	16	14	14	12	15	E S 13	E S 15	E S 14	E S 15	E S 14	E S 13
8	E S 12	E S 14	11	E	E	15	E S 15	E S 15	11	11	14	15	16	16	14	14	13	E S 14	E S 15	E S 14	E S 13	E S 15	E S 14	E S 15
9	12	E S 14	11	E	E	15	E S 15	E S 15	14	14	15	15	16	17	16	14	14	E S 15	E S 15	E S 15	E S 13	E S 15	E S 15	E S 15
10	E S 15	E S 15	13	11	E	15	E S 15	E S 15	E S 15	15	C	17	17	18	15	15	14	E S 13	11	E S 15	E S 14	E S 14	E S 15	E S 13
11	E S 15	E S 13	11	E	14	E	E S 15	E S 15	E S 15	15	C	C	19	17	15	15	14	E S 15	E	E S 15	E S 15	E S 15	E S 15	E S 15
12	E S 15	E S 13	13	11	13	11	E S 15	E S 15	E S 14	14	14	15	15	15	15	11	11	E S 15	E S 15	E S 13	E S 15	E S 14	13	12
13	E S 15	E S 15	11	11	E	E	E S 14	E S 13	14	C	C	21	25	24	27	21	16	E S 14	E S 12	E S 14	E S 12	E S 14	E S 15	E S 15
14	E S 15	11	13	E	E	13	E S 15	E S 14	E S 14	14	17	22	18	17	21	16	16	E S 15	E S 15	E S 15	E S 15	E S 15	C	E S 15
15	E S 15	E S 15	15	11	E	14	E S 15	E S 15	13	14	15	16	18	21	18	11	11	11	E S 15	E S 15	E S 15	E S 15	E S 15	E S 15
16	E S 14	E S 14	13	12	11	12	E S 15	E S 15	15	15	15	17	18	16	15	15	15	E S 15	E S 15	E S 15	E S 15	E S 15	E S 15	E S 15
17	E S 15	E S 14	13	13	15	13	E S 15	E S 15	E S 15	E S 15	15	15	18	19	15	14	12	14	E S 15	E S 15	E S 14	E S 15	E S 15	E S 15
18	E S 15	11	12	E	13	E S 13	E S 15	E S 15	E S 15	E S 15	15	17	20	18	21	15	15	E S 15	E S 15	E S 13	E S 15	E S 13	E S 15	E S 15
19	E S 15	13	16	14	12	13	E S 15	E S 15	E S 15	14	14	19	16	15	16	14	12	E S 14	E S 15	E S 15	E S 15	E S 15	13	E S 15
20	E S 13	E S 15	12	13	14	13	E S 14	E S 15	E S 15	14	14	17	19	18	17	15	13	E S 13	12	E S 15	E S 15	E S 14	E S 14	E S 15
21	E S 15	E S 14	E	12	E	E S 15	E S 15	E S 15	E S 14	14	15	17	22	19	16	15	14	E S 14	E S 15	E S 14	E S 15	E S 14	E S 15	E S 15
22	E S 15	11	E	11	E	14	E S 15	E S 15	E S 14	15	16	18	17	18	15	14	15	E S 15	E S 15	E S 13	E S 14	E S 14	E S 15	E S 15
23	E S 15	E S 12	13	13	E	11	E S 15	E S 15	E S 15	14	16	17	19	18	17	19	14	E S 15	E S 11	E S 15	E S 15	E S 14	E S 15	E S 15
24	E S 15	E H 13	15	E	11	12	E S 15	E S 15	E S 13	14	13	16	16	15	22	17	15	E S 14	E S 15	E S 15	E S 15	E S 15	E S 15	E S 15
25	E S 15	E S 13	12	E	12	11	E S 14	E S 14	E S 13	14	14	15	16	15	15	16	16	E S 14	E S 15	E S 13	E S 14	E S 14	E S 15	E S 14
26	E S 14	14	E	E S 14	E	12	E S 14	E S 15	E S 15	14	15	14	14	15	14	15	E S 15	E S 14	E S 15	E S 15	E S 14	E S 13	E S 15	E S 15
27	E S 14	E S 15	15	13	E	E S 15	E S 15	E S 14	15	15	15	17	20	17	18	15	15	13	E S 13	E S 13	E S 13	E S 14	E S 13	E S 15
28	E S 13	17	E S 15	E	16	11	12	E S 14	E S 14	14	15	16	15	16	15	15	E S 15	E S 15	E S 14	E S 14	16	E S 15	E S 15	E S 13
29	E S 14	E S 13	13	E	11	E S 15	E S 14	E S 15	E S 13	15	14	15	18	19	15	15	15	E S 15	E S 15	E S 15	E S 15	E S 13	E S 15	E S 15
30	E S 14	E S 15	E	E	E	12	E S 14	E S 15	14	14	13	16	17	15	19	15	17	E S 14	E S 14	E S 15	E S 16	E S 15	E S 13	E S 13
31	E S 12	E S 14	E	14	17	15	15	E S 14	E S 14	15	14	16	15	17	18	14	16	E S 14	E S 15	E S 11	E S 14	E S 14	E S 14	E S 13
	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
CNT	31	31	31	31	31	31	31	31	31	30	28	30	31	31	31	31	31	31	31	31	31	31	30	31
MED	E S 15	E S 14	12	11	E	12	E S 15	E S 15	E S 14	14	15	16	17	16	15	15	15	E S 15	E S 15	E S 15	E S 15	E S 15	E S 15	E S 15
UQ	E S 15	E S 15	13	12	12	14	E S 15	E S 15	E S 15	15	15	17	18	18	18	15	15	E S 15	E S 15	E S 15	E S 15	E S 15	E S 15	E S 15
LQ	E S 14	E E 12	11	E	E	11	E S 14	E S 15	E S 14	14	14	15	16	15	15	14	12	E S 14	E S 13	E S 14	E S 14	E S 14	E S 14	E S 14

The Radio Research Laboratories, Japan

IONOSPHERIC DATA

DEC. 1968

M(3000)F2(0.01)

135° E Mean Time (G. M. T. + 9 h)

Station YAMAGAWA Lat. 31°12.1'N. Long. 130°37.1'E Sweep 1.0 Mc to 20.0 Mc in 20 sec in automatic operation

Hour / 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	275	280	290	295	270	270	315	330	325 S	325	315	310 S	310 I S	325	310	315	305 J S	330	345	275	275	280	270
2	270	280	255 F	280	305	265	265	305 S	325 S	335	320 U S	330	305	310 U S	315	325 S	345	345 U S	335	320 S	325	340	285 U S	275
3	285 S	270 S	270	270	295	325	280	320	335 J S	315 U S	310	310 S	305 U S	S	295	305 J S	315 S	315	310 S	315	275 U S	250 I S	275	290
4	280 J S	295 U S	295 S	250	275	280	270	315 J S	325 S	335	315	315	310	310 R	315	310 J S	340 J S	340 U S	320 S	310	330	335	295	265
5	270	280	275	275	265	280	285 U S	305 S	335 S	320	315	310	300	310	305	310 S	325	330 S	345 J S	315 S	270	245 F	300 S	310 S
6	260 S	250 I A	250 S	255	255	245	250	290	310 U S	320	310	310	300	295	295	315	315	310	320	310	285	290	295	310
7	320	325	290	275	275	260	255	305 S	330 S	340	335 S	325	315	300	300 S	325	320	315	310	315	325	300	345	270
8	295	300	305	270	250	265	295	350	355	330	325	325	325	320	310	315	315	320 S	300	310 J S	315	350	325 S	280
9	320	310	290	270	270	255	265	330 S	360	350	335 S	320	320	310	310	315 S	325 S	325 U S	325	325	350	320	335 S	295
10	300	295	305	265	275	270	285	325	355 J S	335 S	320 I C	320	310 S	310 R	300	295 J S	310 R	S	320	295	290 J S	320	300	315
11	310	335	350	240 F	260 F	F	280 S	315 J S	340 U S	310	315 I C	320 I C	295 J S	305 J R	315 S	310 S	320 J S	330	320 R	350 S	325 J S	300 U S	310 S	305
12	320	330	305 F	250 F	275 F	295 F	295	320	335	295	285	300	305	300	295	300	315	315	345	275	305	285 F	290 S	310
13	325	315	295	310	285	300	285	300	340	325 I C	315 I C	325	305	315	305	305	335	330	300	330	310	285	315 F	295
14	305 F	295	275 F	270 F	290 F	280 F	315 F	305 U S	325 S	310	315	320	295	295	305	320	285 J S	305 S	305	315 I S	315 S	305	300 I C	290
15	300	295	290	285	290	275	280	320 S	335 S	330 S	320	325	320	310	300	325 S	340	320	315	325	305	310	280	300
16	285	295	280	285 F	290	295	295	295 S	340 S	340 S	345 S	350	325	305	325	325	355	335	300 S	300	310	305 I A	290 J S	F
17	290 S	305	325	280	305	260	275	310 I S	325	340 U S	345 U S	340	310	340	305	315	315 R	315 S	305 R	330	330 S	335 J S	310 S	290
18	275 S	320 V	325 F	295	280	295	290	300 S	340 S	310 U S	330 U S	325	320 S	325	325	335	350	325	325	305 H	330 S	290	295	275
19	280	295	285	325	320	270	265	295	340 J S	325 S	330	300	310	305	310	325	325 S	320 S	315	330	280 H	270	270	270
20	280 S	295	325 S	315	270	275	290	325 S	330	310	315	315	315	305	290	320	340	320	315	320	300	310 S	285	290
21	290 S	295	290 S	300	305	295	295	295 S	320 S	330 I S	325 S	320	310	300	295	335	330	320	310	350	265	265	275	290
22	285	290	300	250	245	255	295 S	320 S	335 S	325	325	335	315	285	300	305	310 S	320 S	320	325	305	280	315	290
23	295	270	300	275	250	250	285	310 S	320 S	315 S	320 J S	310	305	300 S	300 S	305	320	315	310 S	310	300	275 S	280	280
24	290	265	280	330	245	260	265	280	320 J S	305	310	310	305	300	300	305	315	310 S	330 S	335 S	275 S	260 S	305	320 S
25	335	270	290	260	250	260	275 S	300 S	345 U S	S	345	315	300 J R	300 J S	300	285	300 J S	305 J S	315	325	290 J S	275 I A	265 S	300
26	325	340	320	250	240	240	255	315	335 S	330 J S	335	335 S	325	300	300	305	315 S	330	310	300	300 S	295 S	305 S	310
27	280	295	335	320	260	245	245	295 S	345 S	S	325	310	310	295 R	S	295 J S	330 J S	305 J S	325	335	305	305 J S	270 J S	310
28	305	295	285	250	260	280	280	300 S	335	330 S	320 S	320	320	300	300	300 S	325	305	315	320	330	305 S	260	265 S
29	275	290	315	270	275 F	250 F	265	280 S	355 S	345	320	290 S	310	295 U S	290	280	295 S	310	280 S	320 S	305 J S	280 S	280	300 S
30	305	255	310	285	250	265	290	260 J S	315 S	325 J S	325	310 J S	295 J S	295 J S	285	290 S	315	335	305	285	300	290 S	260	280 S
31	275	280 F	285	305	250	265	280 S	290 S	340	340	295	320	300	300	310	305	320	320	335	325	315	275	255	290
	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
CNT	31	31	31	31	31	30	31	31	31	29	31	31	31	30	30	31	31	30	31	31	31	31	31	30
MED	290	295	290	275	275	268	280	305 S	335 S	325	320	320	310	302	300	310	320	320	315	320	305	290	290	290
UQ	305	302	308	292	290	280	290	318 S	340 S	335	328	325	315	310	310	320	330	330	325	328	320	308	305	305
LQ	280	278	282	262	252	260	265	295 S	325 S	315	315	310	305	300	300	305	315	310	310	310	290	275	278	280

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IONOSPHERIC DATA

DEC. 1968

M(3000)F1(0.01)

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

Station YAMAGAWA Lat. 31° 12.1' N. Long. 130° 37.1' E Sweep 1.0 Mc to 20.0 Mc in 20 sec in automatic operation

Hour / 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 415	L	L	L	L	L	A								
2										L	L	L	A	A	A	L								
3											L	L	L	L	L	L								
4									L 420		L	L	L	L	L	L								
5										A	L	L	L	A	L	L	A							
6										L	L	L	L	L	L	L	L							
7										L	L	L	L	L	L	L	L 400							
8										L	L	L	L	L	L	L								
9										L	L	U L 380	U L 385	L	L	L								
10										L	C	L	L	L	A	L								
11										L	C	C	L	L	L		L							
12										A	L	L	L	L	L	L								
13										C	C	L	L	L	L	L 375								
14										L	L	L	L	L	L	L								
15										L	L	L	L	L	L	L								
16										L	L	L	L	L	U L 360	L								
17										L	L 380	U L 380	L 395	L	L	L	405							
18										L	L	L	L	L	L	L								
19											L	L	L	L			L							
20										L	L	L	L	L	L	L								
21											L	L	L	A	A	L								
22										L	L	L 380	L	L	L									
23										L	L	L	L	L	L	L	415							
24										L	L	L	L	L	L	L								
25										L	L 395	L	L	L	L	L								
26										L	L	L	L	L	L	L	L							
27										L	L	L	L	L	L	L								
28											L	L	L	L	L	L	L							
29											L	L	L	L	L	L	L							
30											L	L	L	L	L	L								
31											L	L	L	L	L	L	L							

	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
CNT										2	2	3	2		1	1	3							
MED										418	L 388	U L 380	L 390		U L 360	L 375	405							
UQ												U L 380					410							
LQ												L 380					402							

IONOSPHERIC DATA

DEC. 1968 | h'F2 (km) | 135° E Mean Time (G. M. T. + 9 h)

Station YAMAGAWA Lat. 31°12.1'N. Long. 130°37.1'E Sweep 1.0 Mc to 20.0 Mc in 20 sec in automatic operation

Hour / 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										230	240	250	255	235	245	240								
2										240	255	240	255	245	255	255								
3											255	260	250	260	270	255								
4									250	240	240	250	240	260	240	255								
5										240	255	240	250	245	245	240	240							
6										235	250	240	250	240	250	245	220							
7										240	235	245	240	245	235	245	230							
8										240	240	235	245	245	250	240								
9										240	250	240	240	240	250	255								
10										230	I C 240	275	250	250	245	250								
11										250	I C 260	I C 250	240	245	245		230							
12										235	275	280	255	245	245	255								
13										C	C	255	245	245	225	250								
14										250	255	245	245	255	260	245								
15										240	230	245	250	250	255	240								
16										245	240	220	270	290	265	240								
17										260	240	225	255	255	250	245	225							
18										250	245	250	240	235	260	240								
19											245	240	275	255			250							
20										250	250	255	240	255	280	250								
21											245	255	250	260	250	235								
22										240	255	240	250	280	250									
23										245	240	265	250	250	250	250	240							
24										260	260	240	245	245	255	245								
25										235	240	250	240	250	250	270								
26										250	250	240	245	255	250	250	225							
27										230	240	250	255	260	255	250								
28											260	250	250	265	275	250	235							
29											250	260	270	245	260	245	230							
30											275	240	280	265	290	260								
31											280	275	260	255	240	245	250							
	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
CNT									1	23	30	31	31	31	30	28	11							
MED									250	240	250	250	250	250	250	248	230							
UQ										250	255	255	255	258	260	252	240							
LQ										238	240	240	245	245	245	242	228							

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IONOSPHERIC DATA

DEC. 1968

h'F (km)

135° E Mean Time (G. M. T. + 9 h)

Station YAMAGAWA Lat. 31° 12.1'N, Long. 130° 37.1'E Sweep 1.0 Mc to 20.0 Mc in 20 sec in automatic operation

Hour / 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 S 300	300	300	290	250	E A 300	280	250	235	220	235	230	225	H 210	255	I A 235	230	220	205	225	255	245	250	255
2	270	255	345	300	250	265	310	260	240	240	215	H 215	A	A	A	E A 245	230	215	205	245	220	205	240	280
3	285	300	305	305	260	245	325	270	245	225	H 210	230	230	H 210	220	250	240	E A 255	240	270	E A 325	300	280	250
4	250	255	230	350	305	295	350	260	H 225	220	225	235	220	E A 240	235	235	235	220	E A 240	255	220	205	240	310
5	325	280	310	E A 350	320	270	360	275	230	I A 225	H 220	H 225	230	I A 240	I A 225	225	I A 220	E A 230	220	225	250	290	210	215
6	A	A	E A 400	360	350	E S 385	E S 390	290	240	225	H 220	225	225	225	225	230	220	205	205	215	240	240	250	245
7	230	235	H 245	300	295	355	E S 360	250	240	230	225	H 200	210	210	220	H 200	220	205	220	220	215	210	200	280
8	260	250	250	E E 290	320	345	275	230	220	H 205	225	H 225	205	205	225	H 205	240	225	205	235	230	215	205	275
9	250	250	250	250	290	350	340	255	220	220	220	210	H 210	220	220	H 220	225	210	215	225	215	220	220	250
10	270	285	275	305	300	350	300	270	230	220	I C 215	210	225	225	I A 235	240	240	220	215	205	225	235	225	255
11	260	235	225	305	350	340	330	265	230	220	I C 225	I C 220	235	H 215	230	235	240	225	230	E A 250	E A 250	245	245	230
12	245	240	250	345	305	290	290	250	215	I A 225	220	225	240	225	230	H 230	225	215	215	245	245	250	250	240
13	215	240	280	265	E E 250	255	E S 300	255	220	I C 225	I C 215	205	235	225	220	210	240	215	225	240	225	275	255	250
14	245	245	300	300	255	290	260	235	230	245	230	225	205	220	H 235	230	225	220	245	225	205	220	I C 230	250
15	255	290	290	280	250	E B 320	300	255	230	225	225	210	210	H 205	230	240	225	215	230	215	230	240	260	E A 340
16	300	295	E B 295	E B 300	280	255	250	240	230	230	220	210	H 205	225	H 200	235	230	215	210	220	250	A	270	270
17	270	255	235	260	255	315	300	275	250	230	220	205	E A 235	E A 240	H 235	220	230	210	220	215	215	215	235	295
18	270	250	250	300	300	300	300	270	240	H 205	230	H 205	H 205	230	230	225	220	220	230	205	225	235	255	300
19	315	295	305	250	210	320	350	290	240	235	230	220	225	230	235	245	240	225	240	205	205	245	280	290
20	285	260	230	250	E B 255	345	295	230	230	H 205	240	230	215	225	H 205	240	220	220	240	205	225	205	250	250
21	E S 280	E S 310	275	260	235	E S 300	270	255	230	230	235	230	240	A	A	I A 240	225	215	235	220	220	250	270	255
22	255	250	245	E B 300	E E 350	345	250	245	240	230	225	210	H 205	H 200	H 220	240	240	230	215	210	245	255	245	E A 270
23	260	E A 300	260	295	325	350	280	245	245	225	H 215	215	215	240	215	H 225	215	225	210	200	235	260	260	E A 295
24	280	325	325	220	E B 260	340	325	270	240	H 200	230	225	220	220	H 220	H 220	230	230	200	220	245	280	250	250
25	235	E A 280	275	260	350	310	305	260	230	230	220	H 200	220	225	H 210	H 205	245	225	210	225	230	A	E A 325	290
26	250	240	230	S	E E 390	E B 400	E S 360	260	240	245	240	220	220	H 210	H 220	H 230	230	215	230	230	240	230	245	245
27	270	275	245	255	E A 280	E A 370	E S 350	270	235	225	215	215	220	220	230	230	H 230	220	230	220	240	220	280	240
28	255	300	300	E A 400	E B 370	335	320	275	235	240	230	215	H 235	H 220	220	230	240	230	245	240	220	210	235	255
29	300	260	230	255	280	350	340	275	225	210	215	H 220	H 225	225	220	225	240	210	230	230	220	215	255	230
30	225	300	255	250	305	320	275	280	235	240	245	H 210	H 205	H 225	225	240	250	225	215	255	230	230	250	275
31	275	295	270	260	E B 350	355	305	260	230	225	H 210	H 205	230	225	220	225	H 225	220	220	210	225	245	300	270
	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
CNT	30	30	31	30	31	31	31	31	31	31	31	31	30	29	29	31	31	31	31	31	31	29	31	31
MED	262	262	262	U 276	U 278	315	302	260	230	225	225	215	220	222	225	230	230	220	220	222	228	235	250	252
UQ	278	295	298	302	314	348	331	270	240	230	230	225	230	225	230	239	240	225	230	235	241	250	259	278
LQ	250	250	245	258	252	289	282	250	230	220	218	210	210	H 215	220	225	225	215	212	215	220	215	238	250

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IONOSPHERIC DATA

DEC. 1968 | h'Es (km) | 135 E Mean Time (G. M. T. + 9 h)

Station YAMAGAWA Lat. 31° 12.1' N. Long. 130° 37.1' E Sweep 1.0 Mc to 20.0 Mc in 20 sec in automatic operation

Hour / 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	S	B	105	105	105	100	105	100	100	100	155	155	100	145	125	115	100	100	100	S	S	S	S
2	S	S	E	110	115	105	105	100	100	100	105	150	125	120	120	100	100	100	95	105	100	S	S	S
3	S	S	B	B	105	105	105	100	G	G	115	115	115	G	G	150	115	105	105	100	100	95	95	95
4	S	S	120	115	105	105	105	105	100	105	G	105	105	105	105	G	170	140	105	105	S	100	105	105
5	105	105	105	105	120	105	105	100	100	100	120	120	120	115	110	110	110	105	105	100	100	100	100	150
6	140	95	125	95	110	100	105	105	G	G	105	105	100	100	100	100	130	125	105	100	100	100	100	95
7	100	B	E	E	E	110	105	100	100	100	100	100	100	G	G	105	105	B	105	105	100	100	S	S
8	S	115	110	105	E	B	105	100	100	95	E G 170	145	140	G	G	G	G	G	125	105	100	100	100	100
9	100	100	B	E	E	B	S	115	105	105	105	100	105	105	105	105	105	100	105	100	100	100	100	100
10	95	S	95	B	E	B	130	115	110	105	C	110	110	110	110	110	110	105	110	110	105	105	105	S
11	100	100	B	100	B	E	S	120	95	110	C	C	105	110	105	105	125	110	105	100	100	100	95	S
12	S	S	B	B	B	B	120	105	105	100	100	100	100	100	100	100	100	100	105	S	100	100	100	100
13	100	S	B	B	E	E	S	125	115	C	C	G	110	G	G	105	105	135	100	105	100	105	105	S
14	100	100	100	100	100	B	100	105	100	110	105	105	105	105	G	100	150	100	100	100	100	100	C	100
15	100	S	B	B	E	B	100	100	130	110	G	100	100	100	G	100	100	95	95	105	100	100	100	100
16	100	S	100	B	B	B	S	S	100	110	105	105	105	105	105	145	120	110	110	105	100	100	100	105
17	100	S	B	B	B	B	S	S	100	115	105	105	105	105	105	105	105	100	100	S	S	S	S	S
18	S	120	115	100	100	115	110	100	G	105	G	G	G	G	G	125	115	110	105	105	100	S	S	S
19	S	B	B	B	B	B	105	105	105	G	130	125	100	100	105	155	125	105	100	100	S	S	B	100
20	100	95	95	95	B	B	S	100	G	110	155	G	G	G	105	105	155	130	115	100	100	S	S	S
21	S	S	E	B	E	S	S	S	G	G	150	145	130	120	110	105	105	100	100	95	95	95	95	S
22	S	B	E	B	E	B	S	S	G	G	150	125	125	125	G	110	105	105	105	105	100	100	100	100
23	S	95	B	B	E	B	S	S	100	G	105	120	G	110	105	125	G	110	105	100	100	100	95	95
24	95	100	95	E	B	B	110	105	100	100	95	95	95	100	G	100	100	95	100	100	100	105	S	95
25	95	95	100	E	B	B	110	105	105	100	100	100	100	95	95	105	105	100	100	100	100	100	100	100
26	100	B	100	S	E	B	S	105	100	100	100	100	100	95	95	90	90	90	100	100	100	95	95	100
27	100	100	100	95	95	95	100	S	110	100	G	G	100	100	100	90	95	100	100	100	100	100	100	100
28	100	100	100	100	B	B	B	S	G	115	105	105	100	100	100	100	95	90	90	90	110	S	S	S
29	105	S	B	E	B	100	100	100	120	105	100	100	100	100	100	95	100	100	100	100	100	100	95	100
30	100	S	E	E	E	B	S	100	G	105	120	100	G	100	G	G	G	95	110	95	S	S	S	105
31	S	100	95	100	B	B	B	95	G	125	105	105	105	100	100	100	G	G	S	S	S	S	S	S
	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
CNT	20	14	15	13	9	10	18	24	22	24	24	26	27	25	21	28	27	28	30	28	25	22	19	19
MED	100	100	100	100	105	105	105	105	100	105	105	105	105	100	105	105	105	100	105	100	100	100	100	100
UQ	100	100	108	105	110	105	110	105	105	110	119	120	112	110	105	110	118	110	105	105	100	100	100	100
LQ	100	95	98	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	95	100

IONOSPHERIC DATA

DEC. 1968

Types of Es

135° E Mean Time (G. M. T. + 9^h)

Station YAMAGAWA Lat. 31° 12.1' N. Long. 130° 37.1' E Sweep 1.0 Mc to 20.0 Mc in 20 sec in automatic operation

Hour / 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 2			F 1	F 2	F 2	F 1	L 1	L 3	L 2	L 3	H 1	HL 11	L 1	HL 32	H 3	CL 62	L 4	F 3	F 2				
2				F 2	F 1	F 2	F 2	L 2	L 4	L 4	L 2	HL 13	HL 33	CL 34	CL 33	L 4	L 5	L 3	F 1	FF 11	F 1			
3					F 2	F 2	F 3	L 1			C 1	C 2	C 1			H 4	C 3	L 4	F 4	F 5	F 5	F 5	F 2	F 1
4			F 1	F 1	F 2	F 3	F 4	L 4	L 1	L 3		L 3	L 2	L 2	L 2		H 1	HC 22	F 3	F 3		F 3	F 1	F 1
5	F 1	F 1	F 1	F 2	F 1	F 4	F 4	L 5	L 3	L 2	CL 11	CL 11	CL 21	C 4	C 3	C 3	C 6	L 5	F 3	F 3	F 2	F 2	F 1	F 1
6	F 4	FF 31	FF 22	F 2	F 2	F 2	FF 41	L 2			L 1	L 1	L 1	L 1	L 2	L 3	HL 32	HL 53	F 1	F 3	F 2	F 2	F 1	F 2
7	F 1					F 1	F 3	L 7	L 3	LH 32	L 1	L 1	L 1			L 1	L 2		F 7	F 1	F 1	F 1		
8		F 1	F 1	F 1			F 1	L 1	L 1	L 3	H 1	H 1	H 1						F 2	F 1	F 3	F 3	F 3	F 1
9	F 1	F 1						L 2	L 5	L 2	L 3	L 3	L 2	L 1	L 2	L 3	L 3	L 5	F 2	F 3	F 4	F 2	F 1	F 2
10	F 1		F 1				F 1	L 5	L 4	L 3		L 1	L 2	C 1	C 3	C 3	C 6	L 3	F 1	F 1	F 3	F 3	F 1	
11	F 1	F 2		F 1				H 1	LC 11	L 3			L 1	L 2	L 2	L 2	H 1	L 4	F 5	F 4	F 3	F 2	F 2	
12							F 1	L 2	L 2	L 3	L 2	L 2	L 2	L 1	L 1	L 1	L 1	L 2	F 1		F 2	F 2	F 3	F 2
13	F 1							HL 11	L 2				L 1			L 1	L 1	LH 21	F 4	FF 22	F 3	F 2	FF 11	
14	F 1	F 1	F 1	F 1	F 1		F 1	L 1	L 1	C 4	L 2	L 1	L 1	L 1		L 1	HL 11	L 2	F 2	F 1	F 1	F 1		F 1
15	F 1						F 1	LH 11	H 3	C 4		L 1	L 1	L 1		L 1	L 1	LH 11	F 1	FF 11	F 3	F 1	F 1	F 1
16	F 1		F 1						L 2	L 3	L 2	L 2	L 1	L 2	L 2	H 1	C 3	L 3	F 2	F 4	F 5	F 6	F 5	F 2
17	F 1								LL 12	C 2	L 2	L 2	L 2	L 2	L 2	L 3	L 2	L 7	F 1					
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19							F 1	L 1	L 1		HL 11	HL 11	L 1	L 1	L 1	HL 22	HL 42	L 4	F 2	F 2				F 1
20	F 1	F 1	F 1	F 1				L 1		C 2	HL 11				L 1	L 1	HL 23	C 4	F 3	F 1	F 1			
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The Radio Research Laboratories, Japan

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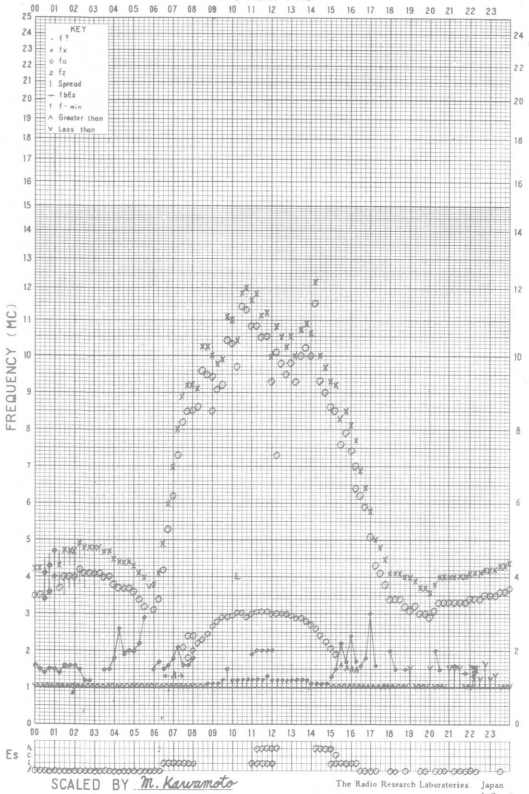
STATION WAKKANAI 135°E MEAN TIME DATE DEC. 1.1968



SCALED BY M. Kawamoto The Radio Research Laboratories. Japan

f-PLOT OF IONOSPHERIC DATA

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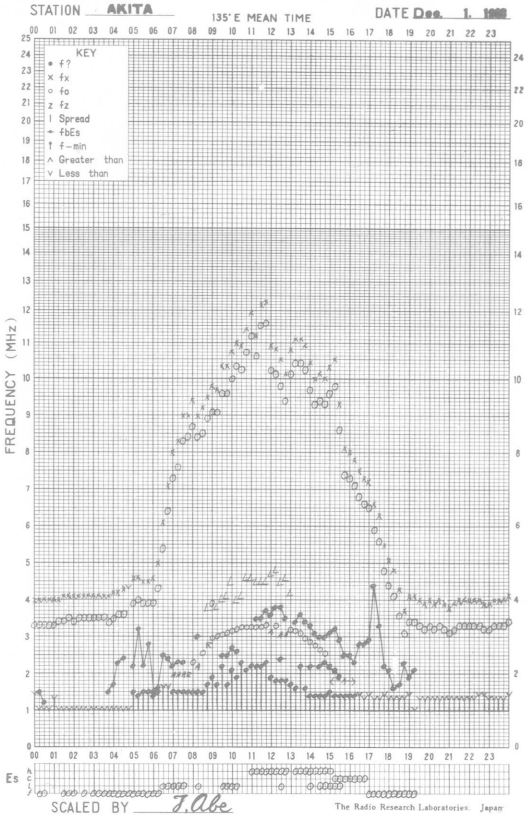
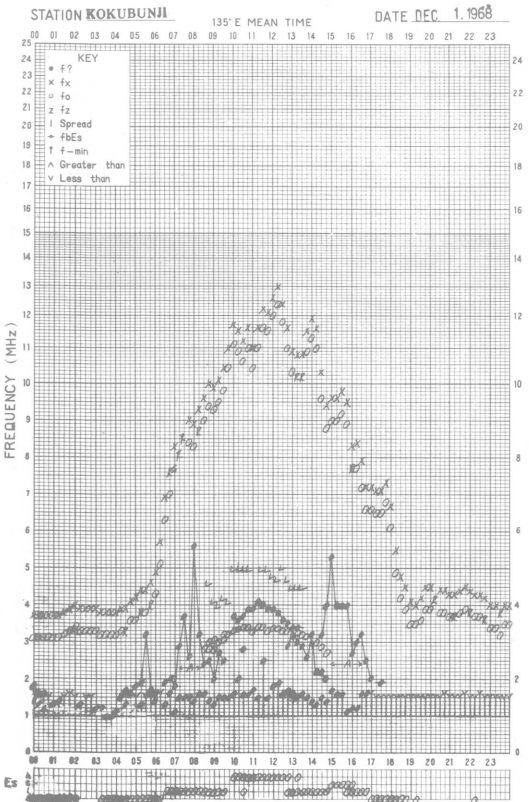


SCALED BY J. Abe The Radio Research Laboratories. Japan

f-PLOT OF IONOSPHERIC DATA

STATION KOKUBUNJI 135°E MEAN TIME DATE DEC. 1.1968



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f-PLOT OF IONOSPHERIC DATA

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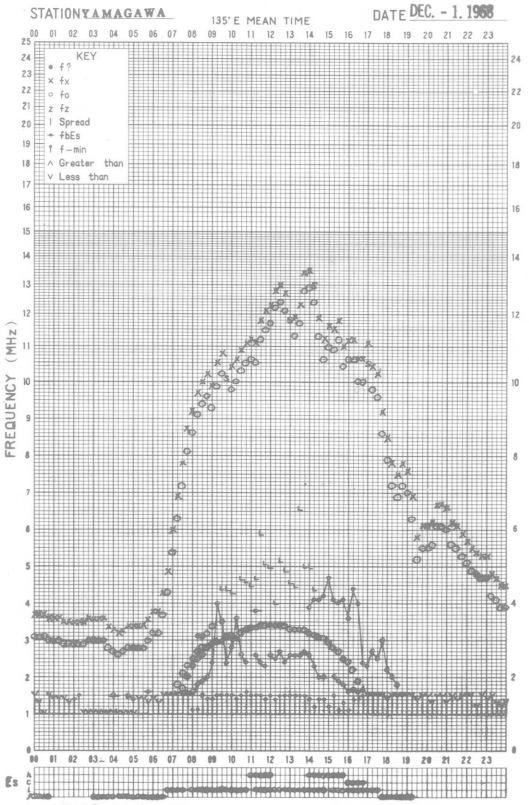
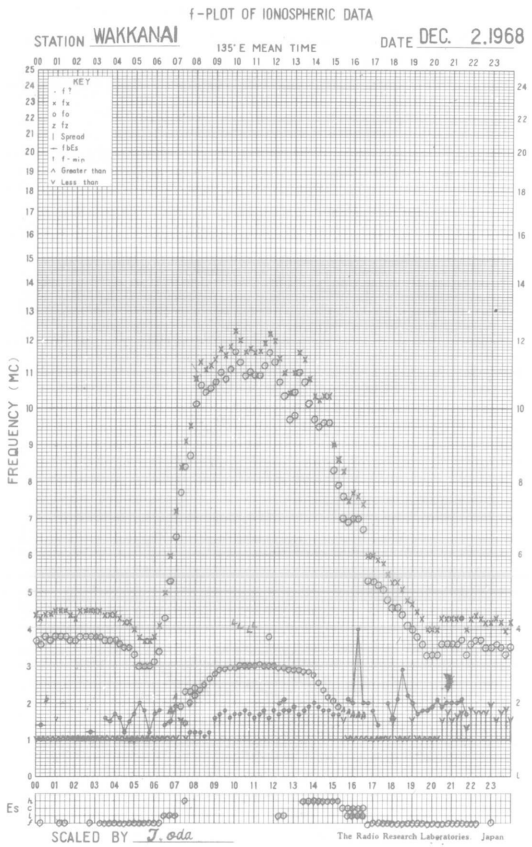


SCALED BY S. Nidaira The Radio Research Laboratories. Japan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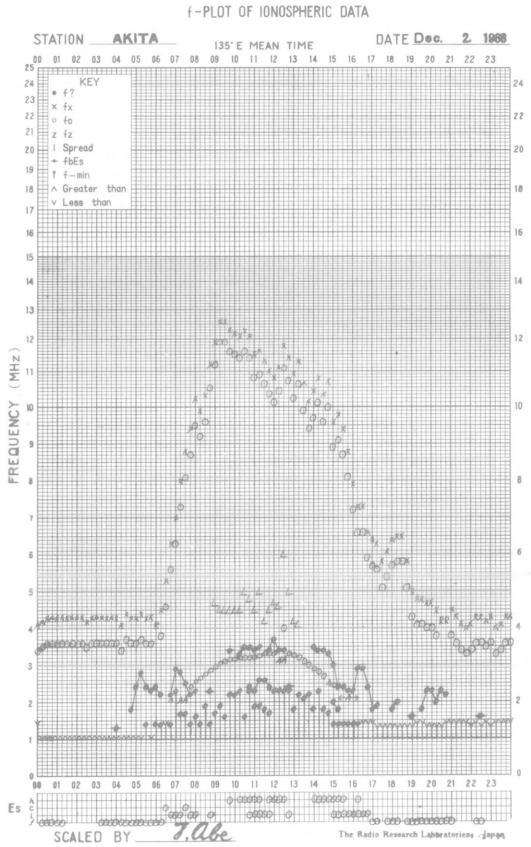
SCALED BY T. Oda
The Radio Research Laboratories. Japan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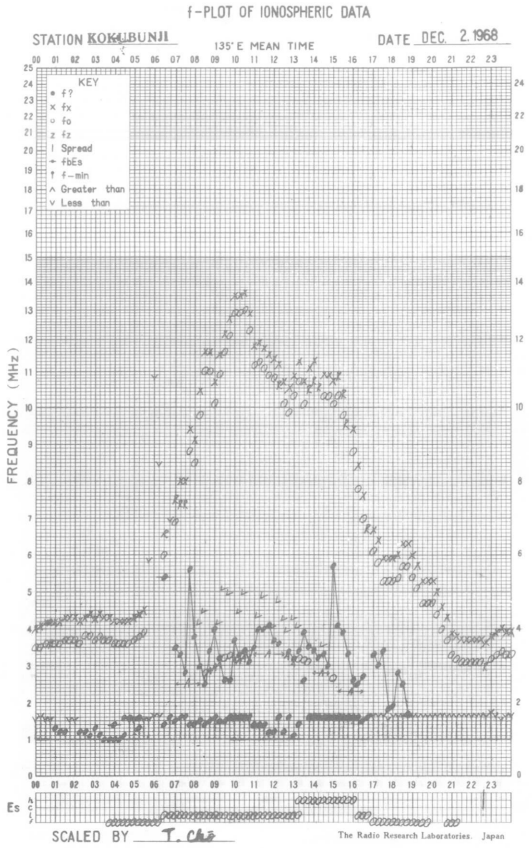
SCALED BY T. Abe
The Radio Research Laboratories. Japan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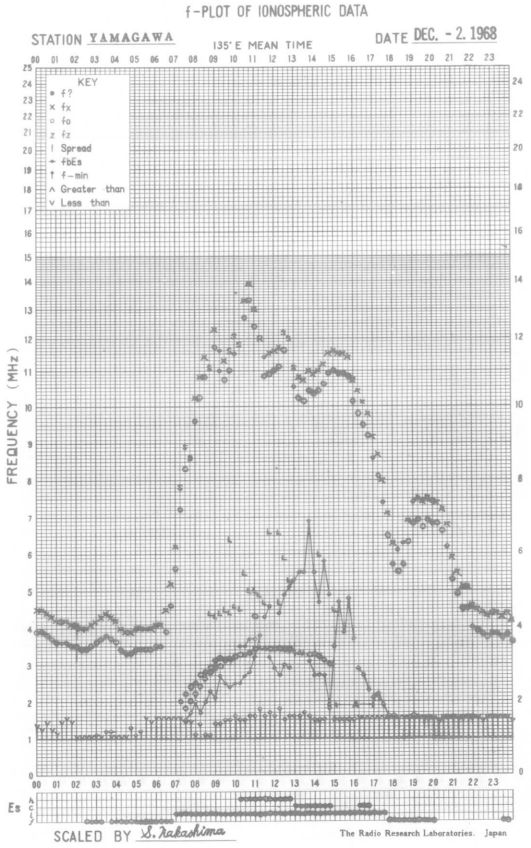
SCALED BY T. Chō
The Radio Research Laboratories. Japan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SCALED BY S. Takashima
The Radio Research Laboratories. Japan

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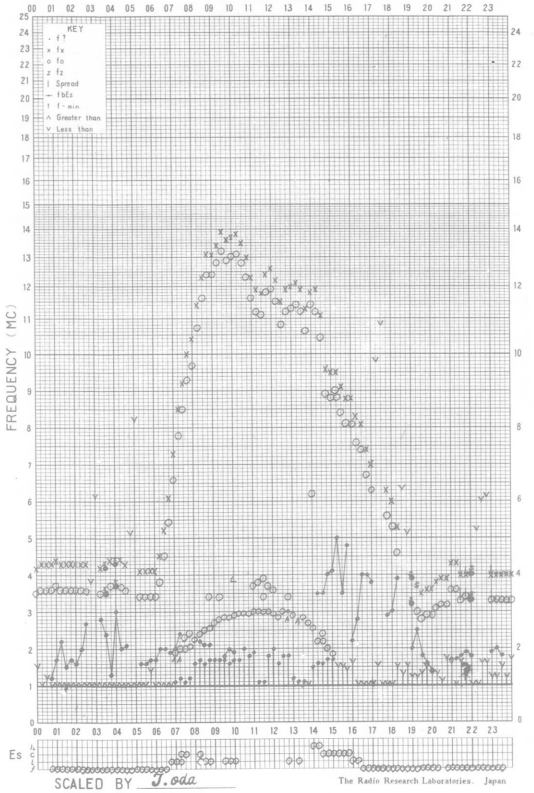

SCALED BY T. oda

The Radio Research Laboratories. Japan

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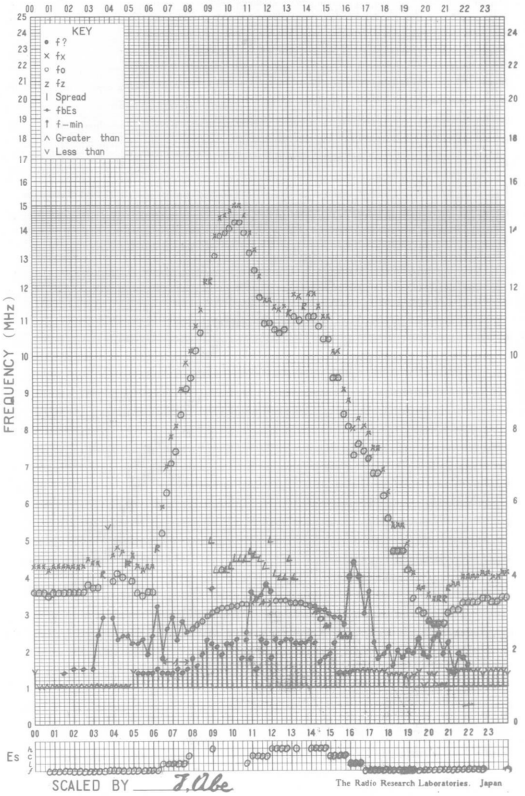

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The Radio Research Laboratories. Japan

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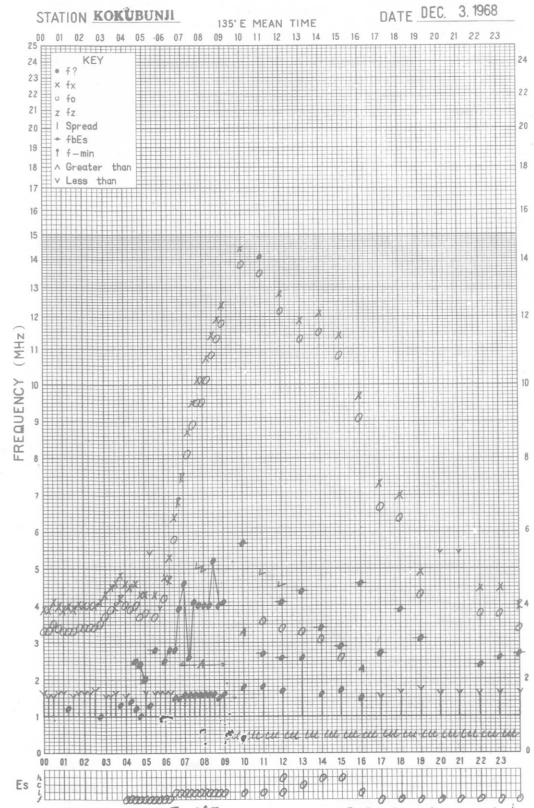

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The Radio Research Laboratories. Japan

f-PLOT OF IONOSPHERIC DATA

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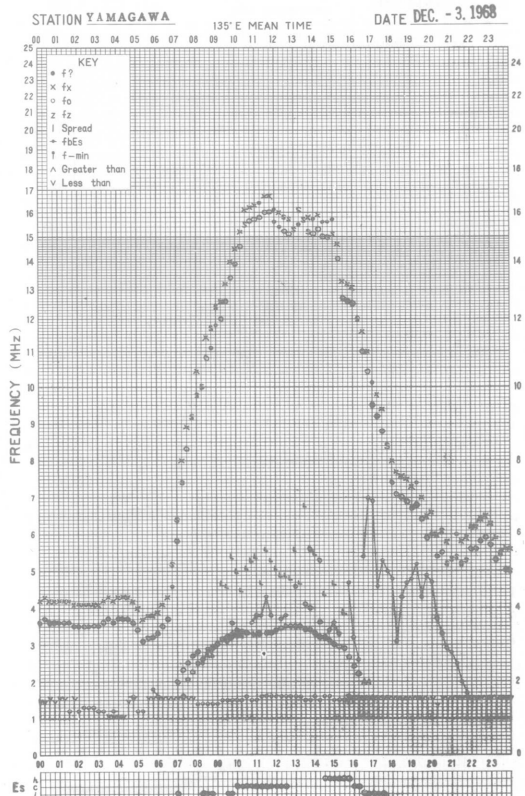
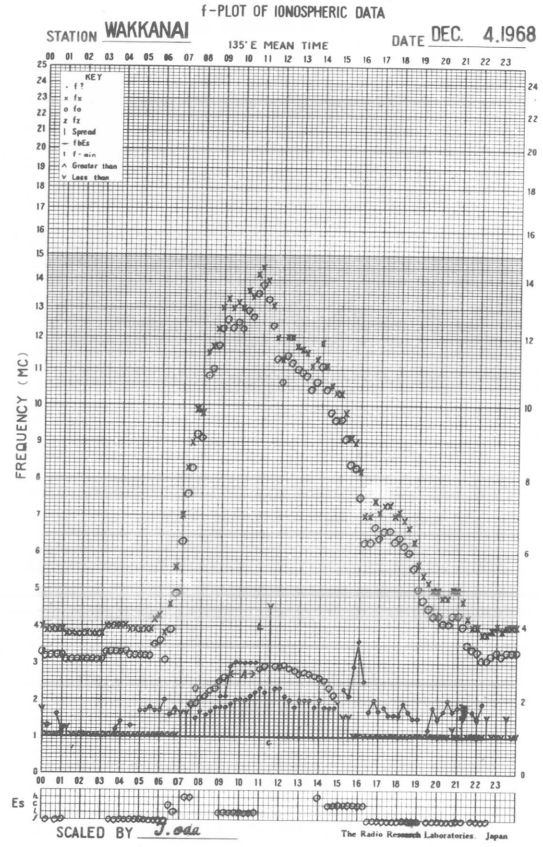


SCALED BY S. Takashima

The Radio Research Laboratories. Japan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DATE DEC. 4, 1968
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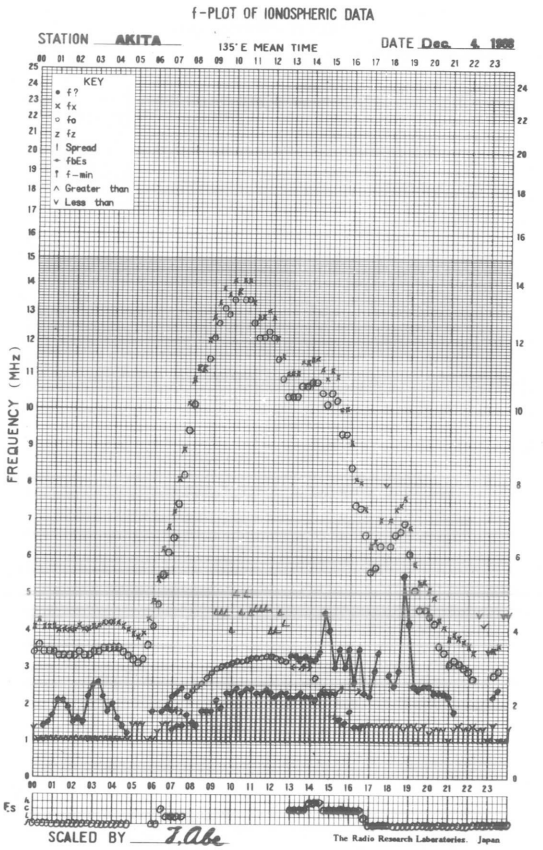
SCALED BY J. oda
The Radio Research Laboratories. Japan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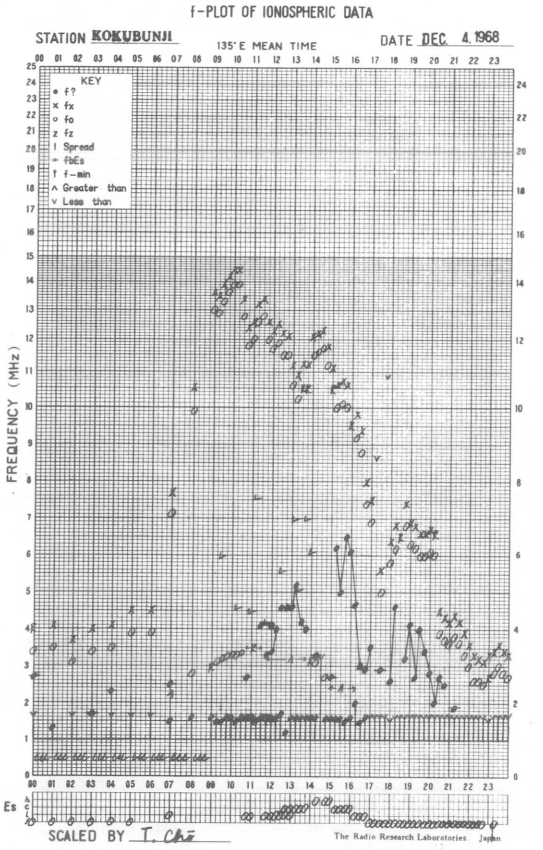
The Radio Research Laboratories. Japan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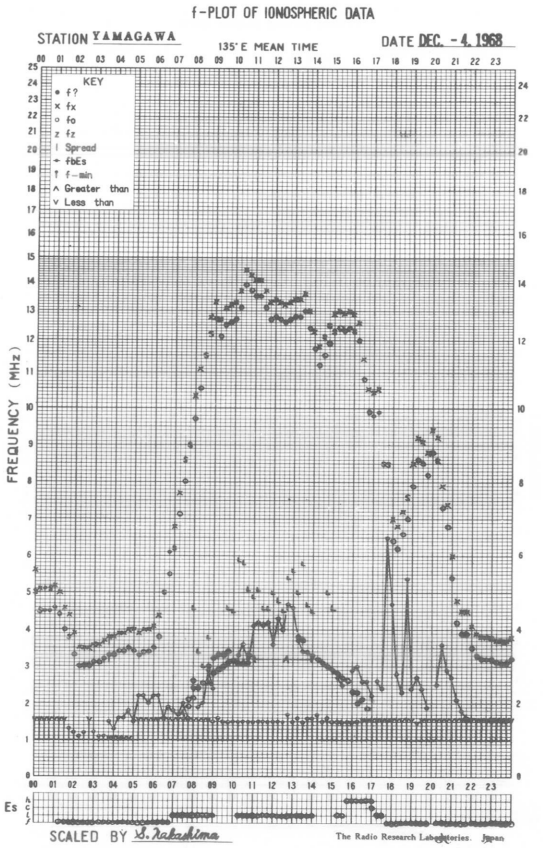
SCALED BY T. Chō
The Radio Research Laboratories. Japan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SCALED BY S. Nakashima
The Radio Research Laboratories. Japan

f-PLOT OF IONOSPHERIC DATA

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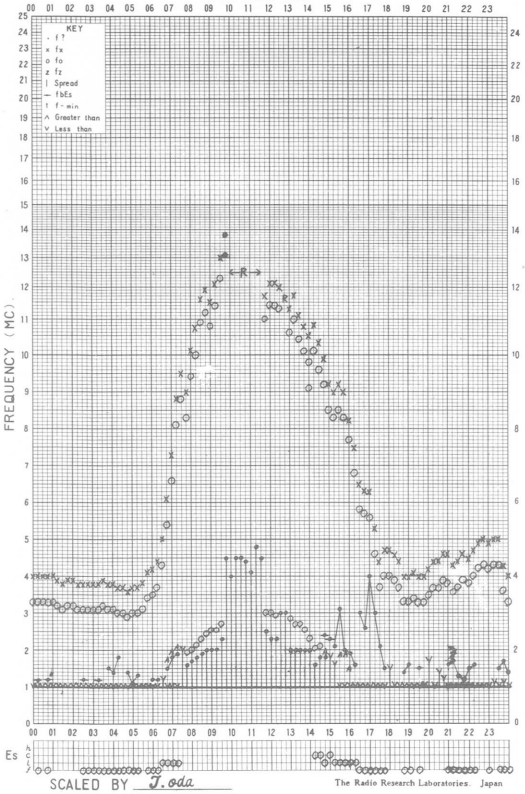

SCALED BY T. Oda

The Radio Research Laboratories. Japan

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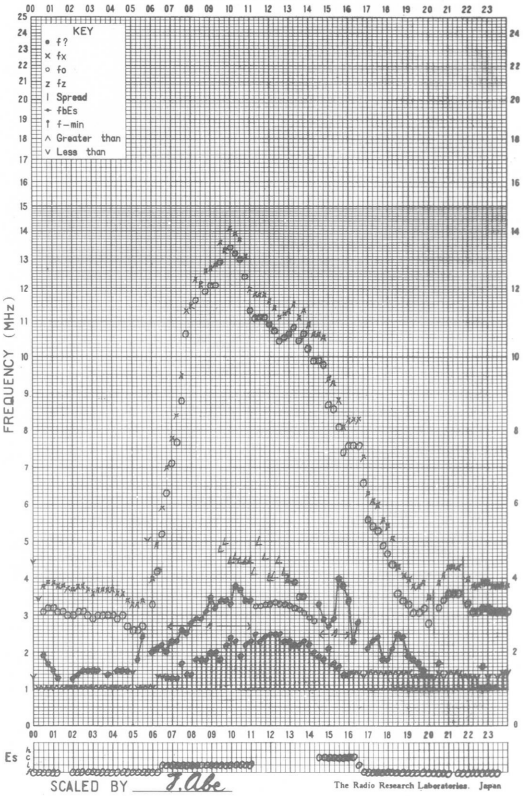

SCALED BY T. Abe

The Radio Research Laboratories. Japan

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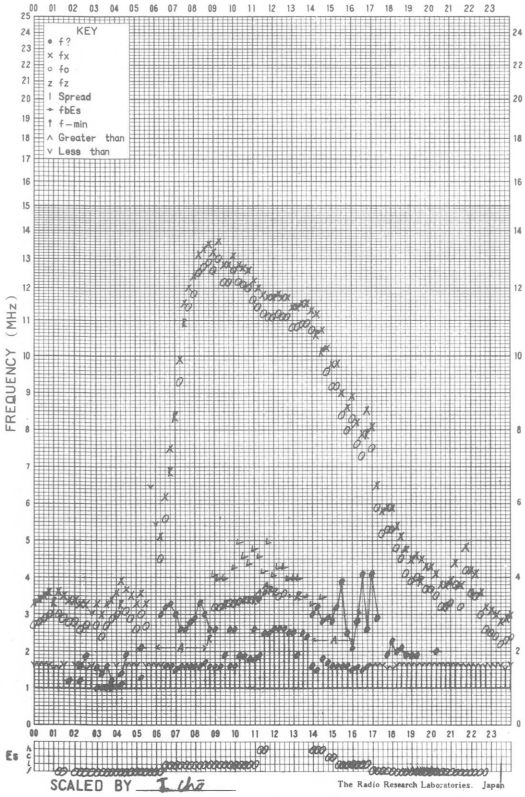

SCALED BY T. Uhō

The Radio Research Laboratories. Japan

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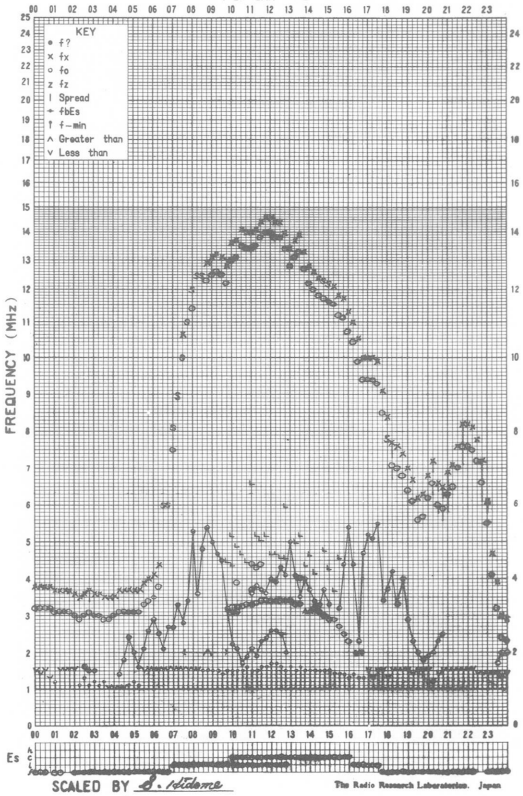

SCALED BY S. Iidaka

The Radio Research Laboratories. Japan

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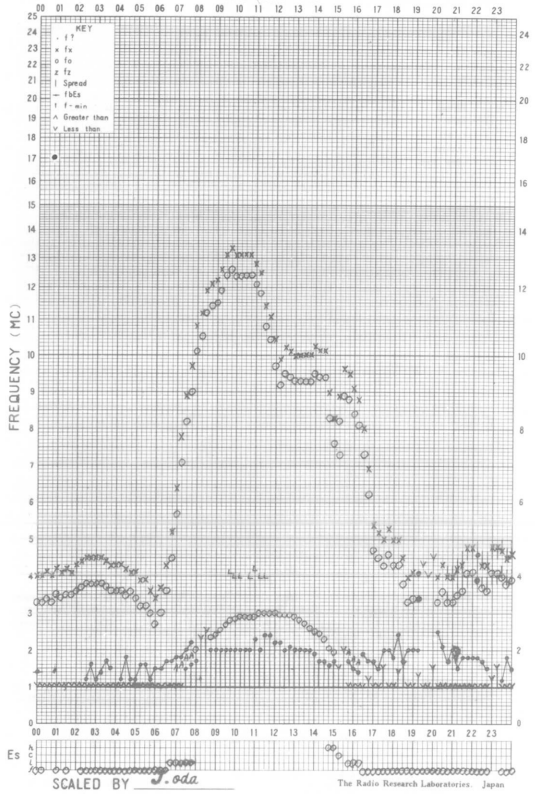

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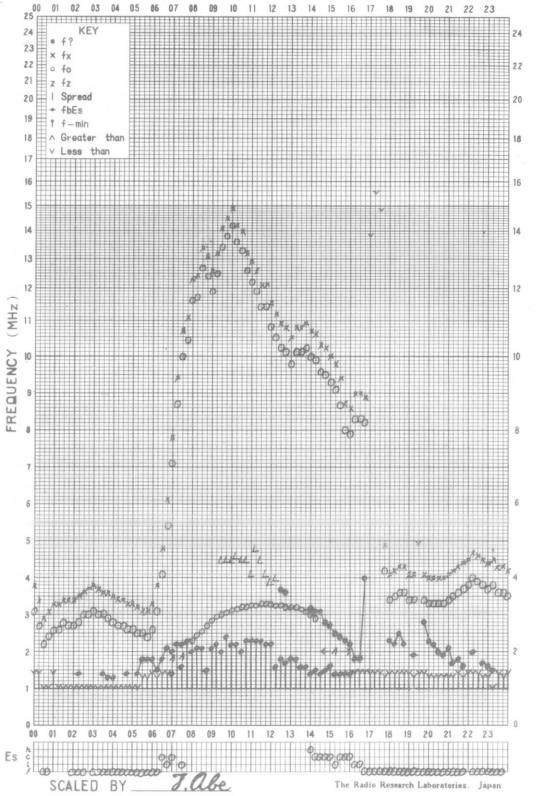

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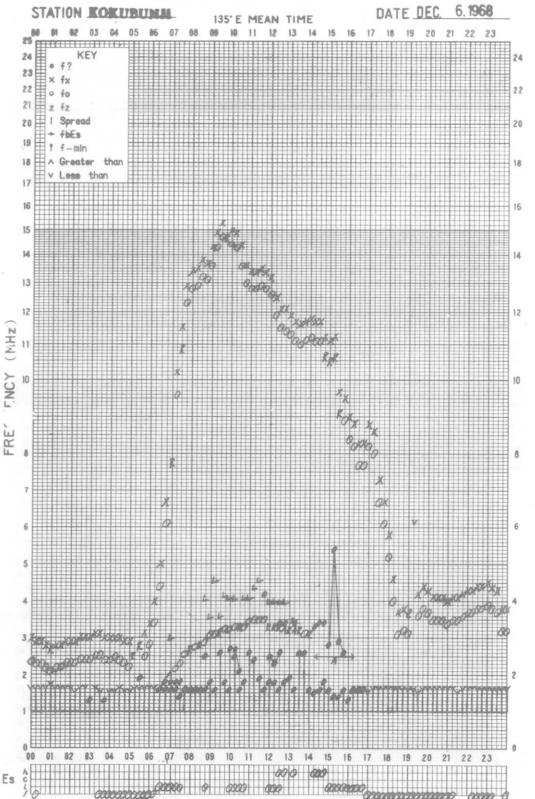

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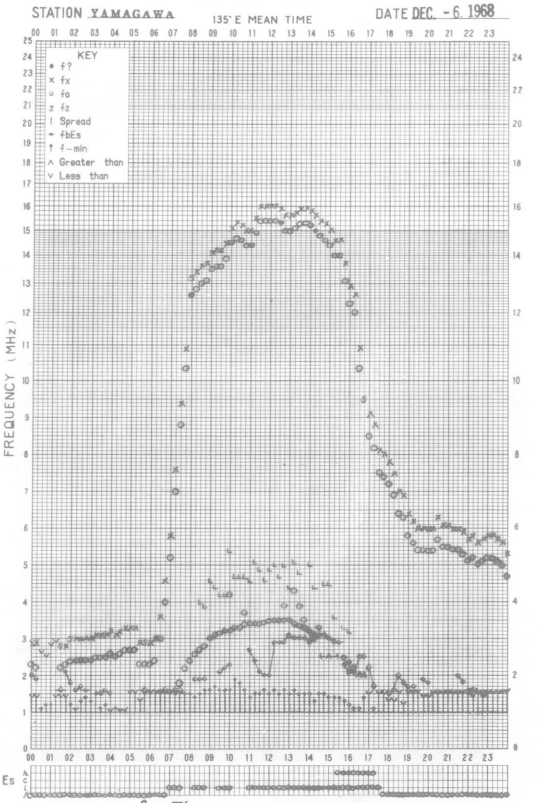

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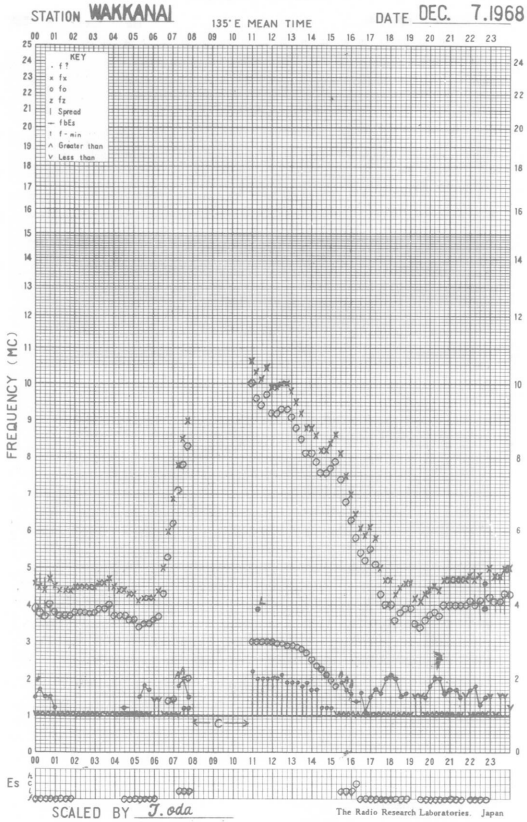

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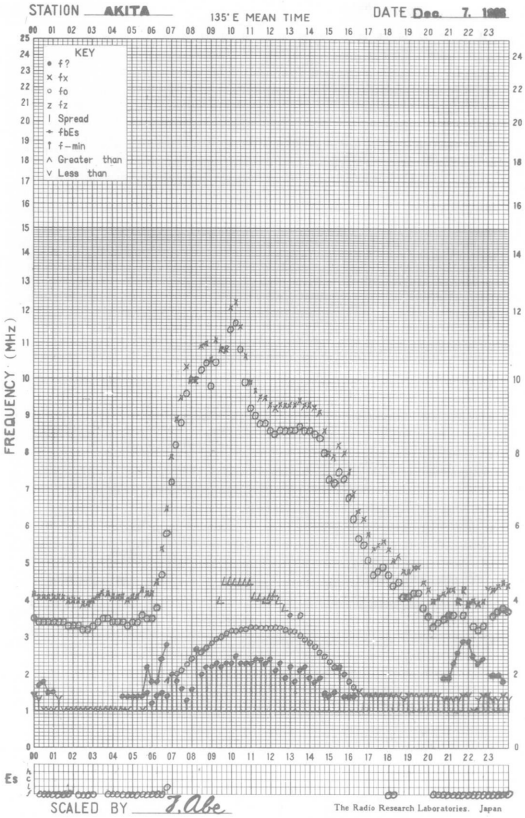

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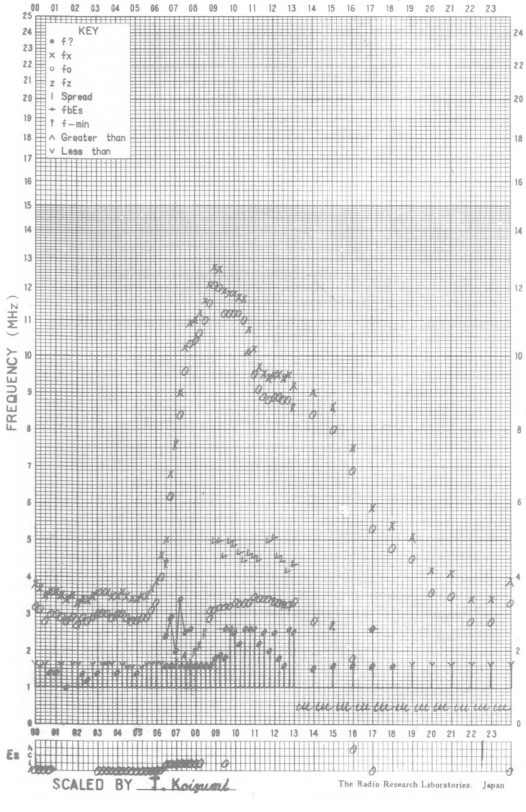

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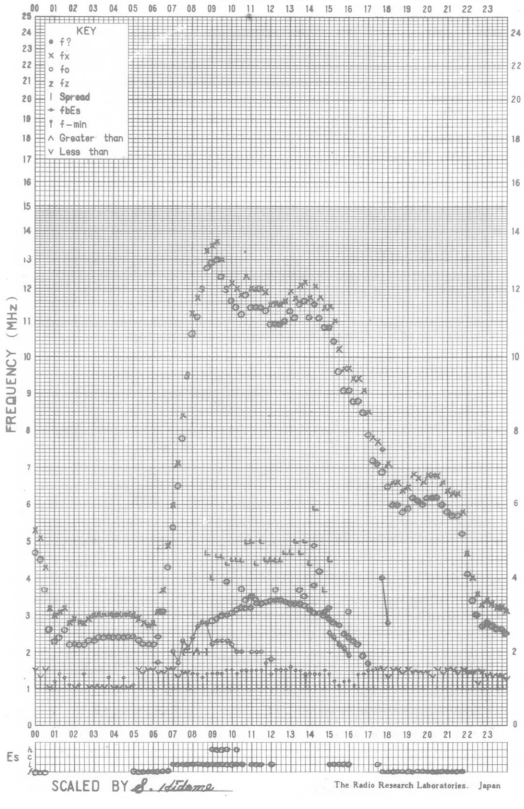

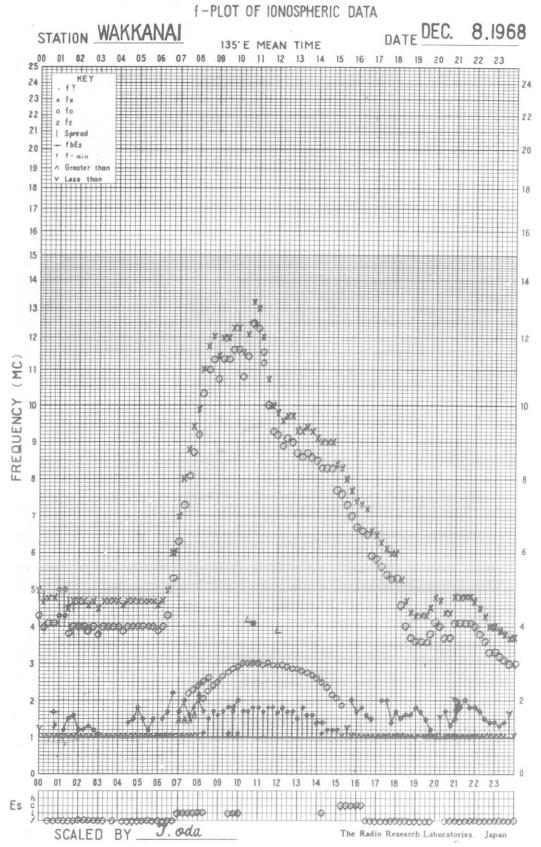
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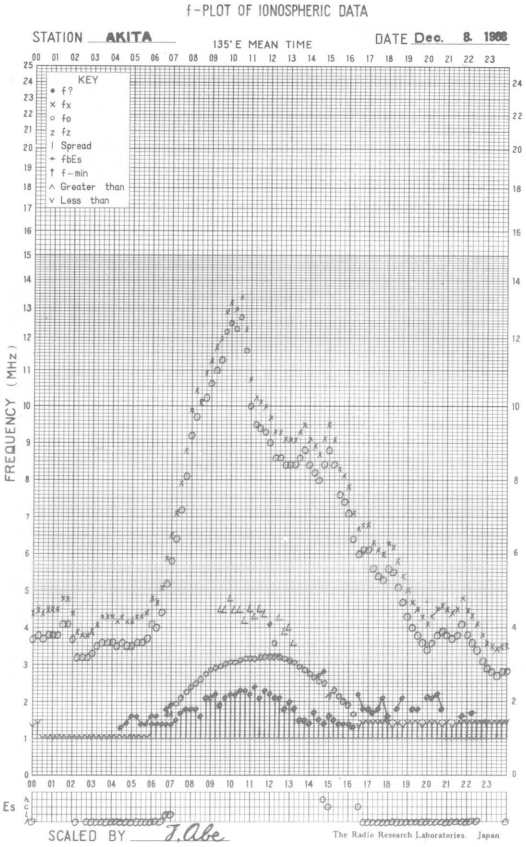
SCALED BY J. Oda
The Radio Research Laboratories. Japan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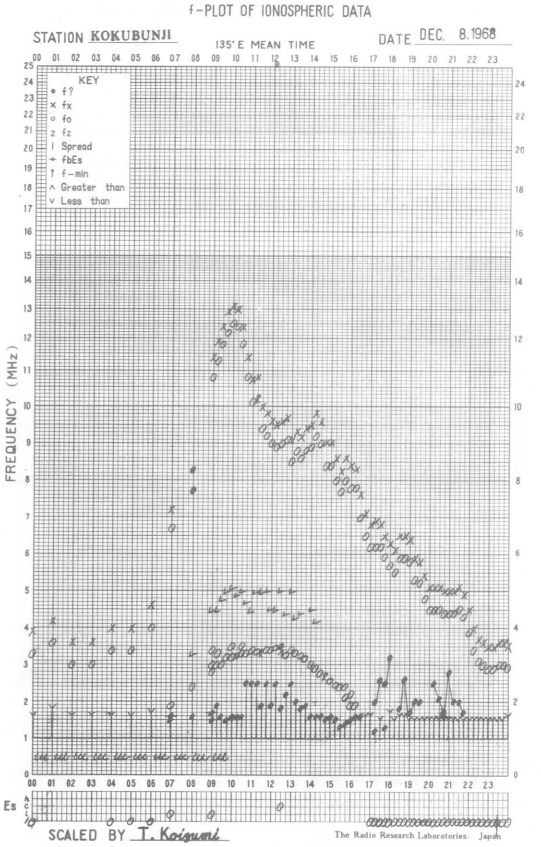
SCALED BY T. Abe
The Radio Research Laboratories. Japan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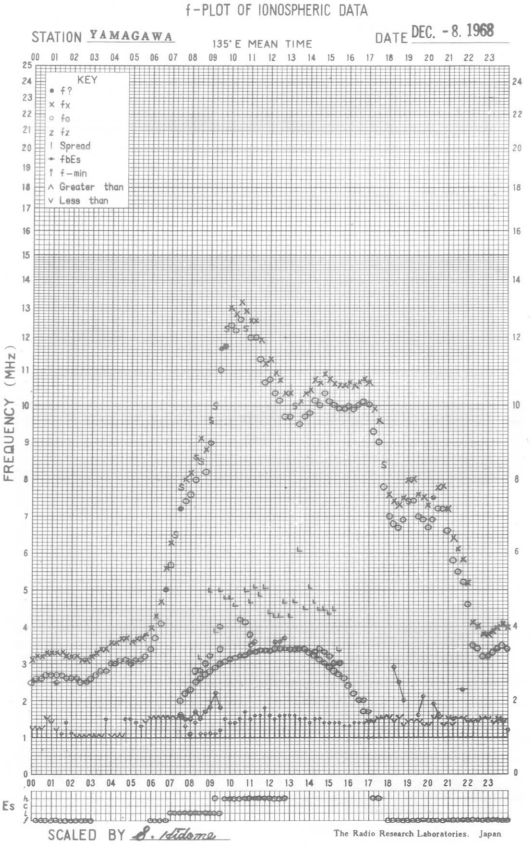
SCALED BY T. Koizumi
The Radio Research Laboratories. Japan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SCALED BY S. Ichidome
The Radio Research Laboratories. Japan

f-PLOT OF IONOSPHERIC DATA

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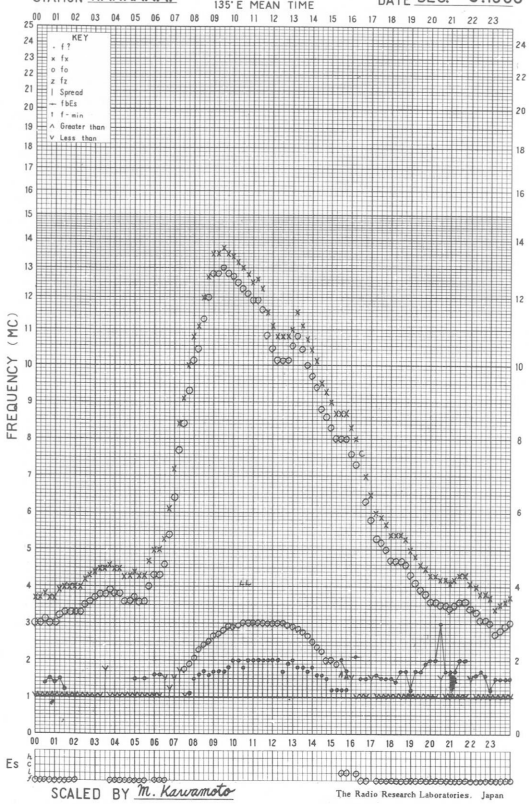

SCALED BY M. Kawamoto

The Radio Research Laboratories. Japan

f-PLOT OF IONOSPHERIC DATA

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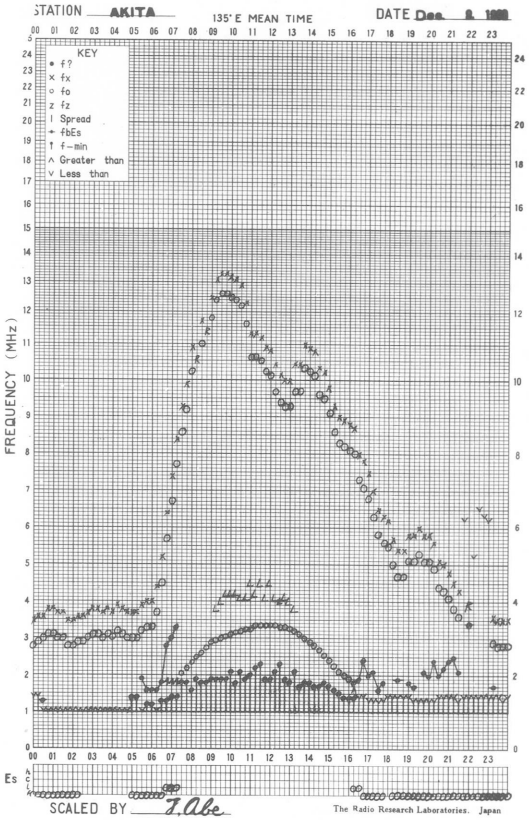

SCALED BY T. Abe

The Radio Research Laboratories. Japan

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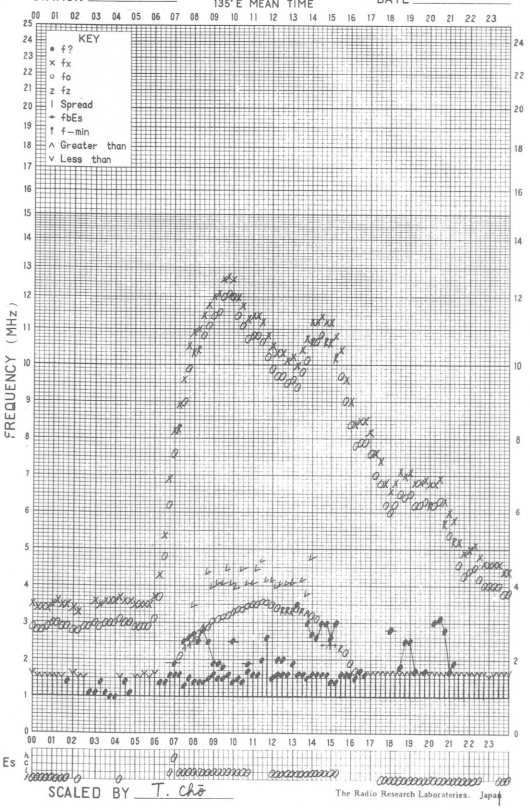

SCALED BY T. Chō

The Radio Research Laboratories. Japan

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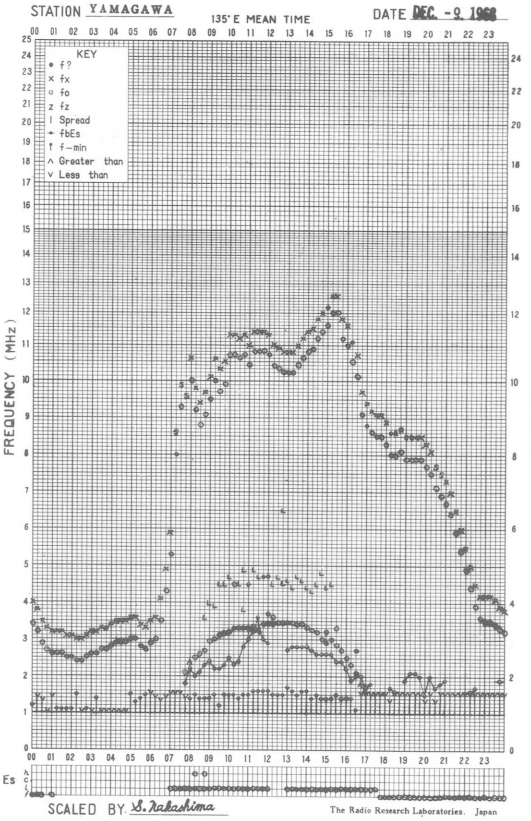

SCALED BY S. Takashima

The Radio Research Laboratories. Japan

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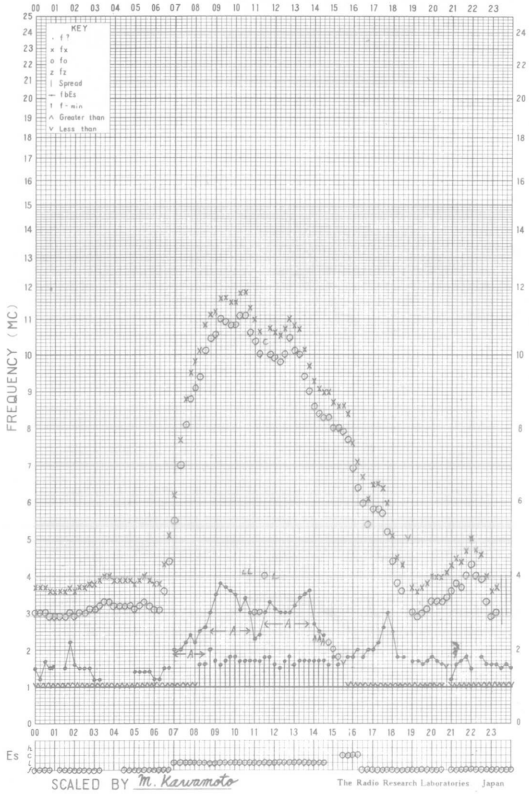

SCALED BY M. Kawamoto

The Radio Research Laboratories Japan

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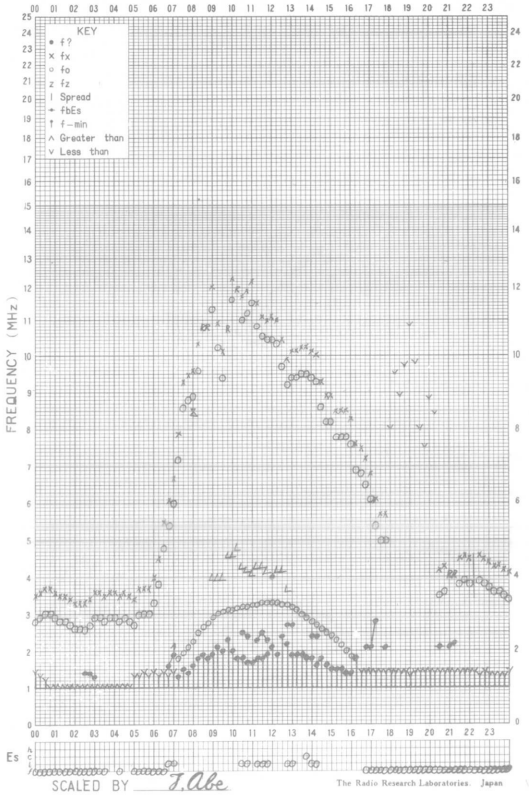

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The Radio Research Laboratories Japan

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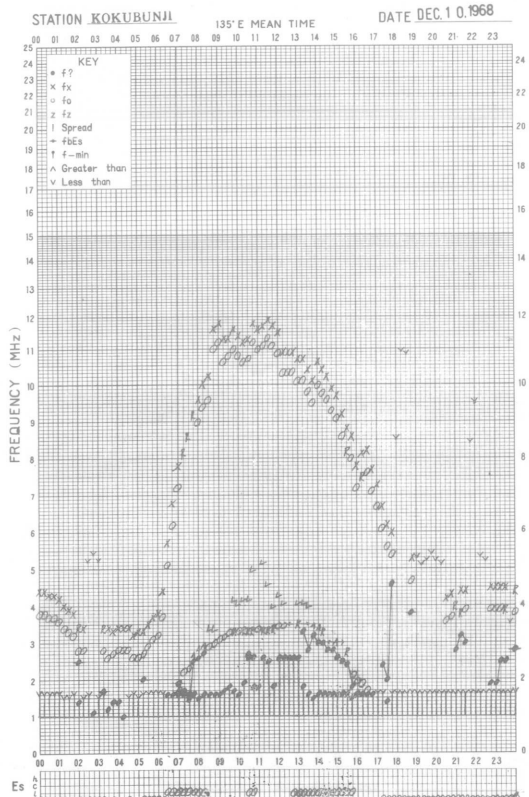

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The Radio Research Laboratories Japan

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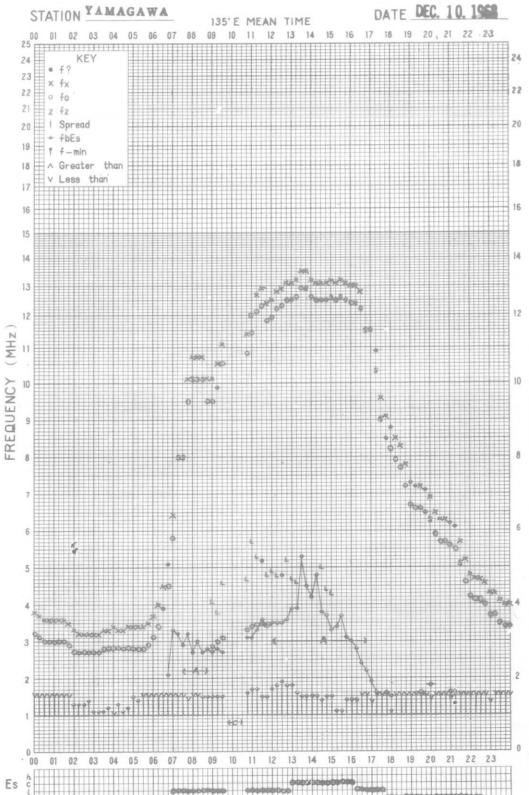

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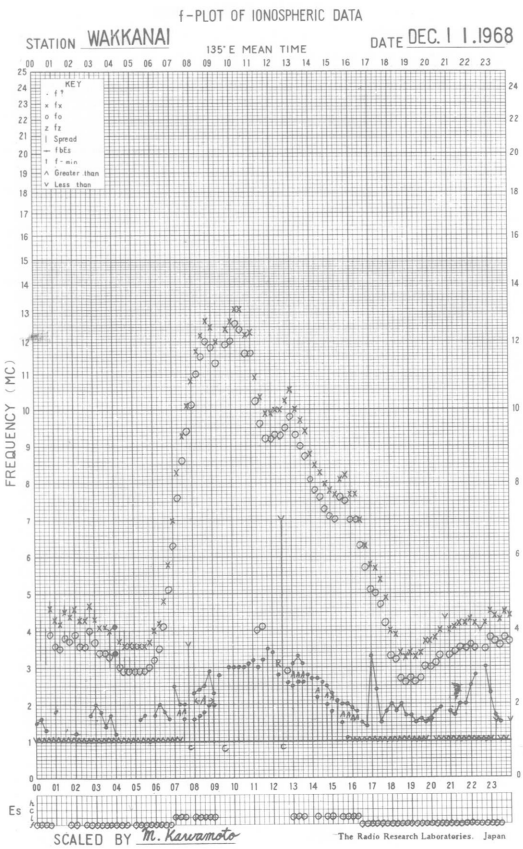
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135°E MEAN TIME
DATE DEC. 11.1968
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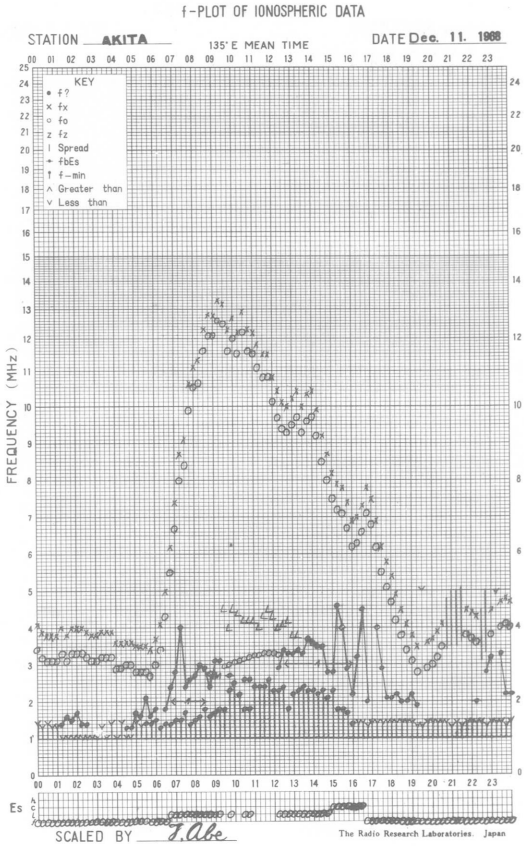
SCALED BY M. Kawamoto
The Radio Research Laboratories. Japan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DATE Dec. 11. 1968
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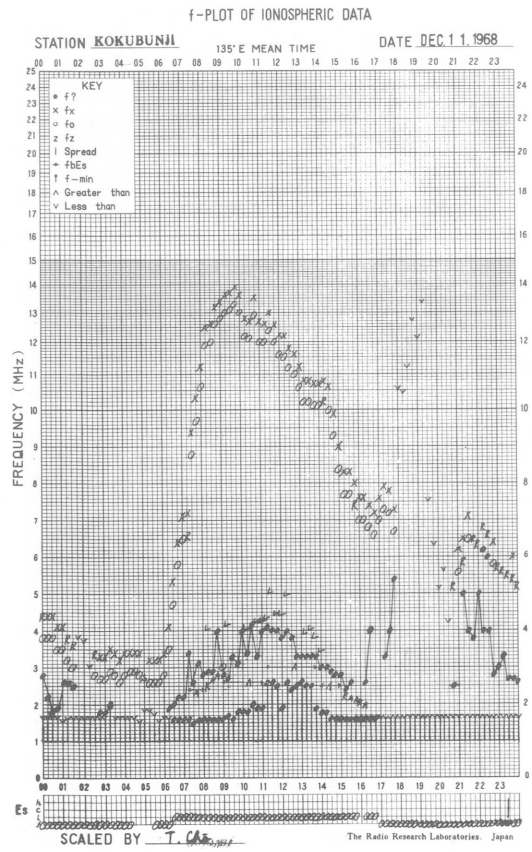
SCALED BY T. Abe
The Radio Research Laboratories. Japan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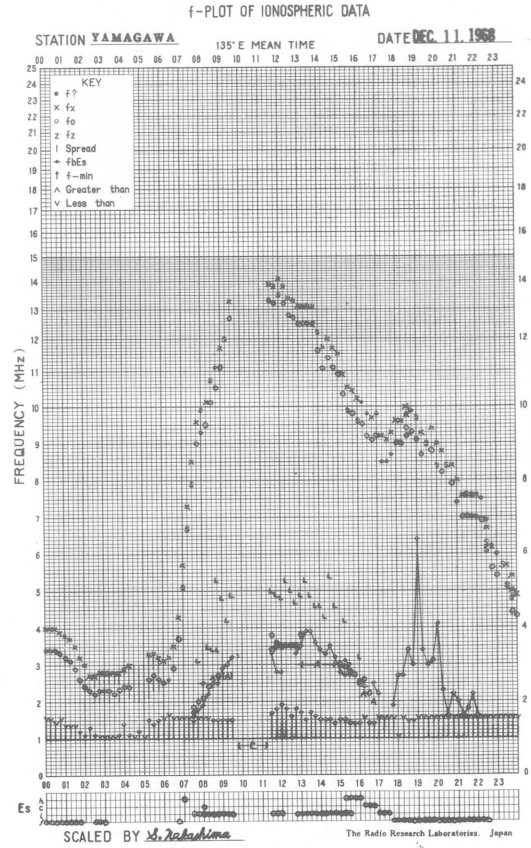
SCALED BY T. Ch...
The Radio Research Laboratories. Japan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SCALED BY S. Takashima
The Radio Research Laboratories. Japan

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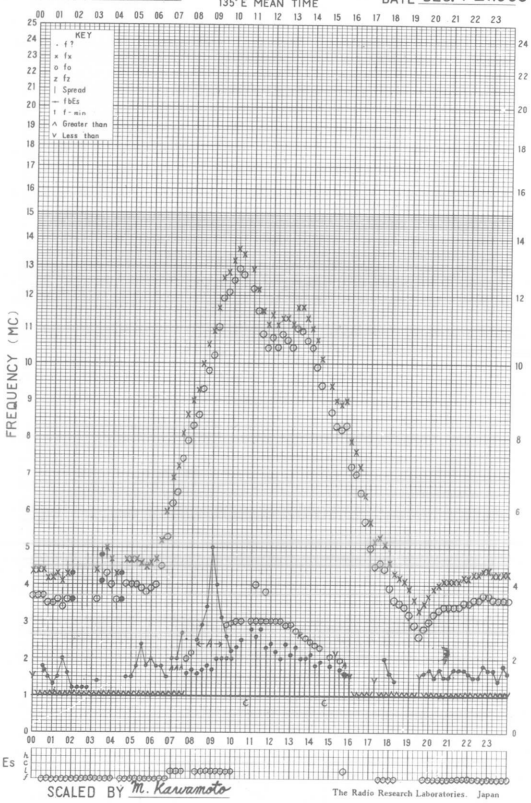

SCALED BY M. Kawamoto

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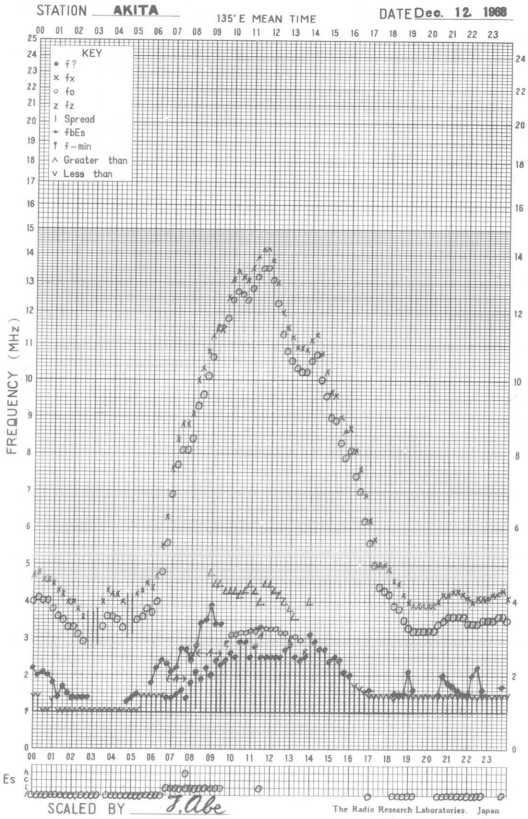

SCALED BY J. Abe

The Radio Research Laboratories. Japan

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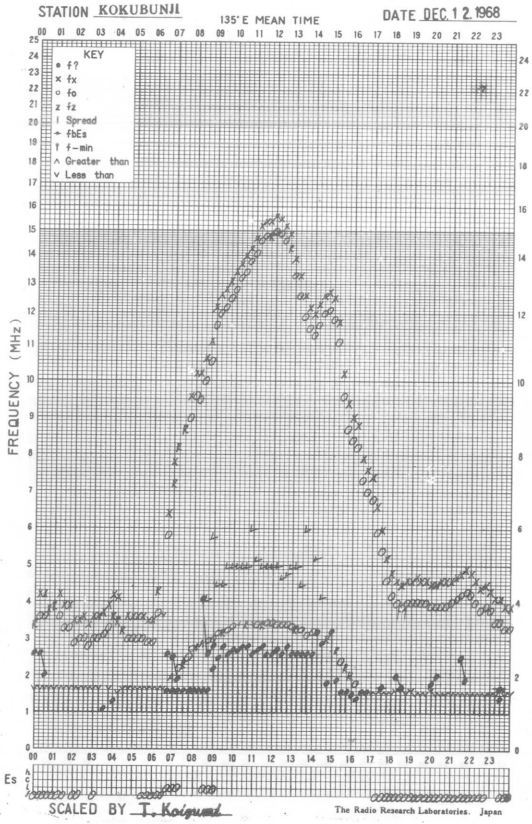

SCALED BY T. Koizumi

The Radio Research Laboratories. Japan

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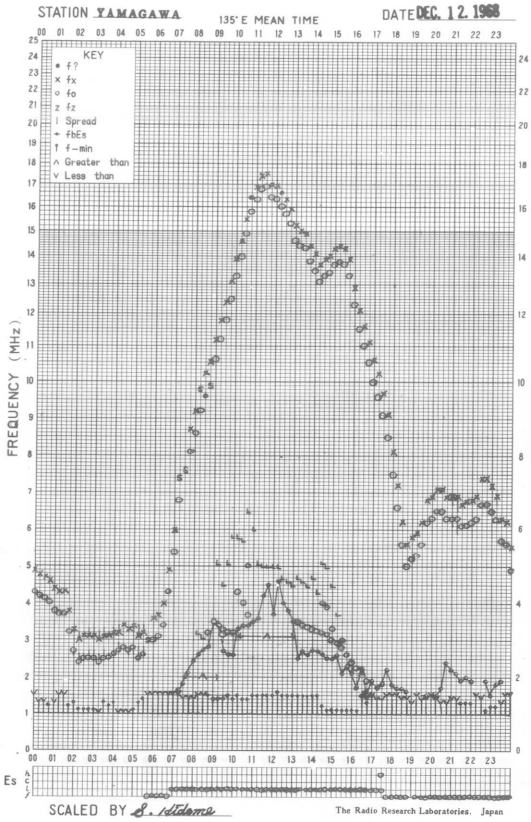

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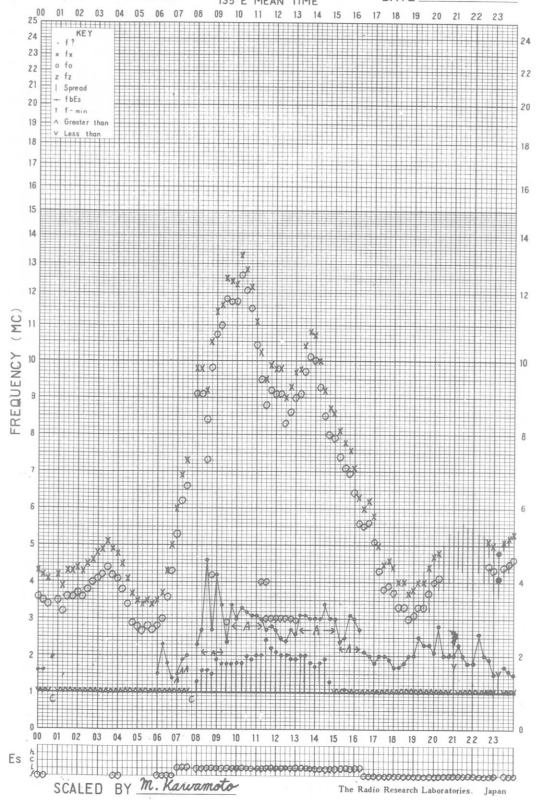

SCALED BY M. Kawamoto The Radio Research Laboratories. Japan

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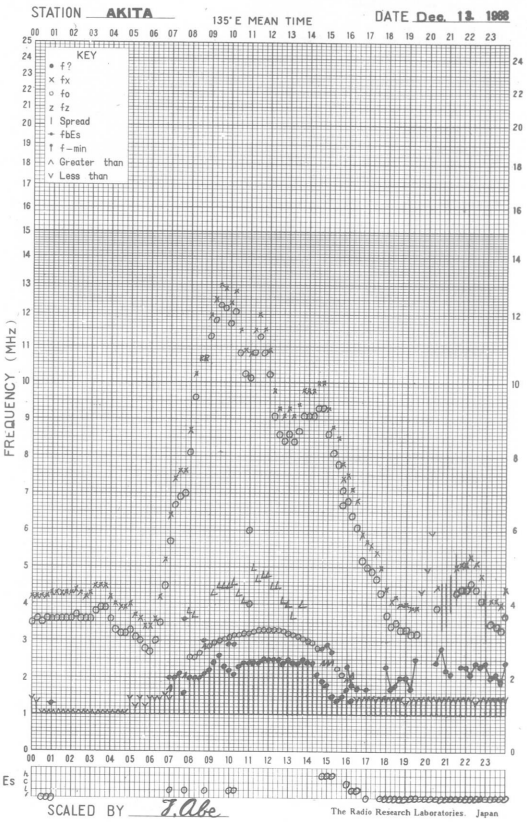

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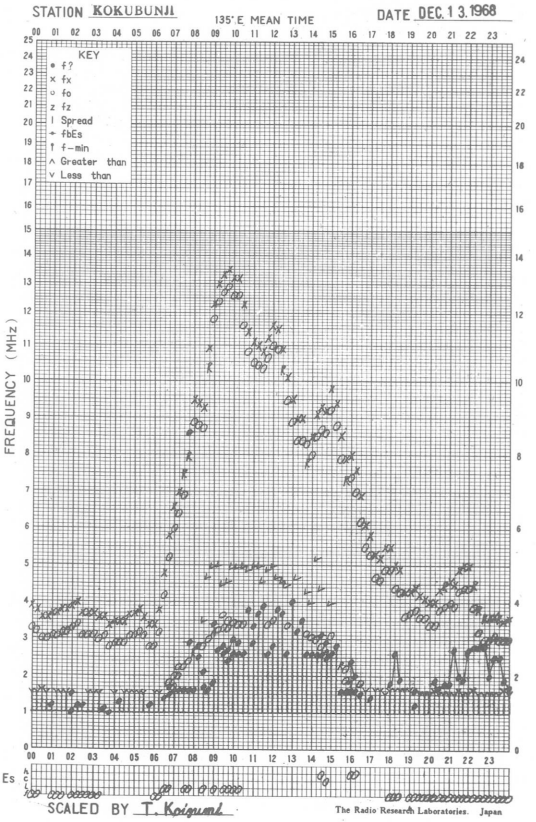

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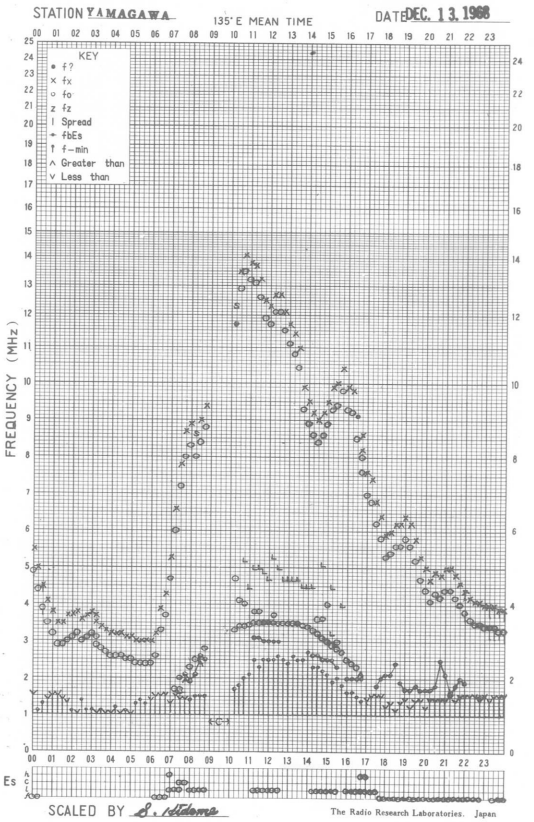

SCALED BY S. Kitamo The Radio Research Laboratories. Japan

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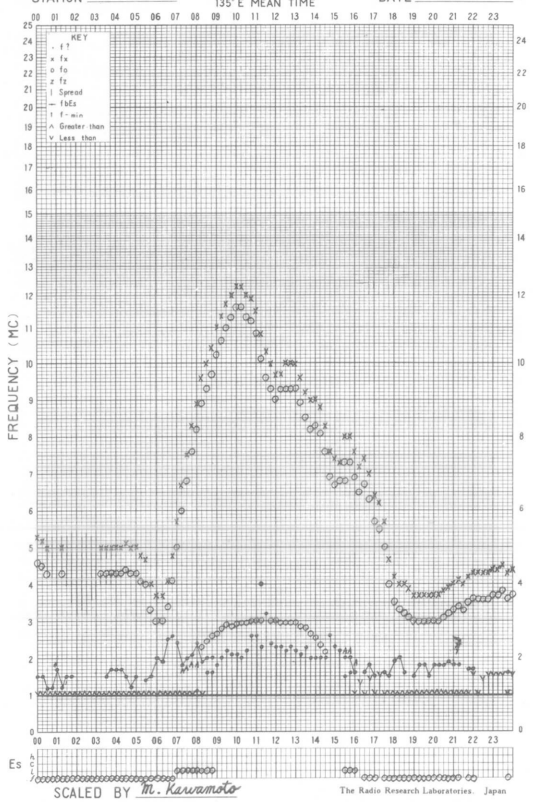

SCALED BY M. Kawamoto

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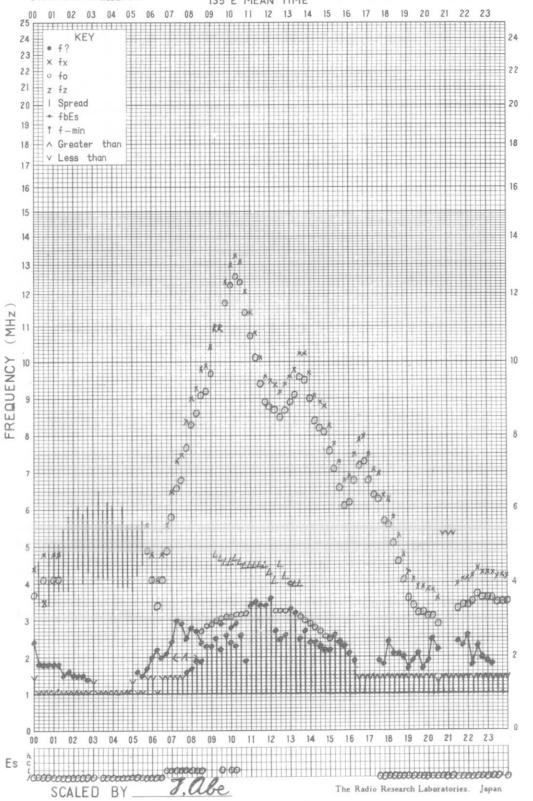

SCALED BY T. Abe

The Radio Research Laboratories. Japan

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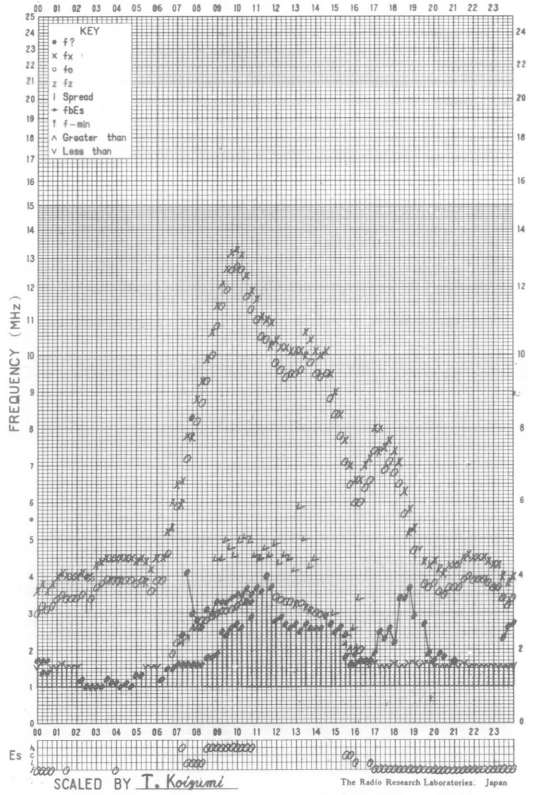

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The Radio Research Laboratories. Japan

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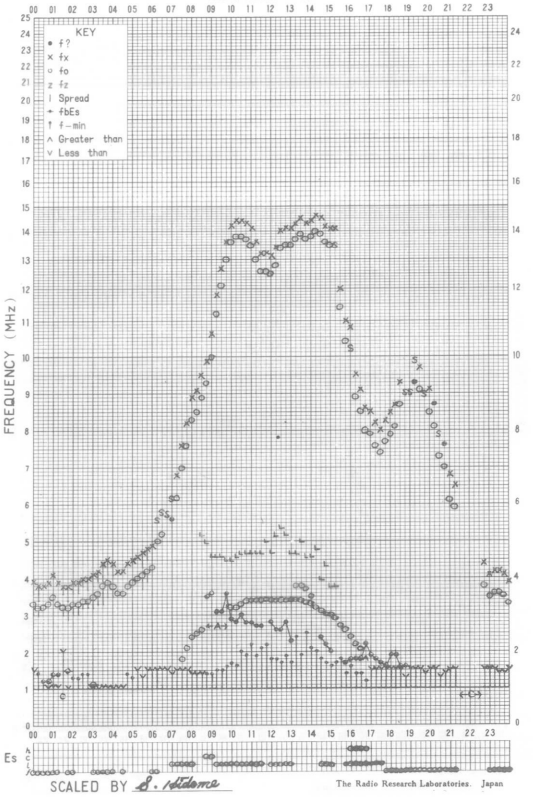

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The Radio Research Laboratories. Japan

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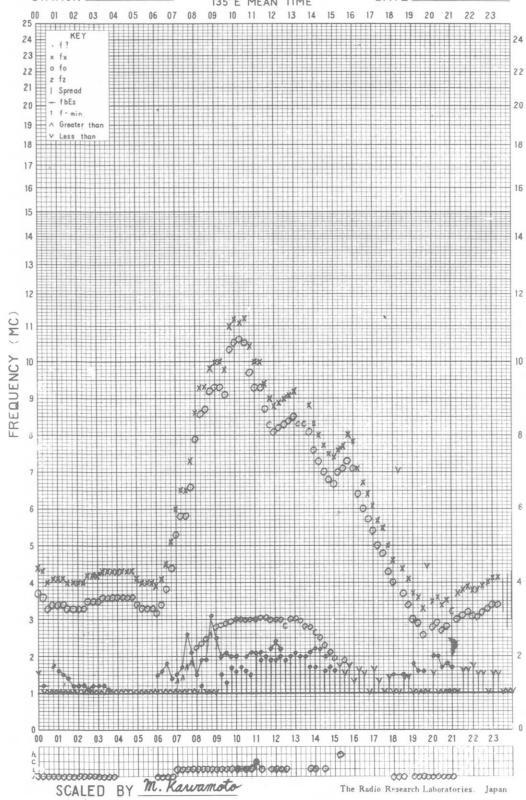

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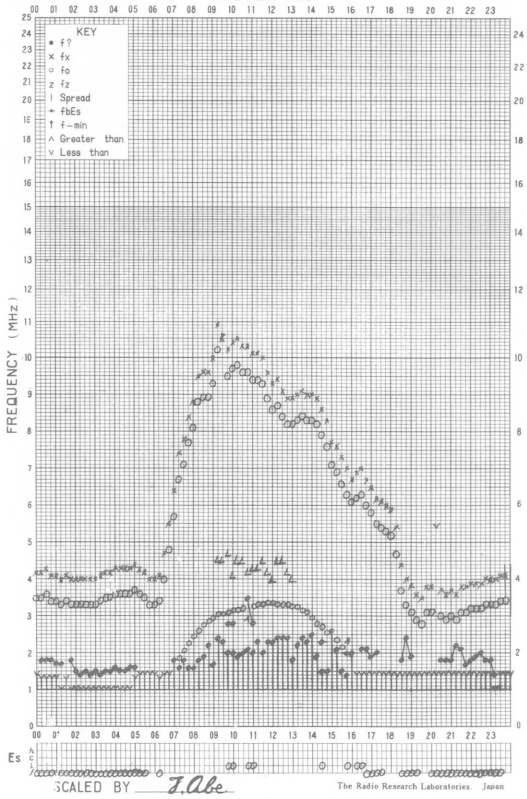

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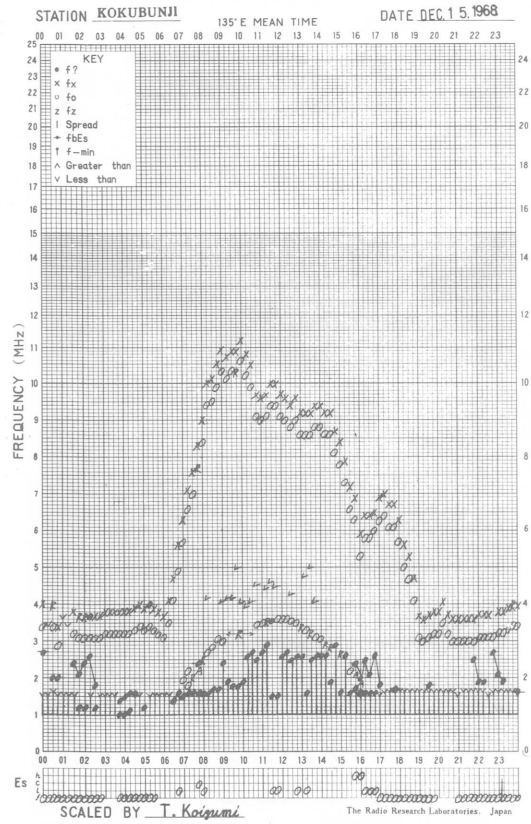

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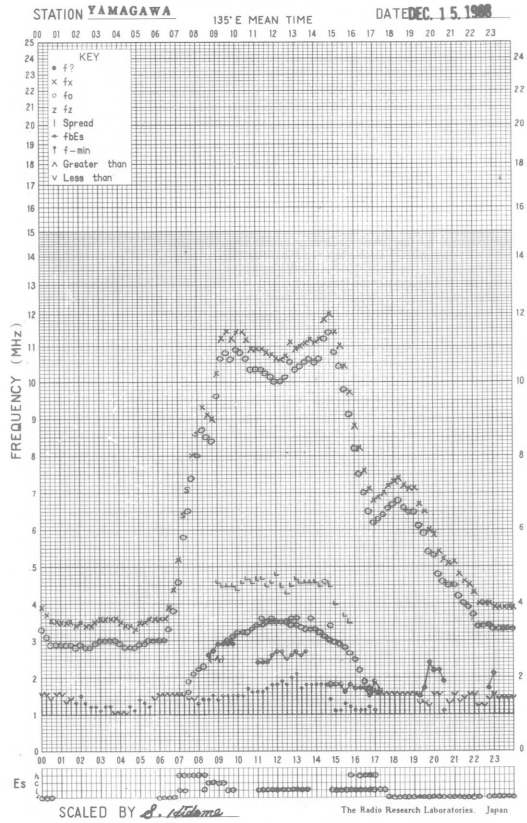

SCALED BY S. Ishidama The Radio Research Laboratories. Japan

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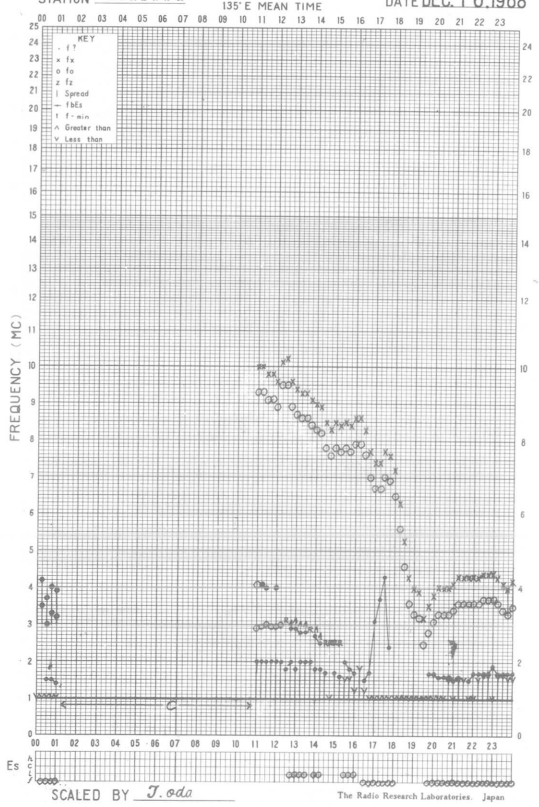

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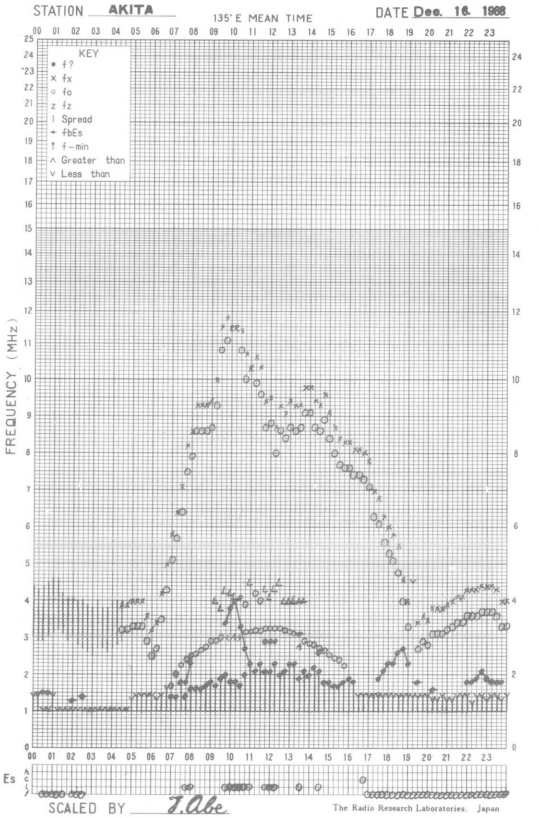

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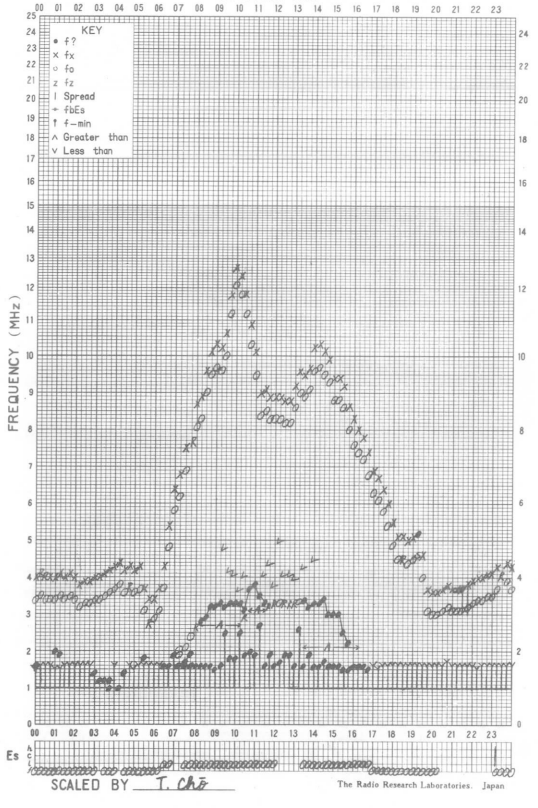

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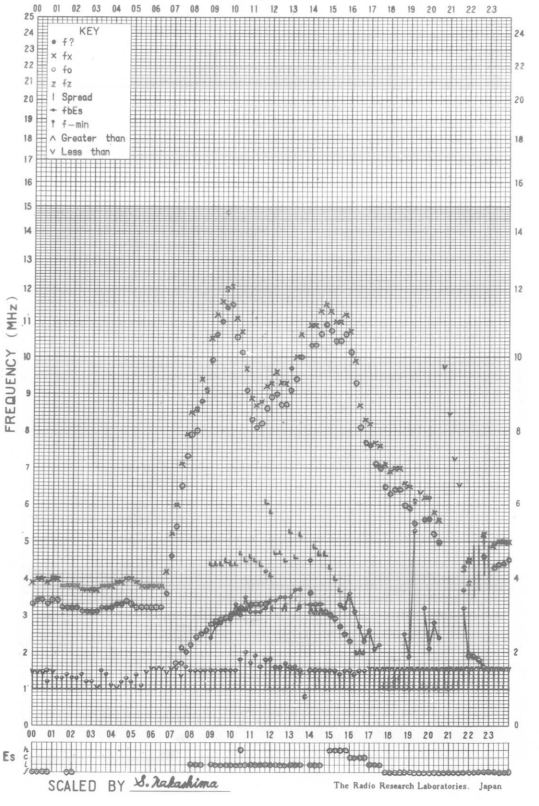

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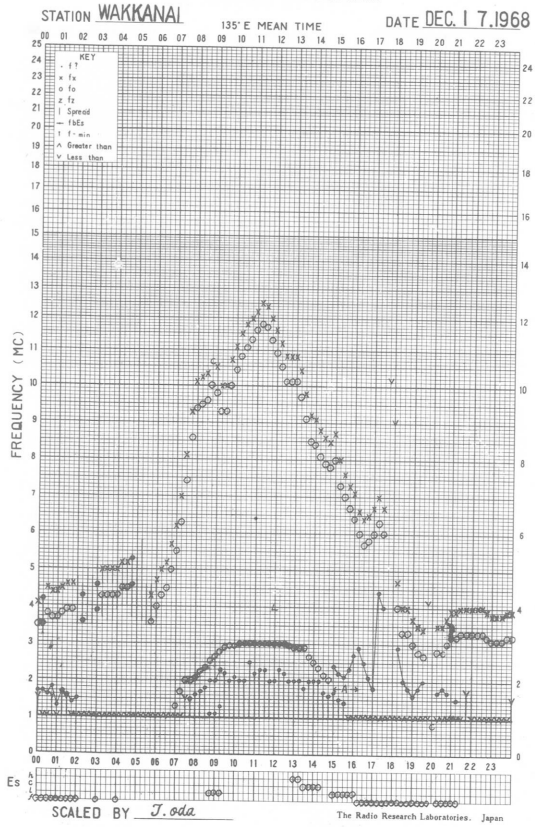

SCALED BY T. oda

The Radio Research Laboratories. Japan

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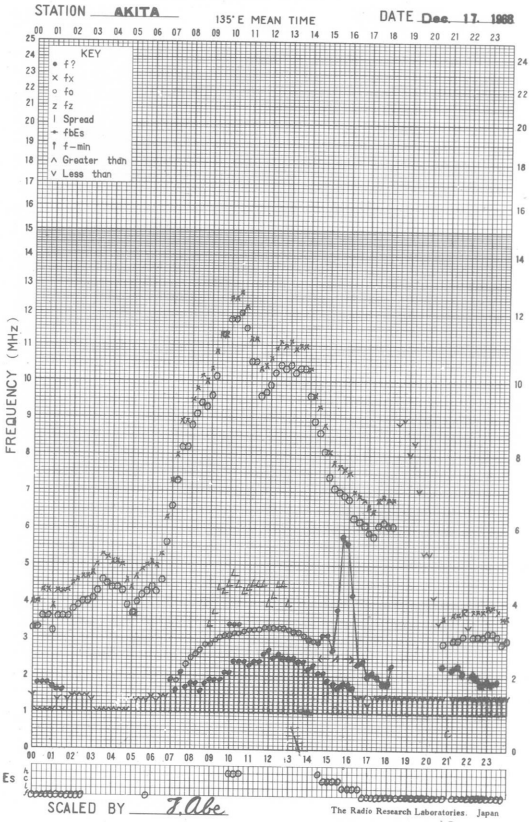

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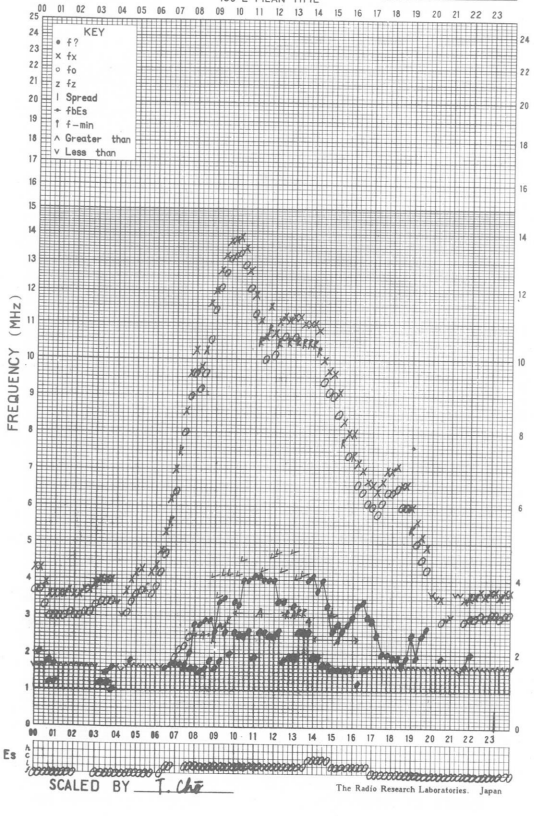

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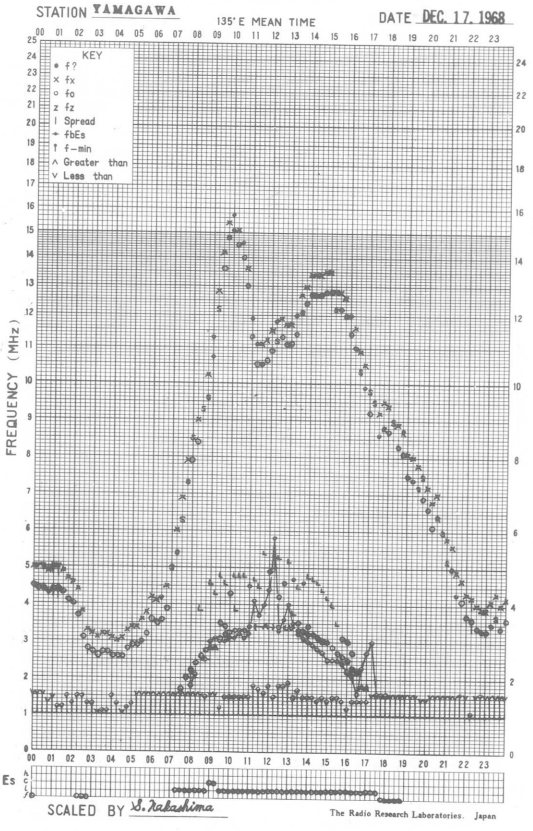

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The Radio Research Laboratories. Japan

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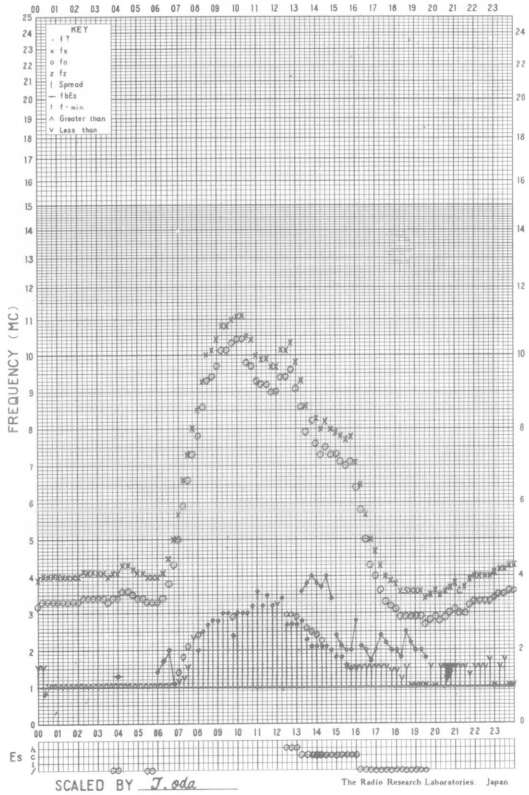

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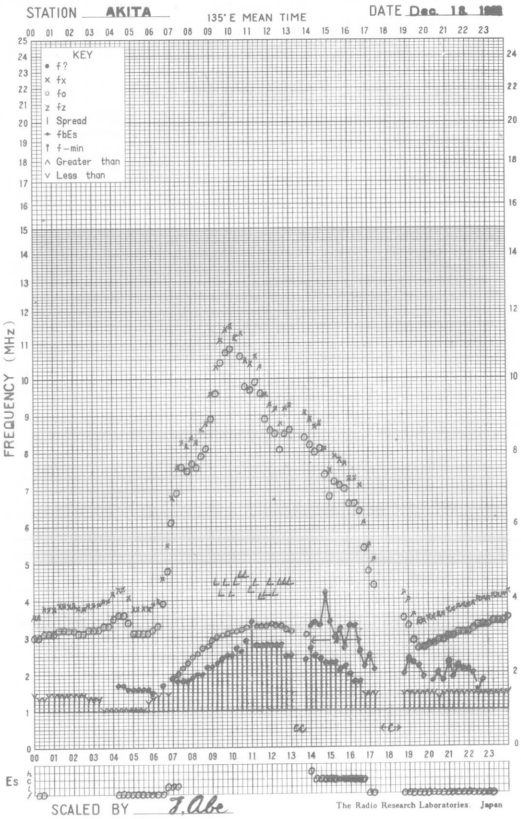

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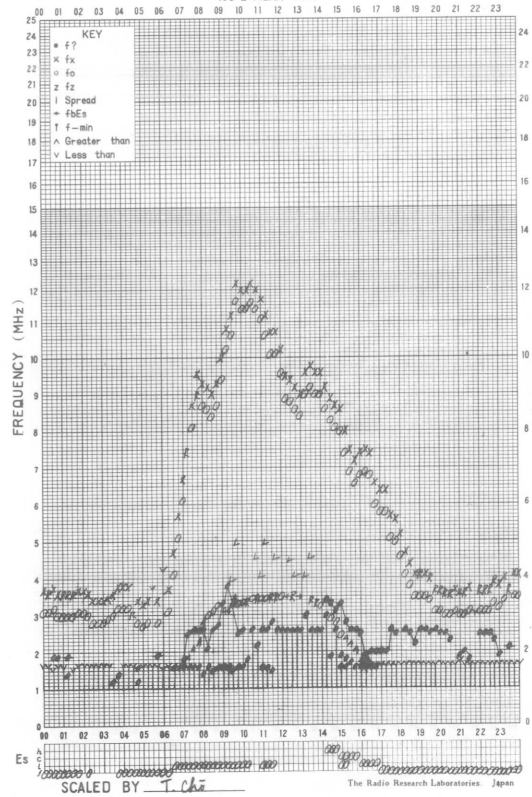

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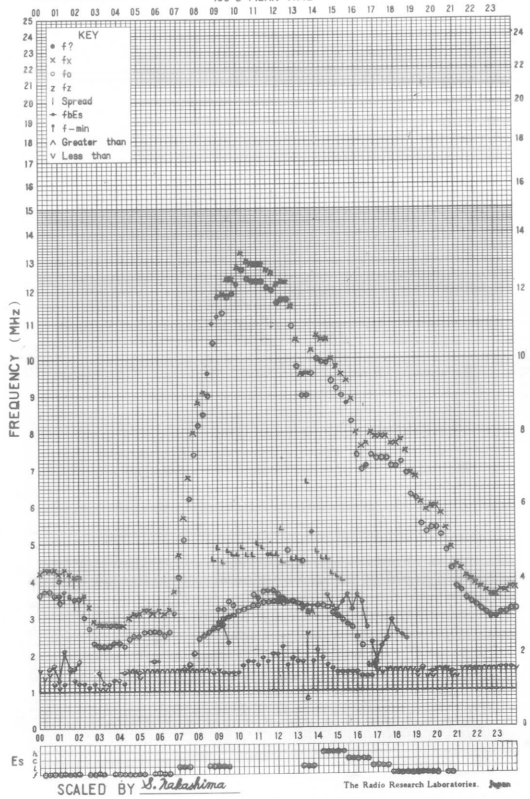

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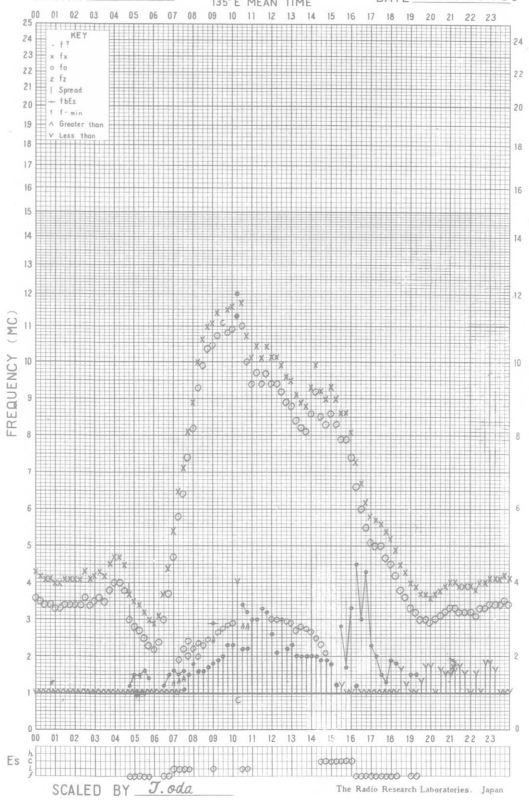

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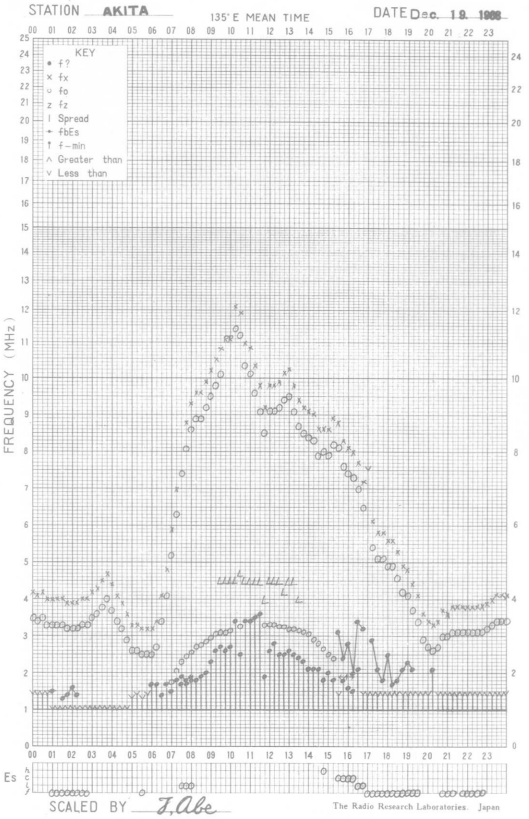

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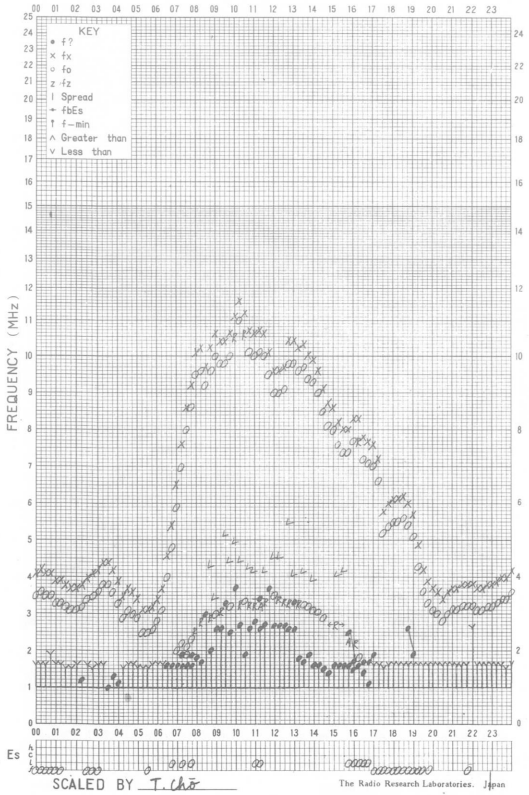

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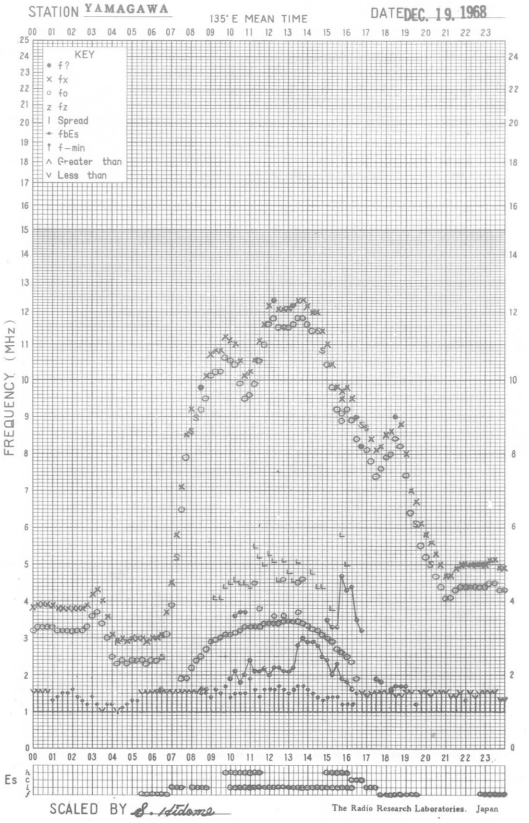

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The Radio Research Laboratories. Japan

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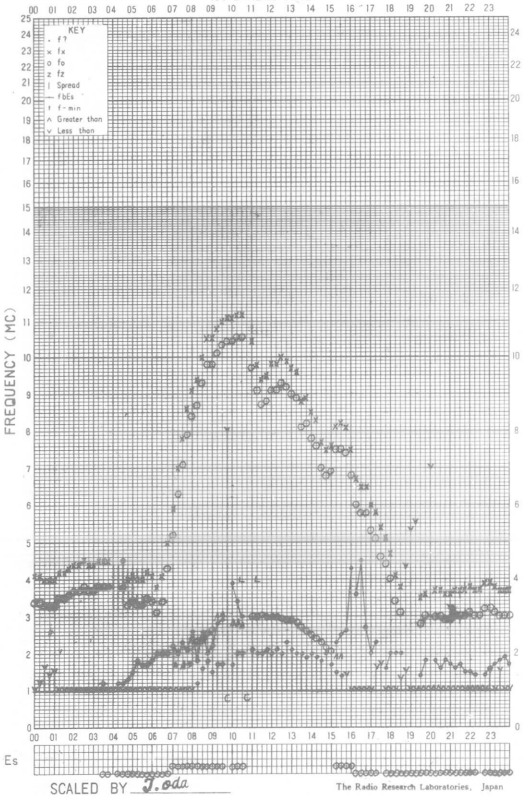

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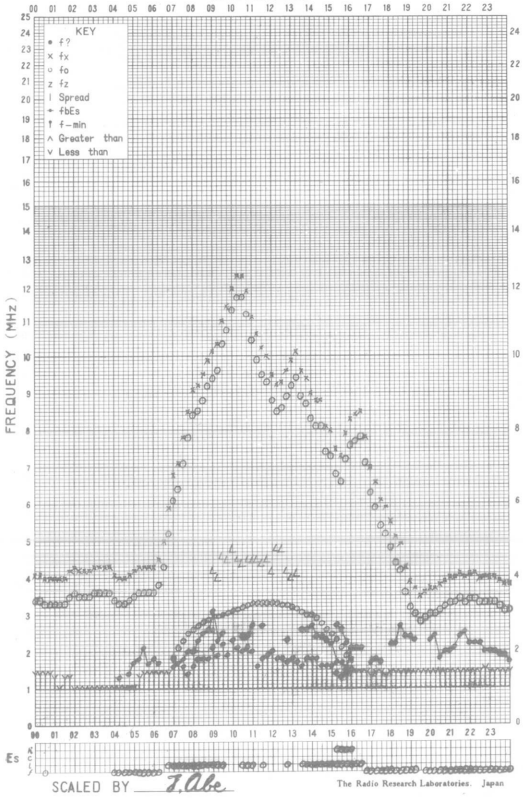

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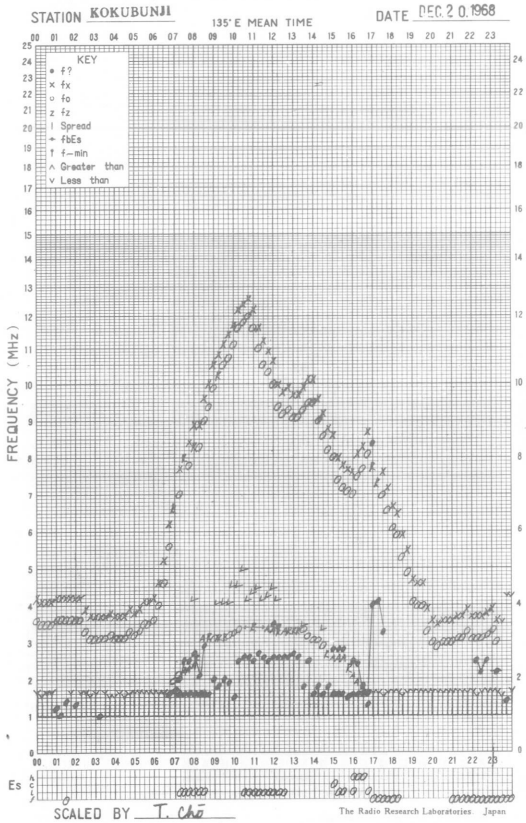

SCALED BY T. Chō

The Radio Research Laboratories, Japan

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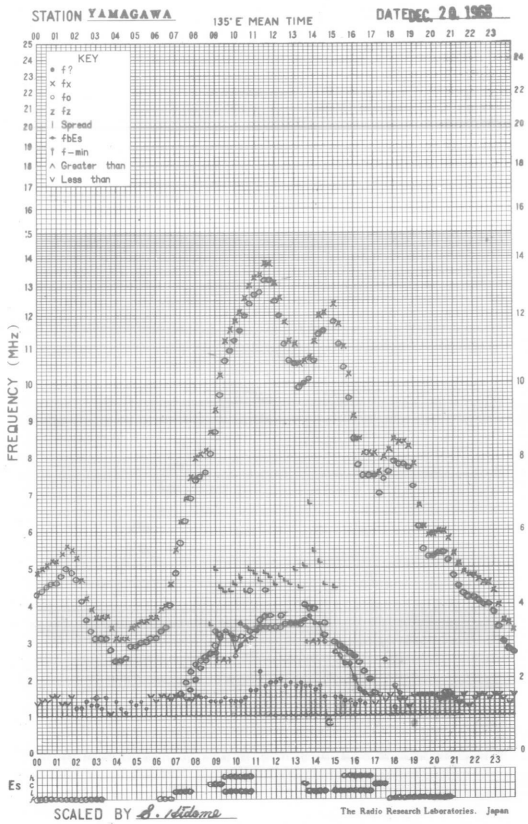
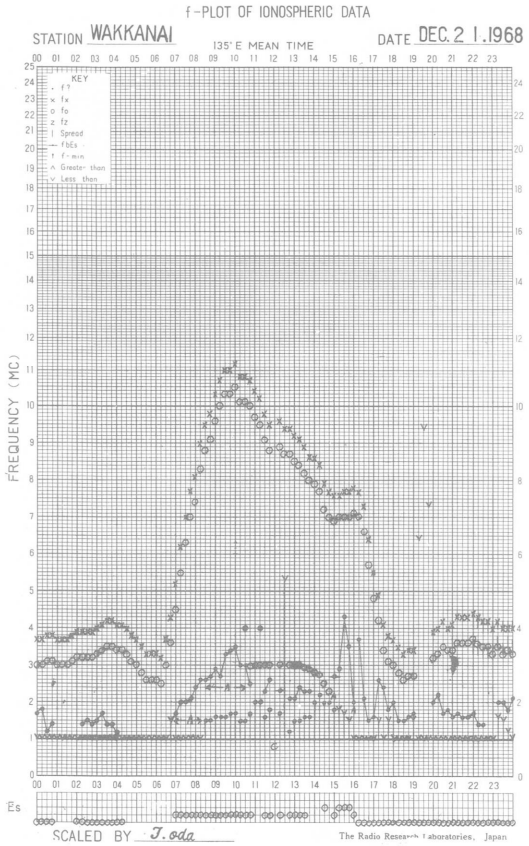
STATION YAMAGAWA 135°E MEAN TIME DATE DEC. 20. 1968



SCALED BY S. Hidema

The Radio Research Laboratories, Japan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STATION WAKKANAI
135° E MEAN TIME
DATE DEC. 2 1. 1968
KEY
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FREQUENCY (MC)
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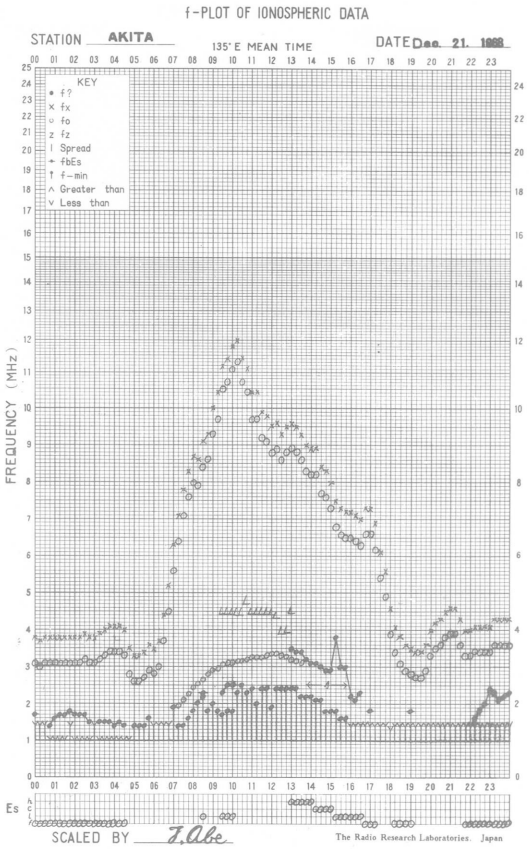
SCALED BY T. oda
The Radio Research Laboratories, Japan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FREQUENCY (MHz)
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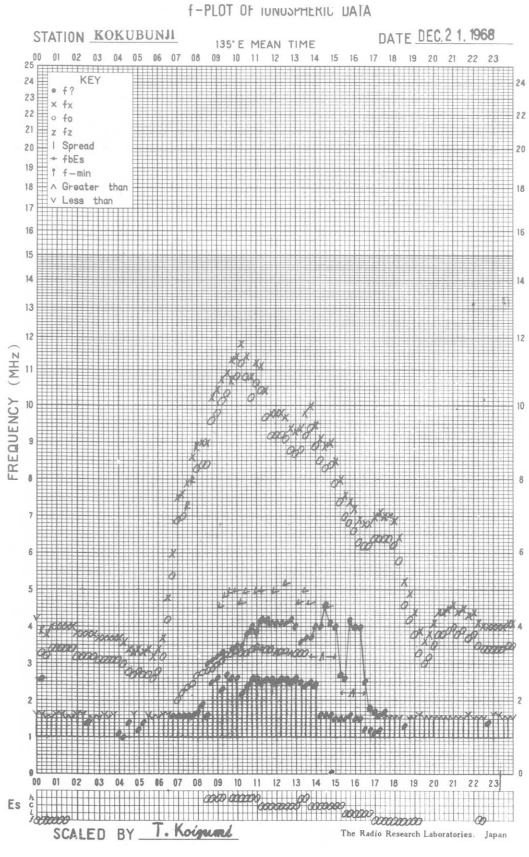
SCALED BY T. Abe
The Radio Research Laboratories. Japan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DATE DEC. 2 1. 1968
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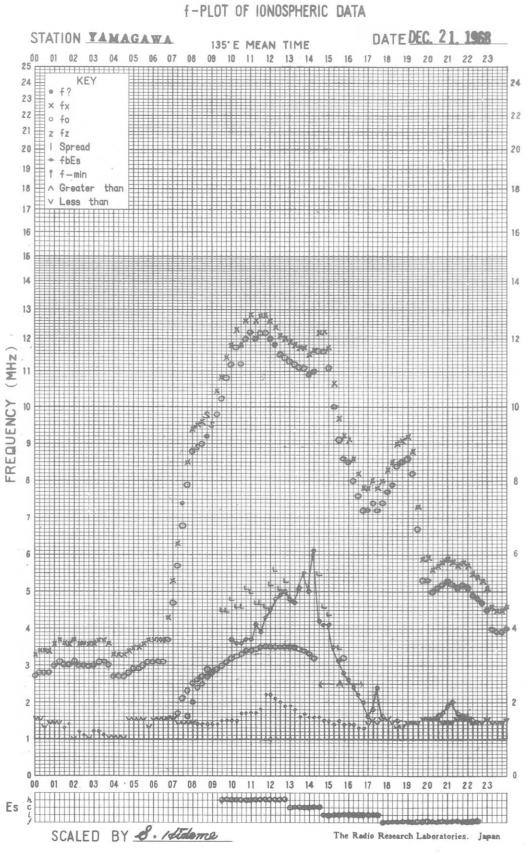
SCALED BY T. Koizumi
The Radio Research Laboratories. Japan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135° E MEAN TIME
DATE DEC. 21. 1968
KEY
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| Spread
fbEs
↑ f-min
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v Less than
FREQUENCY (MHz)
Es
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The Radio Research Laboratories. Japan

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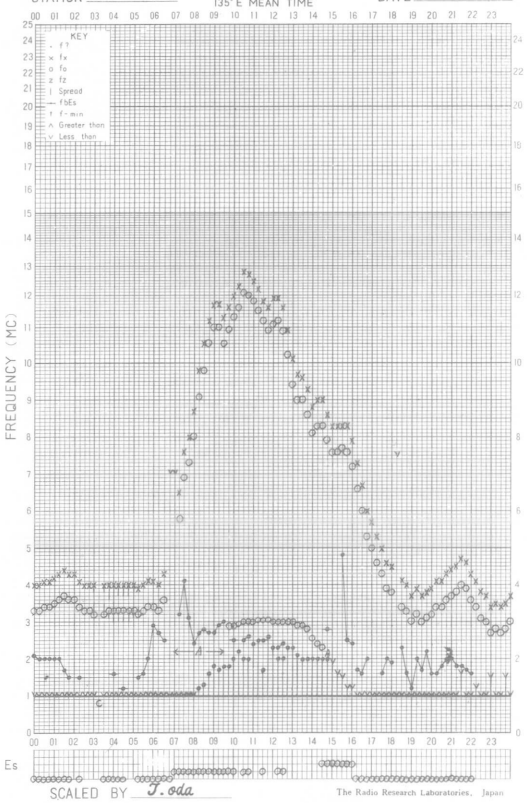

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The Radio Research Laboratories, Japan

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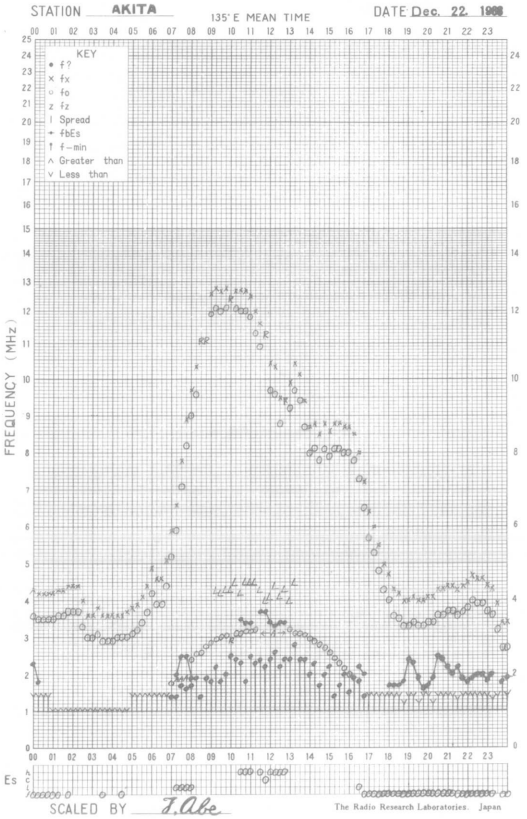

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The Radio Research Laboratories, Japan

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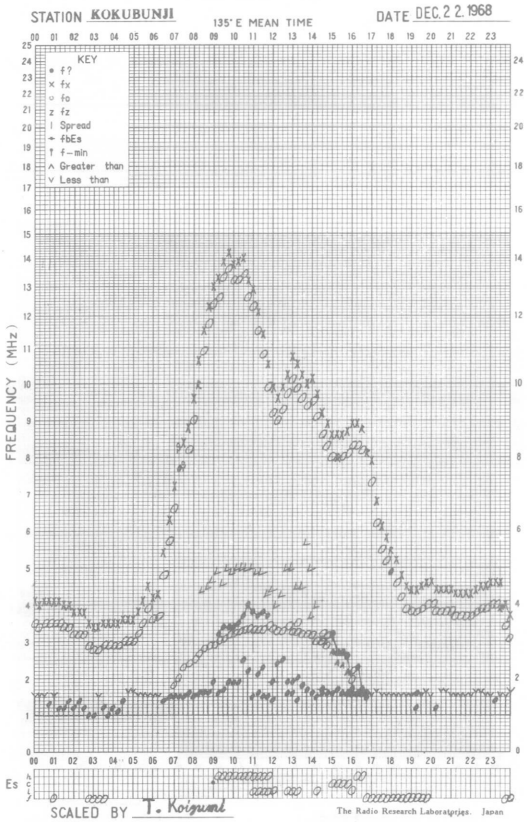

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The Radio Research Laboratories, Japan

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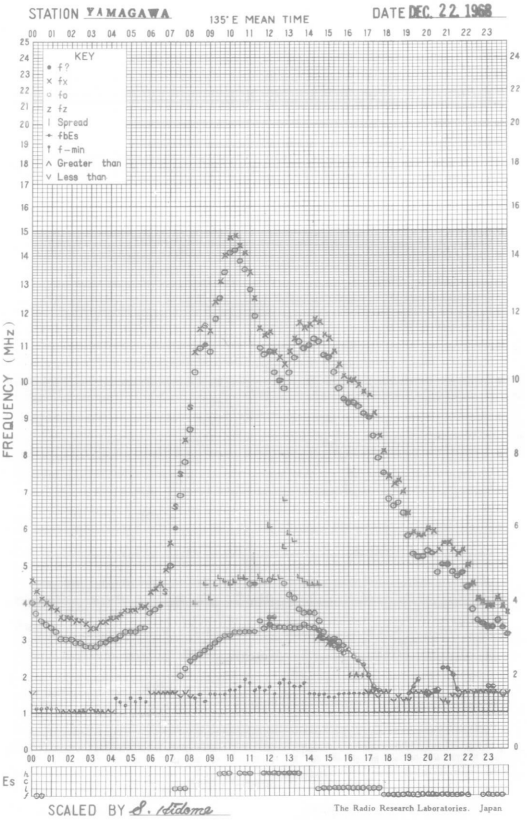

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The Radio Research Laboratories, Japan

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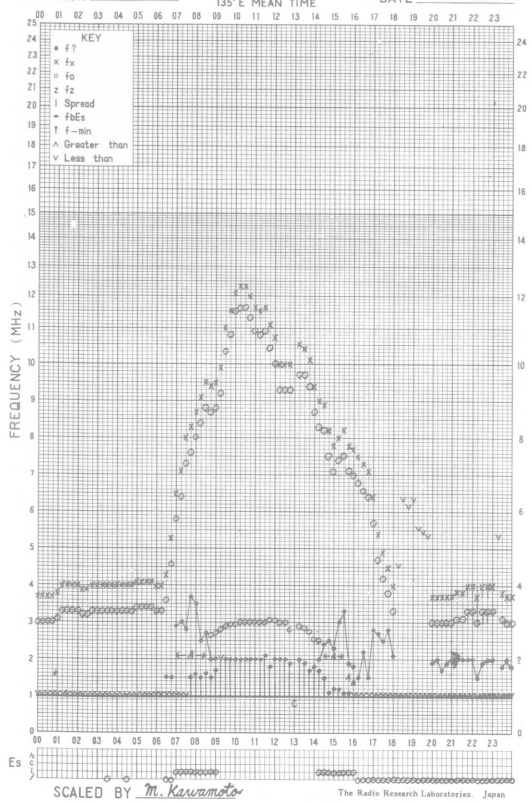

SCALED BY M. Kawamoto The Radio Research Laboratories. Japan

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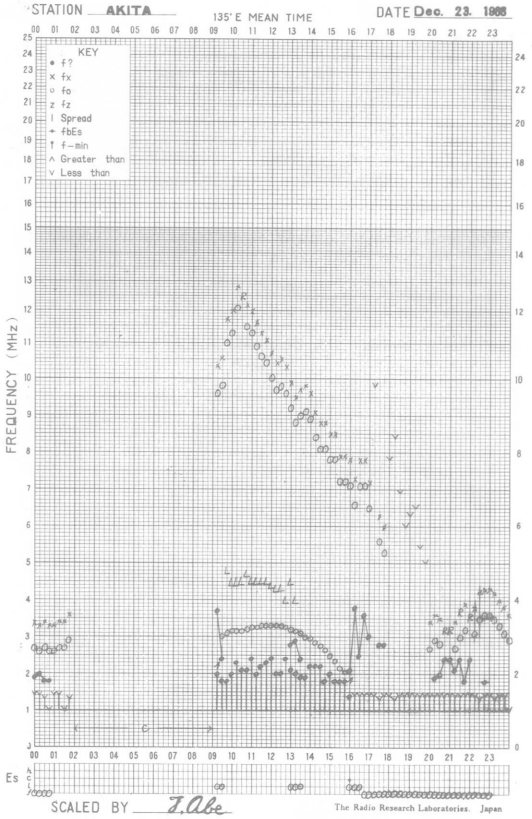

SCALED BY T. Abe The Radio Research Laboratories. Japan

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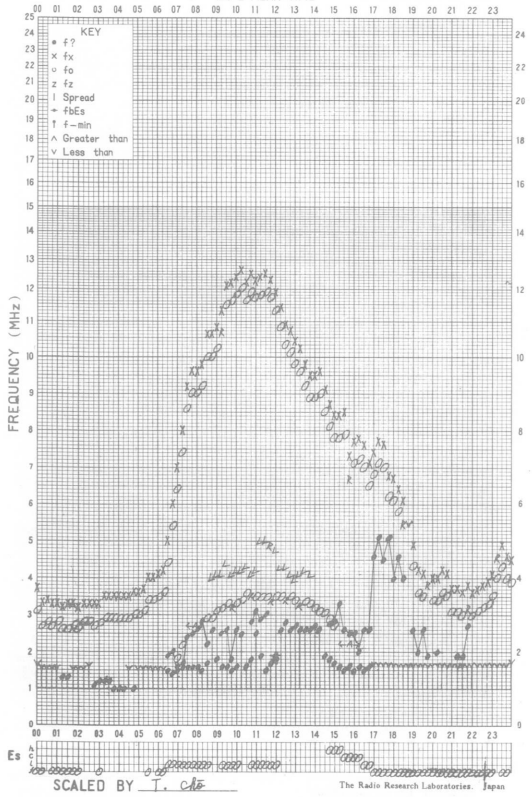

SCALED BY T. Abe The Radio Research Laboratories. Japan

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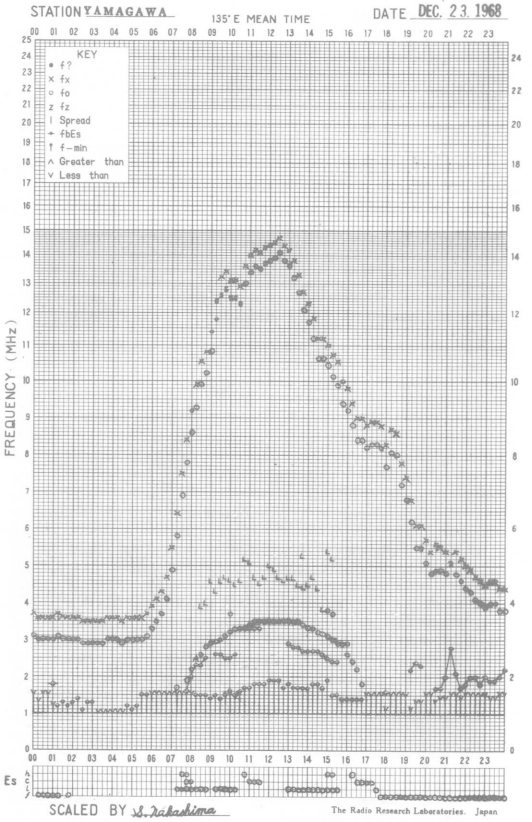

SCALED BY S. Takashima The Radio Research Laboratories. Japan

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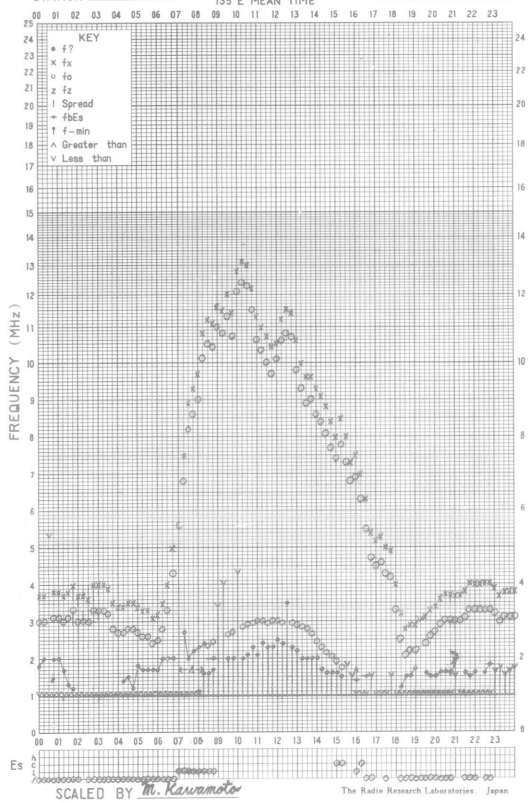

SCALED BY M. Kawamoto

The Radio Research Laboratories. Japan

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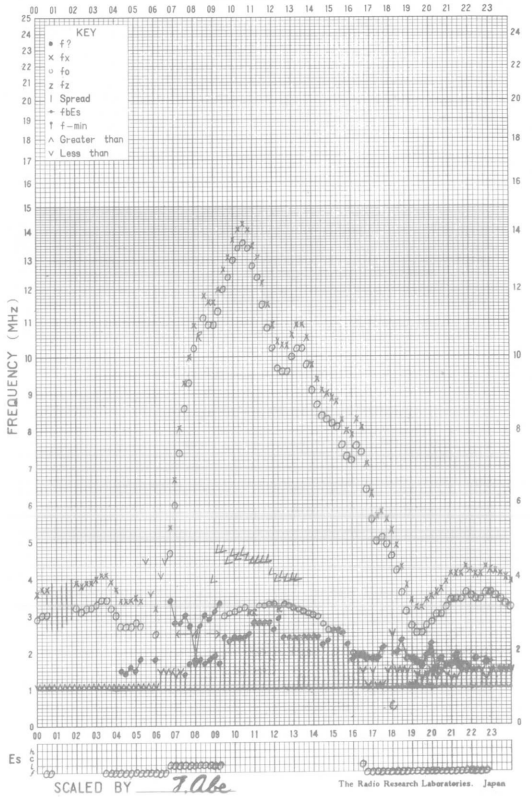

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The Radio Research Laboratories. Japan

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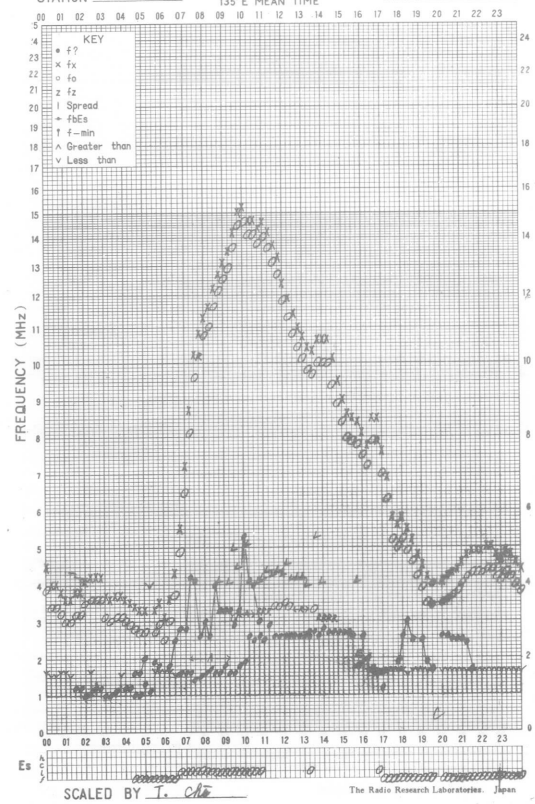

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The Radio Research Laboratories. Japan

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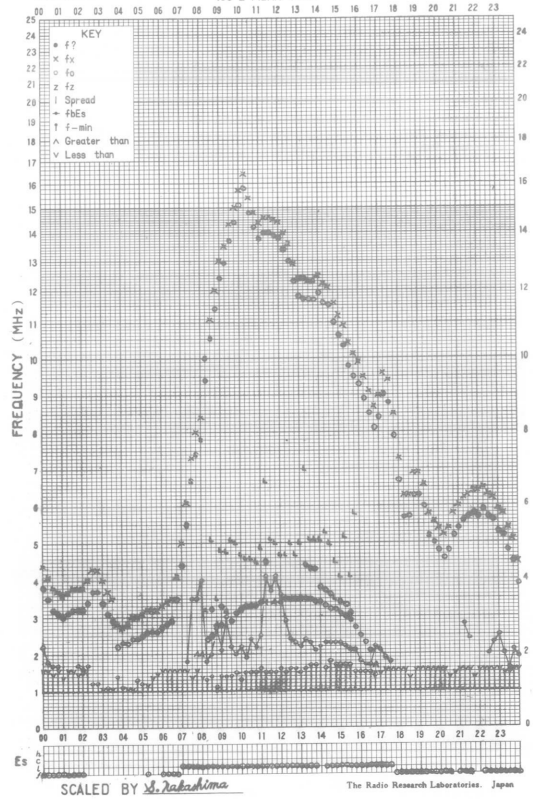

SCALED BY S. Takashima

The Radio Research Laboratories. Japan

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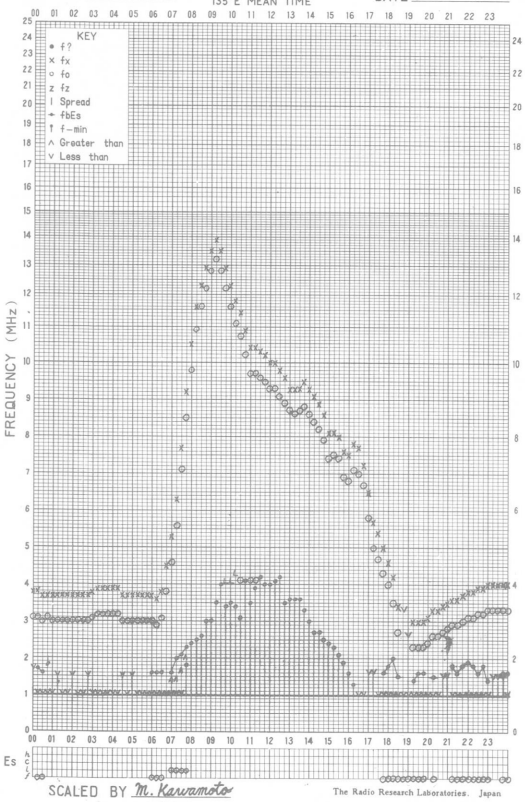

SCALED BY M. Kawamoto The Radio Research Laboratories. Japan

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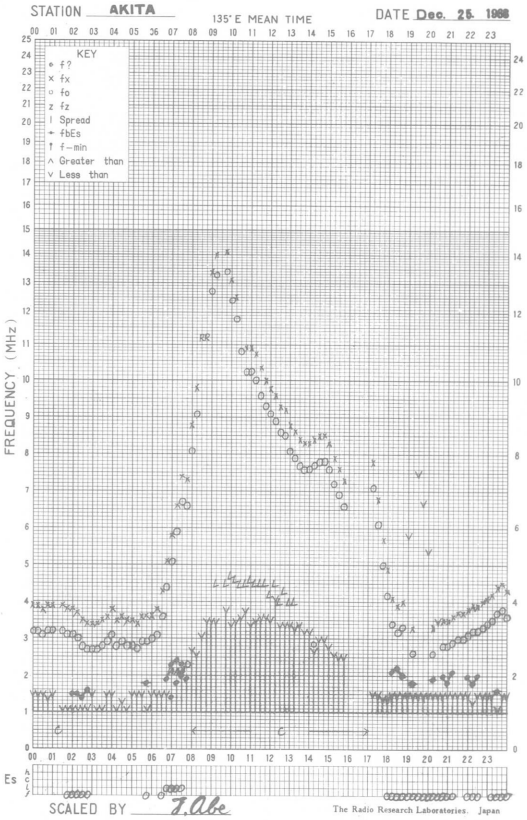

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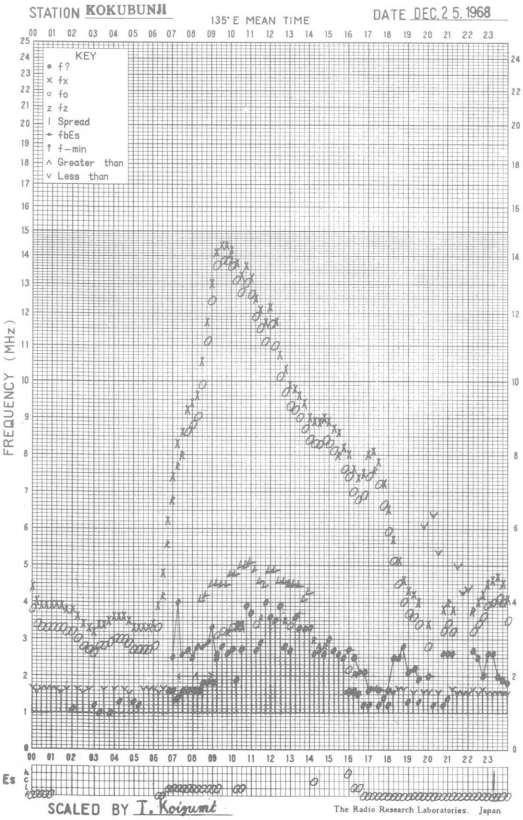

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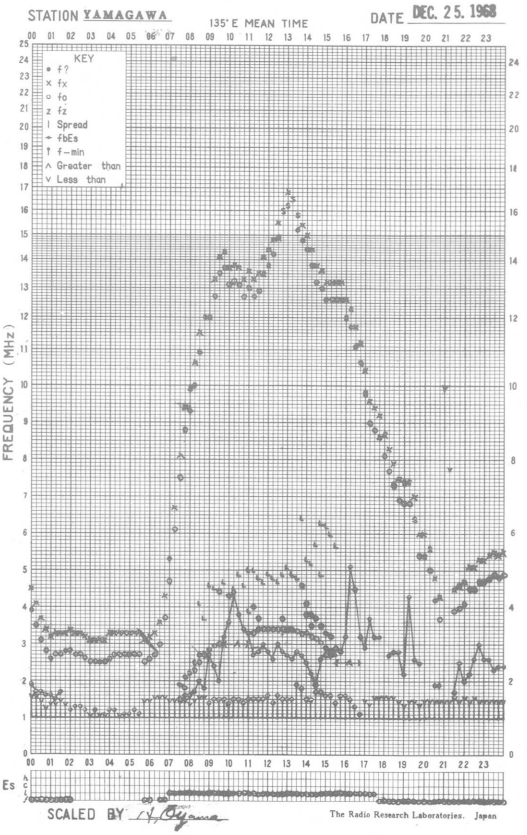

SCALED BY H. Ogawa The Radio Research Laboratories. Japan

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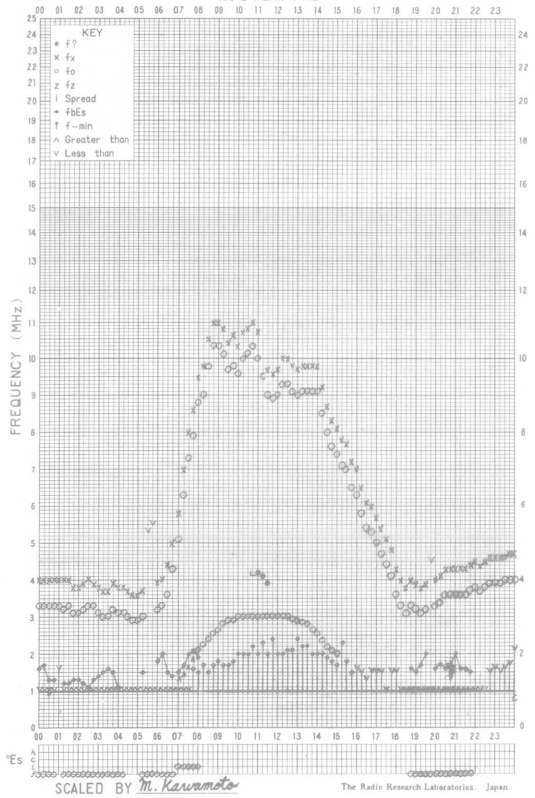

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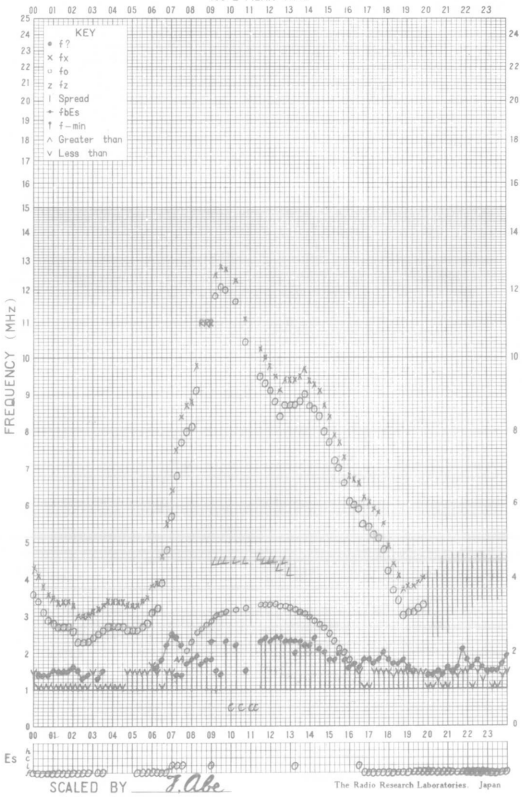

SCALED BY T. Abe The Radio Research Laboratories. Japan

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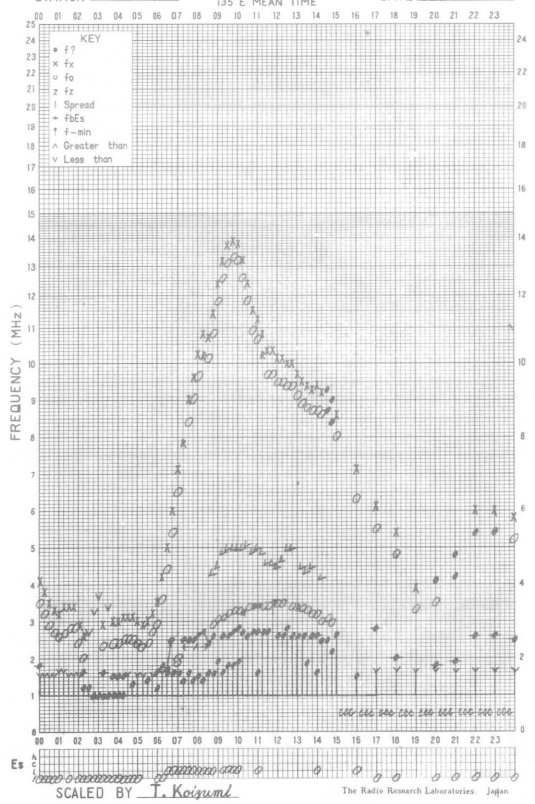

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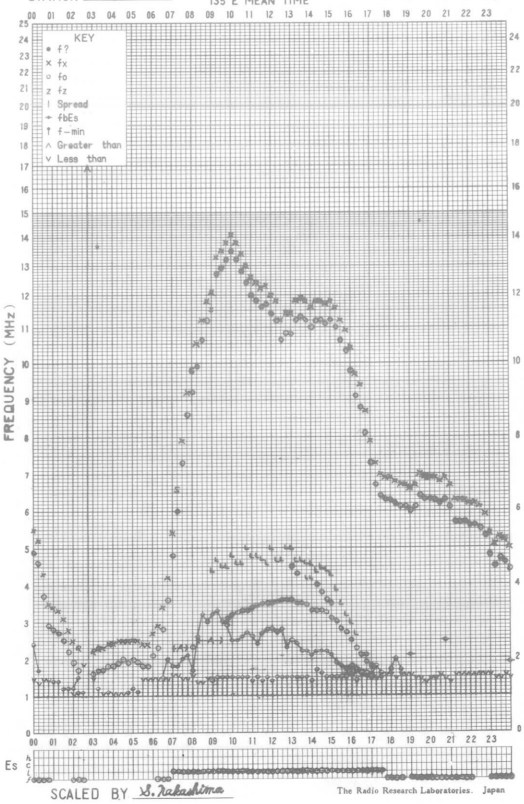

SCALED BY S. Takashima The Radio Research Laboratories. Japan

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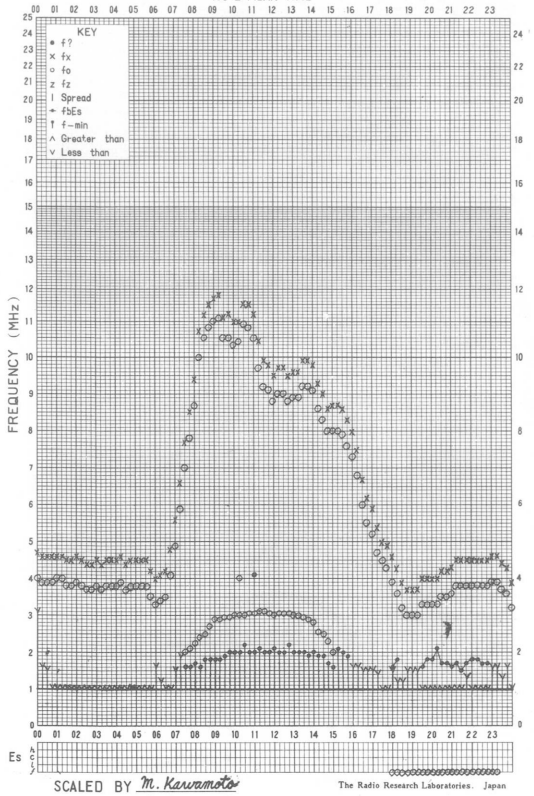

SCALED BY M. Kawamoto

The Radio Research Laboratories. Japan

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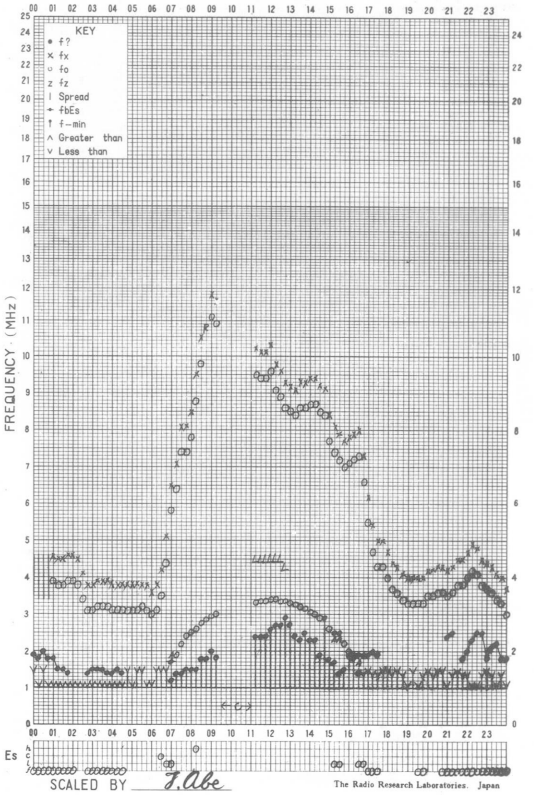

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The Radio Research Laboratories. Japan

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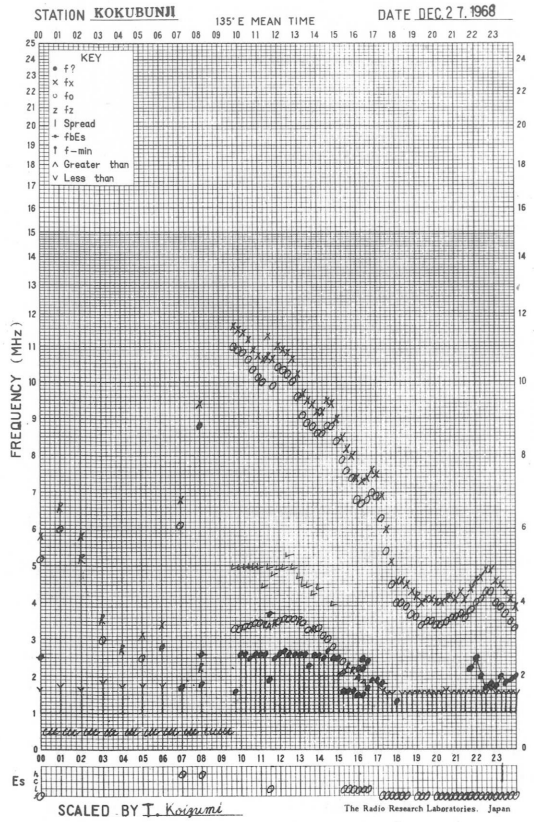

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The Radio Research Laboratories. Japan

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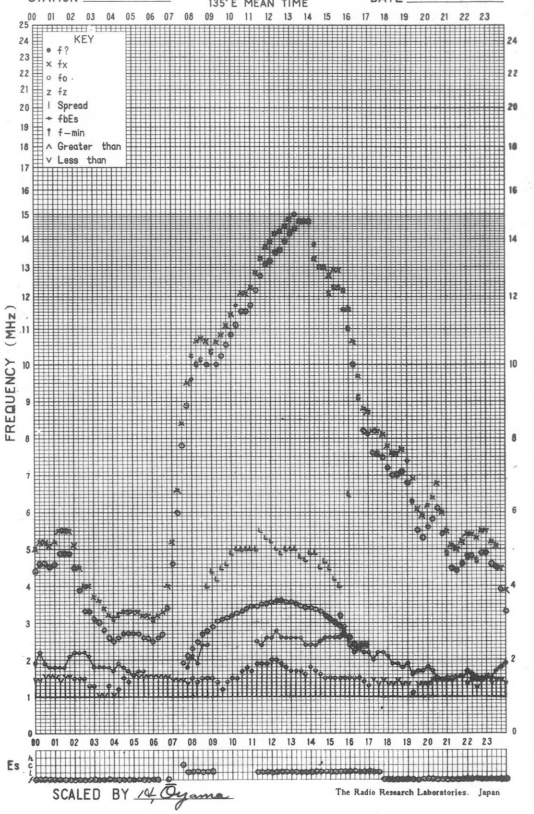

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The Radio Research Laboratories. Japan

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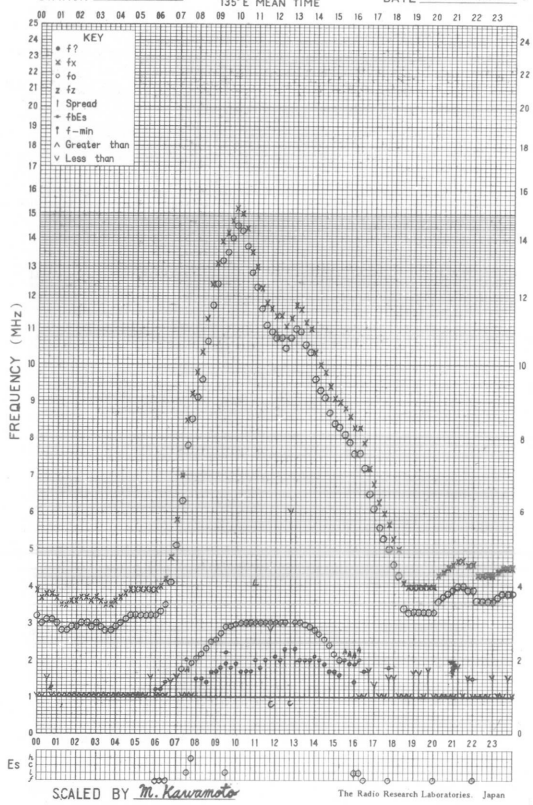

SCALED BY M. Kawamoto The Radio Research Laboratories. Japan

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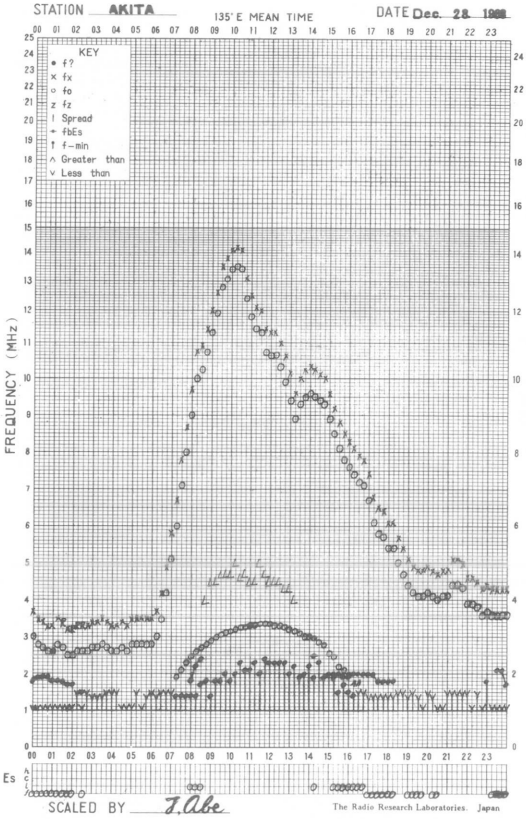

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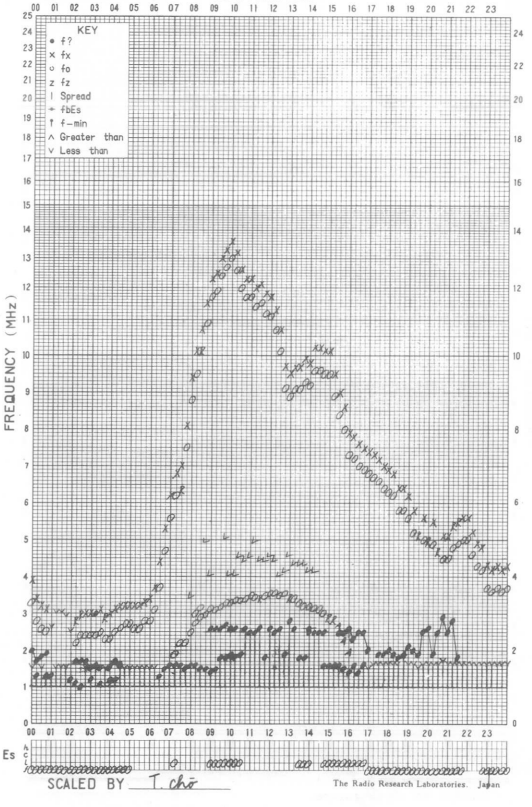

SCALED BY T. Ichi The Radio Research Laboratories. Japan

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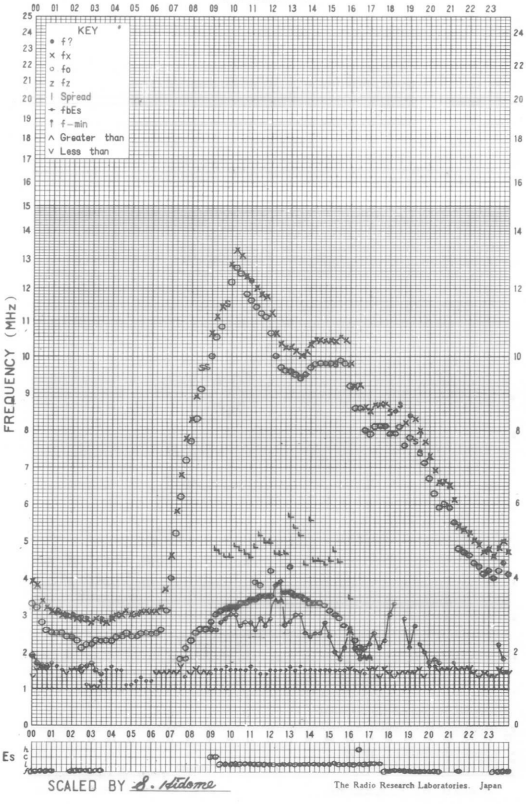

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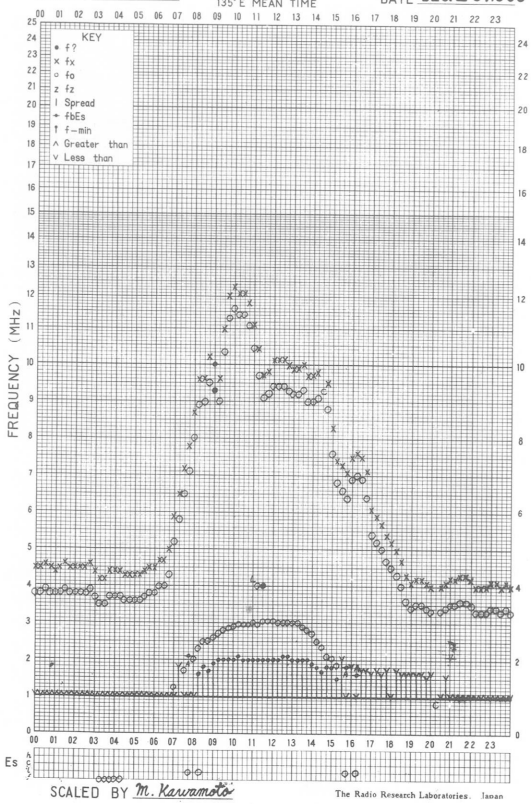

SCALED BY M. Kawamoto

The Radio Research Laboratories. Japan

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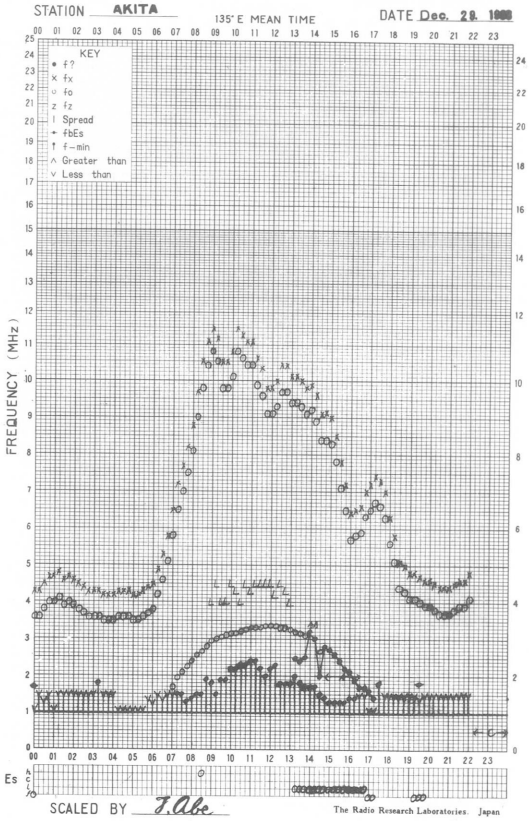

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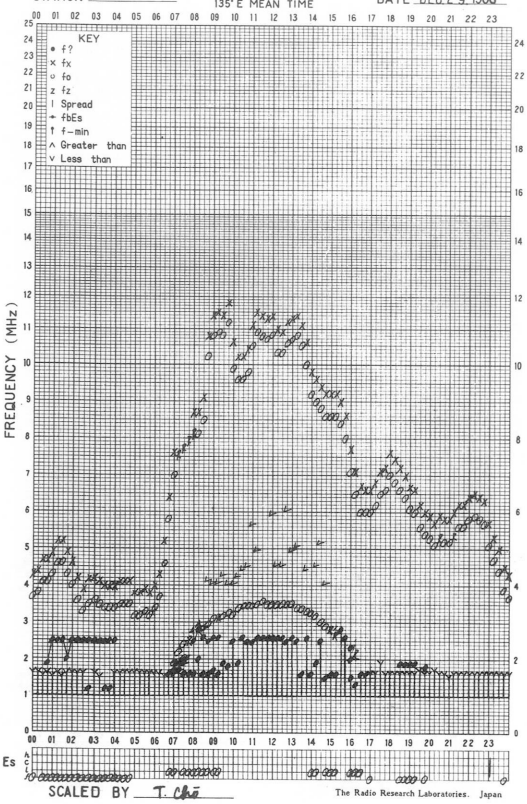

SCALED BY T. Obi

The Radio Research Laboratories. Japan

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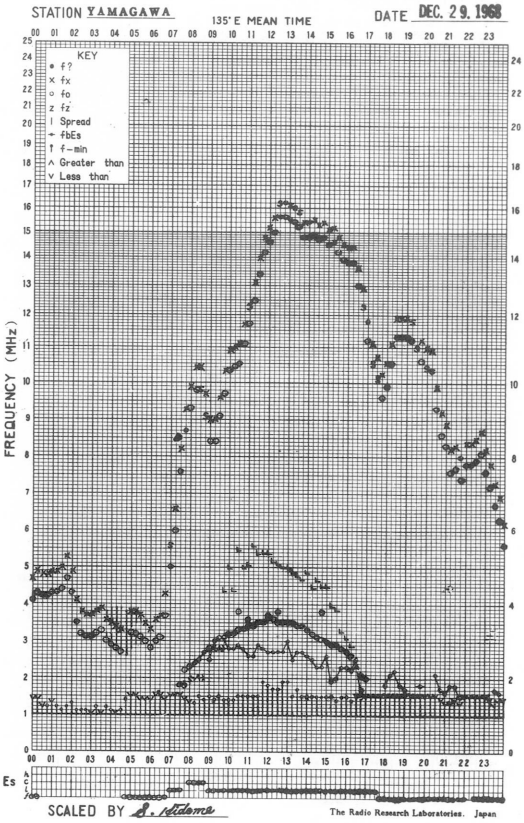

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The Radio Research Laboratories. Japan

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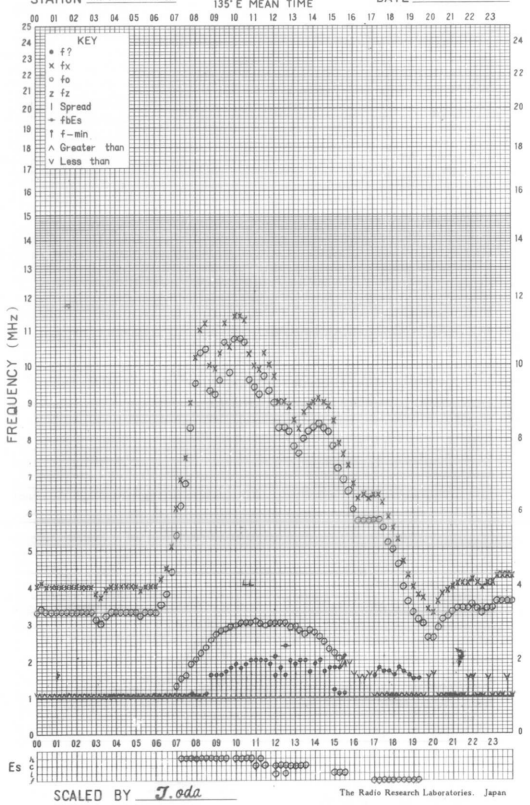

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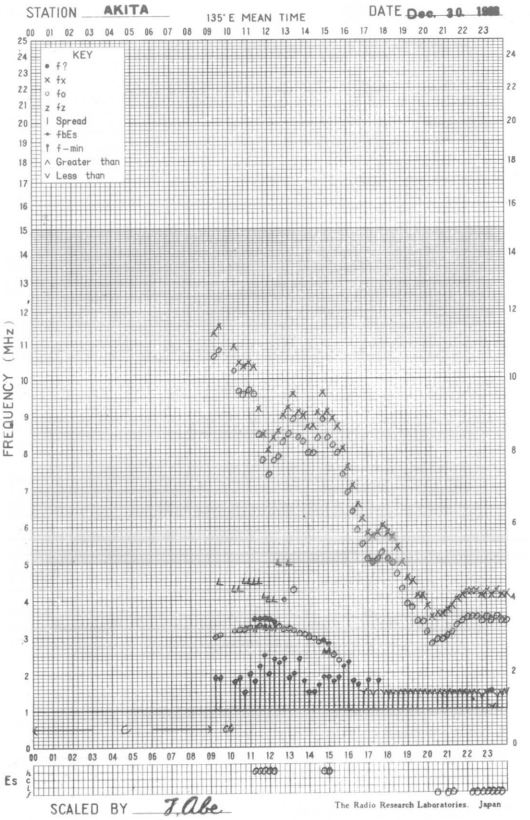

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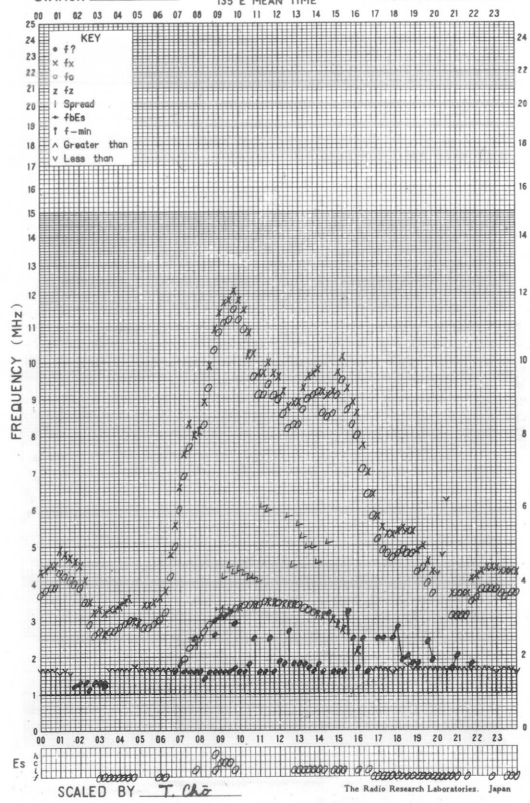

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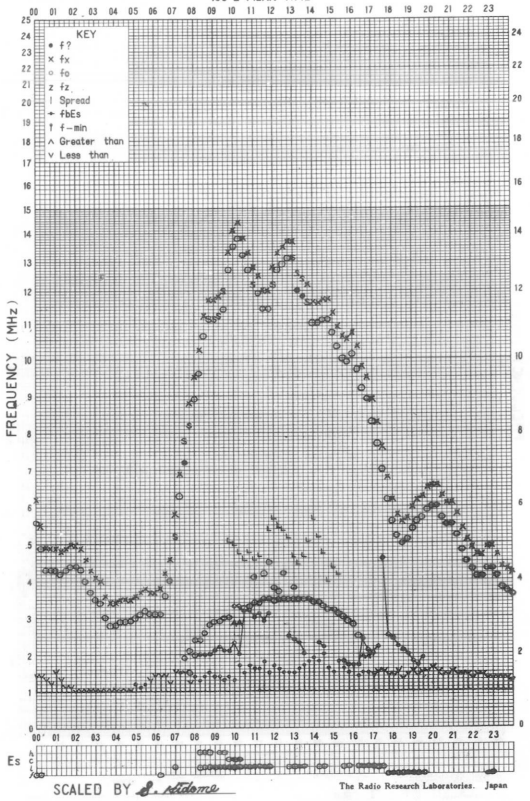

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The Radio Research Laboratories. Japan

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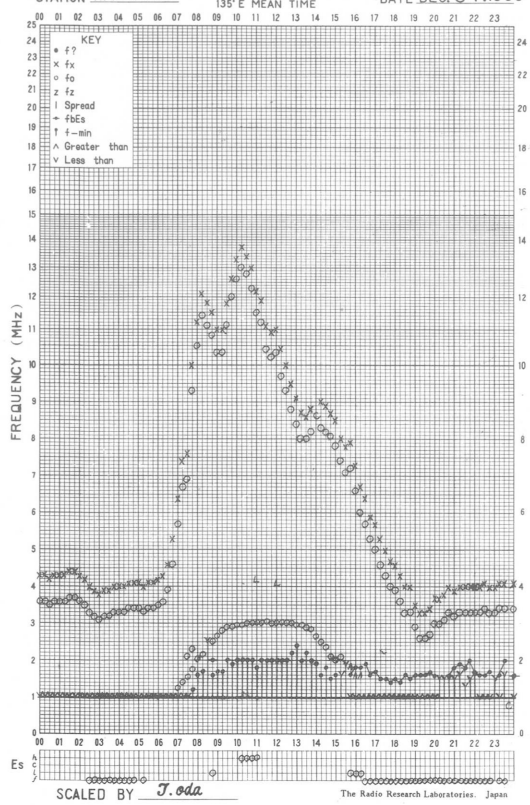
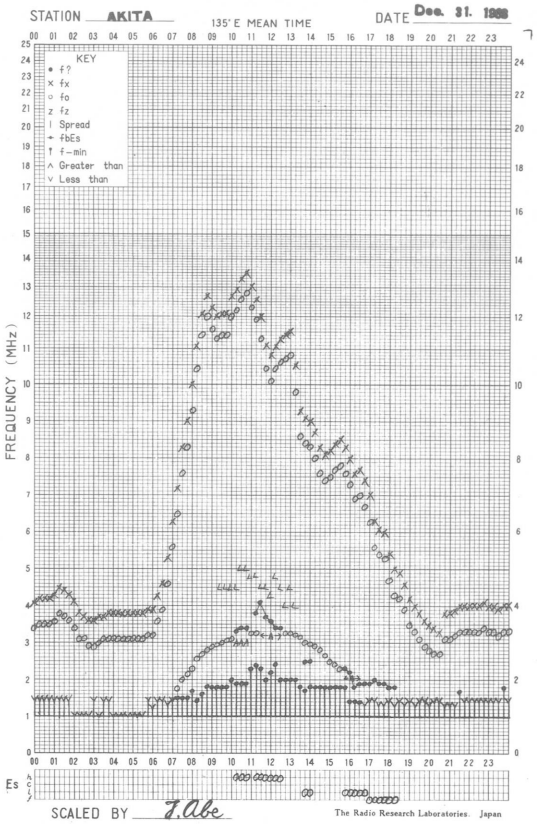


SCALED BY J. oda

The Radio Research Laboratories. Japan

f-PLOT OF IONOSPHERIC DATA

STATION AKITA 135° E MEAN TIME DATE Dec. 31. 1968

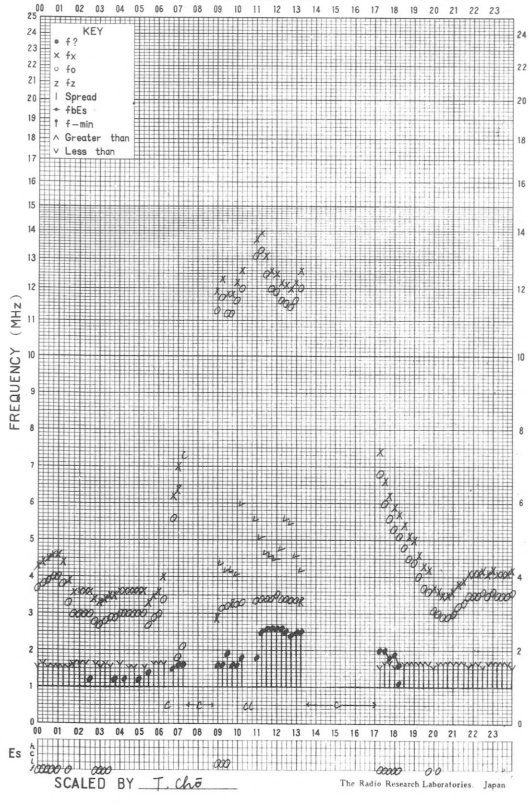


SCALED BY J. Abe

The Radio Research Laboratories. Japan

f-PLOT OF IONOSPHERIC DATA

STATION KOKUBUNJI 135° E MEAN TIME DATE DEC. 3 1. 1968



SCALED BY I. Chō

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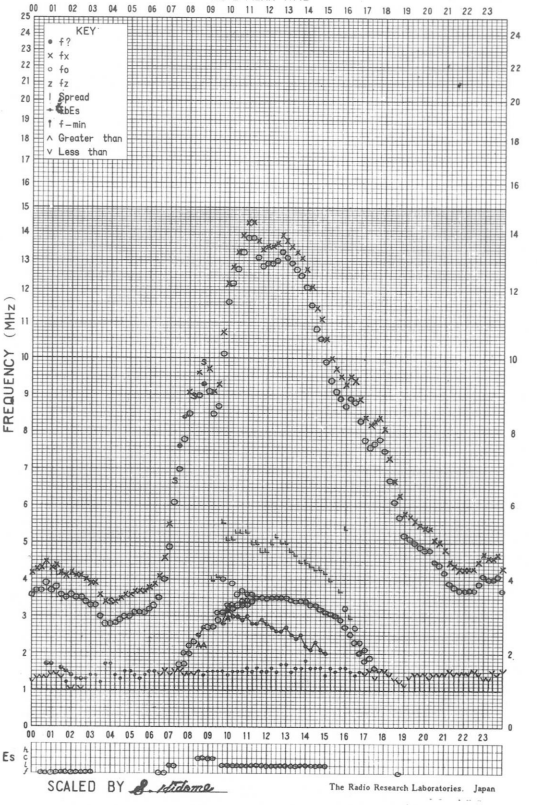
f-PLOT OF IONOSPHERIC DATA

STATION YAMAGAWA 135° E MEAN TIME DATE DEC. 3 1. 1968



SCALED BY S. Hitotome

The Radio Research Laboratories. Japan

SOLAR RADIO EMISSION

Flux Density and Variability

Month: December 1968
Observing station: Hiraiso
Frequency: 200 MHz

	Flux density $10^{-22}Wm^{-2}(Hz)^{-1}$					Variability 0 to 3				
UT Date	00-03	03-06	06-09	21-24	Day	00-03	03-06	06-09	21-24	Day
1	8	8	(8)	14	8	0	0	(1)	1	0
2	12	13	(13)	9	13	1	1	(1)	1	1
3	9	12	(18)	7	11	1	1	(1)	1	1
4	7	8	(8)	11	8	1	1	(1)	1	1
5	11	14	(17)	21	13	1	1	(1)	1	1
6	31	31	(29)	15	27	1	1	(1)	1	1
7	12	10	(10)	10	12	1	1	(1)	1	1
8	11	18	(13)	19	13	1	2	(1)	1	1
9	13	14	(15)	12	15	1	1	(1)	1	1
10	13	12	-	16	12	1	1	-	1	1
11	16	19	(22)	13	17	1	1	(1)	1	1
12	12	13	(15)	12	13	1	1	(1)	1	1
13	11	11	(10)	28	11	1	1	(1)	2	1
14	23	14	(9)	10	20	2	1	(1)	1	2
15	10	11	(15)	10	11	1	1	(1)	1	1
16	10	8	(8)	(9)	9	0	0	(0)	(1)	0
17	10	9	-	(13)	9	1	1	-	(1)	1
18	12	11	-	(20)	12	1	1	-	(1)	1
19	13	11	-	(8)	13	1	1	-	(1)	1
20	8	8	-	(9)	8	0	0	-	(0)	0
21	10	9	-	(18)	9	0	0	-	(1)	0
22	14	15	-	(8)	15	1	1	-	(0)	1
23	10	10	-	(9)	10	1	1	-	(1)	1
24	9	8	-	(10)	9	1	0	-	(1)	1
25	10	11	-	(12)	10	0	0	-	(1)	0
26	13	12	-	(11)	13	1	1	-	(1)	1
27	12	16	-	(10)	14	1	1	-	(1)	1
28	8	8	-	(12)	8	1	1	-	(1)	1
29	30	22	-	(14)	24	2	2	-	(1)	2
30	16	17	-	(10)	16	1	1	-	(1)	1
31	9	8	-	(10)	9	1	1	-	(1)	1

Note No observations during the following periods:

3rd 0525- 0555
10th 0600- 0730
28th 0000- 0100

SOLAR RADIO EMISSION

Flux Density

Month: December 1968
Observing station: Hiraiso Frequency: 500 MHz

Flux density 10^{-22} $Wm^{-2}(Hz)^{-1}$

UT	00-03	03-06	06-09	21-24	Day
Date					
1	33	33	(32)	34	33
2	35	34	(33)	33	34
3	35	34	-	35	34
4	36	35	(33)	34	35
5	36	34	(33)	31	34
6	33	32	(33)	-	32
7	32	30	(30)	q	31
8	q	q	q	32	q
9	32	32	(32)	29	32
10	31	32	(30)	33	31
11	36	38	(34)	30	36
12	35	35	(34)	35	34
13	36	36	(35)	34	36
14	37	37	(34)	35	36
15	35	34	(34)	35	35
16	36	36	(34)	(35)	36
17	36	37	-	-	36
18	37	37	-	(41)	37
19	39	39	-	(38)	39
20	36	35	-	(37)	36
21	37	36	-	(38)	36
22	38	39	-	(38)	39
23	38	38	-	(36)	38
24	36	36	-	(35)	36
25	36	35	-	(34)	36
26	35	35	-	(36)	35
27	38	38	-	(35)	38
28	39	35	-	(44)	37
29	49	40	-	(39)	45
30	40	40	-	(40)	40
31	39	37	-	(39)	38

Note No observations during the following periods:

3rd	0605-	0730	11th	2325- 12th	0005
5th	0100-	0200	13th	2325- 14th	0006
6th	2140-	2400	15th	2324-	2400
8th	2325-	2400	17th	0500-	0600
10th	2325-	2400	17th	2140- 18th	0010

"q" means quiet level, when radiometer is unstable.

Distinctive Events

(single-frequency observations)

Month: December 1968
Observing station: Hiraiso
Normal observing period: 2140 - 0730 (sunrise to sunset)

Date	Frequency	Starting time	Time of maximum	Duration	Type	Flux density 10^{-22} Wm^{-2}(Hz)$^{-1}$		Remarks
	MHz	UT	UT	minutes		peak	mean	
9	500	0110.0	0111.0	2.0	C	550	85	
		0623.0	0623.5	2.0	C	370	50	
12	200	2313.0	2316.8	5.0	C	460	40	
13	500	-	-	>2.0	C	-	-	#
	200	0425.5	0425.8	5.0	C	210	10	
24	200	0155.0	0158.8	4.0	C	960	30	
	500	0244.3	0244.4	0.5	C	380	30	
	200	0244.0	0244.5	1.0	C	680	20	
	500	2227.0	2228.8	5.0	C	110	10	
	200	2227.0	2228.5	10.0	C	260	20	
27	500	0204.0	0207.4	5.0	C	450	15	
	200	0204.0	0204.0	1.5	C	600	100	

End: 0428, preceding part missing.

MEASUREMENT OF H.F. FIELD STRENGTH (UPPER SIDE-BAND OF WWV)

DEC 1968 FREQUENCY 15 MHZ BANDWIDTH 80 HZ RECEIVING ANTENNA ROD 4.5 M

MEASURED AT HIRAISO

UT DAY	00H 15M	01H 15M	02H 15M	03H 15M	04H 15M	05H 15M	06H 15M	07H 15M	08H 15M	09H 15M	10H 15M	11H 15M	12H 15M	13H 15M	14H 15M	15H 15M	16H 15M	17H 15M	18H 15M	19H 15M	20H 15M	21H 15M	22H 15M	23H 15M
1	20	22	22	15	4	6	2	19	ES -2	ES -9	ES -28	ES -28	ES -17	ES -33	ES -33	ES -33	ES -33	ES -33	-23	-7	-4	0	12	9
2	8	14	11	ES -3	-1	ES 4	ES -1	ES -1	ES 2	ES -2	ES 0	ES -13	ES -33	ES -33	-23	ES -33	ES -33	-16	-5	2	-4	-2	6	11
3	12	17	23	6	ES 5	ES 5	ES -8	ES -7	ES -1	ES 2	ES -8	ES -18	ES -23	ES -17	ES -33	-23	ES -33	ES -33	ES -33	-8	-13	8	12	12
4	13	15	13	12	ES 5	ES 3	ES 2	ES -8	ES -9	ES 1	ES -5	ES -18	ES -22	ES -22	-21	-25	ES -35	-17	-11	-8	2	9	11	13
5	12	8	16	ES -9	ES 2	C	ES -10	ES -2	ES 2	ES -3	ES -23	ES -15	ES -22	ES -12	ES -34	ES -27	ES -34	ES -34	-22	-20	-22	5	11	8
6	18	12	19	-13	ES -1	ES 5	ES 3	ES -7	ES 4	ES -6	ES -7	ES -32	ES -21	ES -18	ES -16	ES -33	ES -33	ES -33	ES -33	-25	-13	8	17	16
7	19	18	13	ES -10	ES -9	ES 4	ES 11	ES -9	ES -9	ES -11	-17	ES -22	ES -13	ES -33	ES -33	ES -33	-21	ES -27	ES -27	ES -27	-5	8	16	18
8	17	20	4	ES 23	ES 10	ES -5	ES -5	ES 15	ES -4	ES -5	ES -13	ES -15	ES -6	ES -32	ES -32	ES -32	ES -32	ES -32	ES -32	ES -32	ES -32	11	17	21
9	1	16	ES -5	ES -5	ES 1	C	ES 0	ES 4	ES 4	4	-5	ES -14	ES -10	ES -20	ES -25	-20	ES -31	ES -31	ES -31	ES -31	ES -31	9	19	14
10	22	16	13	ES 2	ES -1	ES 2	ES -20	ES -8	ES -3	ES 0	ES 5	ES -3	ES -16	ES -23	ES -23	-22	ES -29	ES -29	ES -29	-26	-11	9	10	10
11	8	2	ES -11	ES -15	ES -4	ES -4	ES -12	ES -11	ES 1	ES 2	ES -3	ES -20	ES -16	ES -16	-20	-11	ES -9	ES -11	-5	ES -12	-9	-1	16	4
12	ES 3	ES 3	2	-8	ES -6	ES 0	ES -5	ES -7	ES -1	ES -14	ES -10	ES -18	ES -20	ES -22	-20	-25	ES -31	ES -31	ES -31	ES -31	ES -31	-3	17	9
13	8	17	-3	ES -16	ES -2	ES -7	ES -12	ES -3	ES 5	-3	ES -15	ES -11	ES 7	ES -24	-29	ES -32	ES -32	ES -32	ES -21	-26	-2	9	8	10
14	14	17	6	ES -16	ES -6	ES -5	-10	ES 23	ES -1	9	ES -8	ES -12	ES -15	ES -32	ES -32	ES -32	ES -32	-25	-26	ES -32	ES -18	-6	9	3
15	19	11	-2	ES -16	ES -11	ES -8	ES -14	ES -10	ES -15	-7	-17	ES -22	ES -32	ES -32	ES -32	ES -32	ES -32	ES -32	ES -31	ES -30	ES -29	2	5	6
16	6	13	ES -9	C	C	C	ES -8	ES -8	ES -6	ES -12	ES -15	ES -25	ES -30	ES -30	ES -30	ES -30	ES -30	ES -30	ES -30	ES -30	ES -30	3	5	6
17	10	11	-1	3	ES -5	ES 2	ES -23	ES -10	ES -9	ES 1	ES -7	ES -19	ES -28	ES -28	ES -28	ES -28	ES -28	ES -28	ES -28	ES -28	ES -24	0	7	6
18	3	7	-3	ES -8	ES -7	ES -3	ES -16	ES -9	ES 0	ES -22	ES -26	ES -32	ES -32	ES -33	ES -33	ES -33	ES -33	ES -33	ES -33	ES -33	ES -33	-1	8	6
19	11	6	9	0	-6	ES -6	ES -7	-9	ES -4	ES -9	ES -5	ES -33	ES -32	ES -32	ES -32	ES -32	ES -32	-9	ES -32	ES -32	0	4	8	9
20	10	10	3	-6	-5	0	ES -11	ES -9	ES -2	ES -2	ES -8	ES -12	ES -15	ES -22	ES -13	ES -13	ES -12	ES -13	ES -10	ES -10	ES -12	2	13	12
21	13	-1	ES -19	-13	ES -7	ES -2	ES -12	ES -4	ES -3	-3	ES -28	ES -13	ES -14	ES -22	ES -18	ES -18	ES -13	ES -9	ES -7	ES -6	2	12	13	11
22	14	9	17	13	ES -5	ES -3	ES -3	ES -3	1	ES -9	ES -9	ES 1	ES -9	ES -10	ES -11	ES -16	ES -12	ES -26	ES -33	ES -33	ES -33	5	11	9
23	13	9	5	ES -14	ES -8	ES 1	ES -9	ES -14	ES 1	ES -2	ES -17	ES -32	ES -23	ES -22	ES -17	ES -8	ES -8	ES -8	ES -8	ES -8	ES -8	0	6	4
24	12	5	5	-16	ES -16	ES -2	ES -3	ES 0	ES 5	ES 5	ES -2	ES -15	ES -14	ES -31	ES -32	ES -24	ES -19	ES -15	ES -15	ES -15	ES -18	2	2	2
25	-7	-5	-3	-18	ES -4	-11	-13	-12	ES -7	ES -13	ES -12	ES -12	ES -19	ES -10	ES -10	ES -12	ES -12	ES -13	ES -13	ES -13	ES -13	-2	2	0
26	9	-2	14	ES -10	ES -2	ES -6	ES -12	ES -12	ES -15	ES -9	ES -18	ES -30	ES -26	ES -19	ES -11	ES -30	ES -30	ES -30	ES -31	ES -31	ES -31	-7	1	4
27	4	3	13	-12	ES 0	ES -3	-11	-11	ES -4	ES -12	ES -28	ES -18	ES -36	ES -31	ES -31	ES -31	ES -31	ES -20	ES -20	ES -20	ES -20	-3	5	6
28	3	9	11	ES -6	ES 0	ES -6	ES -10	ES -8	-2	ES -2	ES -20	ES -26	ES -21	ES -29	ES -18	ES -20	ES -20	ES -15	ES -15	ES -15	ES -15	0	7	-1
29	2	8	2	ES -12	ES 3	ES -8	ES -12	ES -12	ES -8	ES 8	ES -21	ES -32	ES -22	ES -17	-26	-26	ES -17	ES -17	ES -17	ES -17	ES -17	-7	2	-2
30	6	8	9	ES -15	ES -5	ES -2	ES -7	ES -13	ES -3	-16	ES -17	ES -17	-20	ES -28	ES -32	ES -32	ES -32	ES -32	ES -32	ES -32	ES -32	3	10	12
31	18	16	7	-11	ES -1	ES -8	ES -29	ES -17	ES -12	-11	ES -31	ES -31	ES -32	ES -32	ES -28	ES -28	ES -28	ES -28	ES -28	ES -28	ES -28	5	7	3
CNT	31	31	31	30	30	28	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31
MED	11	10	6	ES -10	ES -3	ES -2	ES -10	ES -8	ES -2	ES -3	ES -13	ES -18	ES -21	ES -24	ES -28	ES -28	ES -31	ES -28	ES -27	ES -26	ES -17	2	9	9
UD	19	18	19	ES 13	ES 5	ES 5	ES 2	ES 15	ES 4	ES 5	ES -2	ES -11	ES -9	ES -12	ES -11	ES -12	ES -12	ES -9	ES -7	ES -7	0	9	17	16
LD	ES 2	ES -1	ES -9	ES -16	ES -9	ES -8	ES -20	ES -13	ES -12	ES -14	ES -28	ES -32	ES -32	ES -33	ES -33	ES -33	ES -33	ES -33	ES -33	ES -32	ES -32	-6	2	0

MEASUREMENT OF H.F. FIELD STRENGTH (UPPER SIDE-BAND OF WWVH)

DEC 1968 FREQUENCY 15 MHZ BANDWIDTH 80 HZ RECEIVING ANTENNA ROD 4.5 M

MEASURED AT HIRAISO

UT DAY	00H 45M	01H 45M	02H 45M	03H 45M	04H 45M	05H 45M	06H 45M	07H 45M	08H 45M	09H 45M	10H 45M	11H 45M	12H 45M	13H 45M	14H 45M	15H 45M	16H 45M	17H 45M	18H 45M	19H 45M	20H 45M	21H 45M	22H 45M	23H 45M
1	6	7	11	18	21	26	14	9	17	ES -11	ES -18	ES -28	-17	-23	ES -33	ES -33	ES -33	-23	-20	8	3	4	2	6
2	3	4	8	15	22	ES -2	21	17	11	ES -5	ES -7	ES -22	ES -33	ES -33	ES -33	ES -33	ES -33	ES -33	ES -17	-17	2	-20	-8	-2
3	-2	C	8	12	18	15	18	26	17	8	ES -7	ES -17	-17	ES -17	ES -33	ES -33	ES -33	ES -33	ES -33	-5	0	2	-2	2
4	5	5	9	15	25	20	16	21	19	10	7	-1	-20	ES -22	-28	ES -35	ES -35	2	-6	-6	2	3	1	1
5	3	3	6	13	18	C	3	13	7	-11	-16	-18	-1	ES -16	ES -18	ES -34	ES -34	ES -34	-12	-13	1	3	3	2
6	3	7	5	21	22	21	19	19	16	-2	-10	-15	-16	ES -14	ES -16	ES -33	ES -33	ES -33	ES -33	-27	3	6	2	7
7	2	7	11	14	11	4	20	15	-8	-10	-12	ES -12	ES -12	ES -33	ES -33	ES -33	ES -33	ES -27	ES -27	ES -27	4	10	4	4
8	4	4	9	17	19	ES 17	10	16	11	ES 5	ES -2	ES -15	ES -1	ES -32	ES -32	ES -32	ES -32	ES -32	ES -32	ES -32	4	10	6	3
9	4	5	5	17	20	20	20	18	17	10	3	-1	ES -12	ES -20	ES -25	ES -31	ES -31	ES -31	ES -31	ES -31	2	5	6	2
10	5	3	11	12	21	15	15	10	10	7	13	14	-3	-21	ES -23	ES -29	ES -29	ES -29	ES -29	ES -29	3	7	3	6
11	2	6	5	17	19	16	21	13	ES 1	ES -8	ES 1	-5	ES -12	ES -15	-23	ES -31	ES -14	ES -17	ES -15	-4	3	8	3	0
12	ES 0	-3	3	10	16	15	10	5	ES -6	ES -11	ES -9	-11	-12	-14	ES -31	ES -31	ES -31	ES -31	ES -31	ES -31	-3	5	4	0
13	-6	2	6	14	22	17	ES 0	ES -9	ES -3	ES -9	ES 22	ES -1	ES -16	ES -32	ES -32	ES -32	ES -32	-27	-24	ES -32	8	11	4	3
14	4	-7	8	18	19	24	20	ES 19	ES 4	-3	ES -4	-2	-12	ES -32	ES -32	ES -32	ES -32	ES -32	-26	ES -32	3	5	-6	6
15	-1	3	11	16	23	19	14	19	-7	-8	-7	-16	ES -32	ES -32	ES -32	ES -32	ES -32	ES -32	ES -31	ES -30	2	-1	3	-3
16	3	0	C	C	C	12	ES -4	20	ES -2	ES -24	ES -14	ES -19	ES -30	ES -30	ES -30	ES -30	ES -30	ES -30	ES -30	ES -30	-1	6	2	2
17	-2	6	7	14	19	24	13	-3	ES 4	11	ES -5	ES -16	ES -28	ES -28	ES -28	ES -28	ES -28	ES -28	ES -28	1	2	6	-3	0
18	-2	6	5	11	21	18	2	6	ES -14	ES -17	ES -13	ES -32	ES -26	ES -32	ES -33	ES -33	ES -33	ES -33	ES -33	ES -33	2	2	2	1
19	1	3	7	16	21	15	22	8	ES 0	0	ES -9	ES -33	ES -32	ES -32	ES -32	ES -32	ES -32	ES -32	ES -32	ES -32	0	4	5	3
20	0	4	5	10	19	16	13	18	9	-8	ES -6	ES -12	ES -15	ES -13	ES -13	ES -23	ES -8	ES -10	ES -10	ES -12	-2	4	4	1
21	-2	-8	9	12	20	18	11	8	10	-9	-2	1	ES -16	ES -11	ES -18	ES -13	ES -9	ES -9	ES -7	ES -6	2	8	2	2
22	3	3	7	17	21	5	4	14	US 1	-4	ES 0	ES -4	ES -9	ES -14	ES -14	ES -16	ES -16	ES -15	ES -33	ES -33	4	7	6	1
23	1	3	5	6	26	18	11	ES 0	5	-1	3	-1	-15	ES -17	ES -17	ES -8	ES -8	ES -8	ES -8	ES -8	3	7	2	1
24	3	2	5	9	9	13	2	17	9	5	ES -3	-9	-11	-18	ES -32	ES -24	ES -16	ES -15	ES -15	ES -15	2	3	-2	-2
25	-7	-5	-2	2	11	13	10	-3	7	10	ES -12	ES -12	ES -19	ES -10	ES -10	ES -12	ES -12	ES -13	ES -13	ES -13	2	8	5	1
26	0	7	8	12	18	21	15	9	5	7	-4	-9	4	ES -15	ES -30	ES -30	ES -30	ES -30	ES -31	ES -31	5	9	9	4
27	-3	1	6	12	13	11	17	6	ES -6	ES -12	4	2	-8	ES -31	ES -31	ES -31	ES -31	ES -20	ES -20	ES -20	6	10	6	6
28	1	3	14	15	14	12	13	15	9	4	-6	-10	-11	ES -29	ES -18	ES -20	ES -20	ES -15	ES -15	ES -15	6	7	4	4
29	1	3	5	13	13	8	19	9	-7	US -9	-10	-10	-10	ES -16	ES -26	ES -33	ES -17	ES -17	ES -17	ES -17	-7	3	3	4
30	4	-1	4	7	5	5	15	-6	-15	ES -14	ES -17	ES -28	-17	-22	ES -32	ES -32	ES -32	ES -32	ES -32	ES -32	6	8	10	7
31	5	10	2	13	14	21	10	10	ES -9	ES -11	ES -11	-13	-15	-19	ES -28	ES -28	ES -28	ES -28	ES -28	ES -28	-11	5	2	3
CNT	31	30	30	30	30	30	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31
MED	2	3	6	14	19	US 16	14	US 13	5	US -5	ES -6	ES -12	ES -15	ES -21	ES -30	ES -31	ES -31	ES -28	ES -27	ES -27	2	6	3	2
UD	5	7	11	18	23	24	21	20	17	10	ES 7	1	ES -1	ES -13	ES -14	ES -13	ES -9	ES -9	ES -8	-4	6	10	6	6
LD	ES -3	-5	3	7	11	ES 5	2	ES -3	ES -9	ES -14	ES -16	ES -28	ES -32	ES -32	ES -33	ES -33	ES -33	ES -33	ES -33	ES -32	-3	2	-3	-2

RADIO PROPAGATION QUALITY FIGURES

HIRAISO

Time in U.T.

Dec. 1968	Whole Day Index	H B 06 12 18 / 12 18 24	W W V 00 06 12 18 / 06 12 18 24	L M 00 06 12 18 / 06 12 18 24	W W V H 00 06 12 18 / 06 12 18 24	Warning 00 06 12 18	Principal magnetic storms Start	End	ΔH
1	4o	4 4 (4)	4 - 4 5	4 - - -	4 4 - 4	N N N N			
2	4+	5 5 4	4 - 4 5	3 (4) - 4	4 4 - 3	N N N N			
3	4o	5 4 4	4 (4) 3 4	4 5 - 4	4 4 - 4	N N N N			
4	4o	4 4 4	4 (4) 4 5	4 4 - C	4 5 - 5	N N N N			
5△	4-	3 3 3	4 - 4 4	(4) 4 - 4	4 4 - 4	N N N N	06.33	---	55γ
6△	4o	4 4 4	4 - 4 4	4 4 - 4	4 4 - 4	N N N N	---	12xx	
7	4o	4 4 4	4 - 4 4	3 4 - -	4 4 - 4	N N N N			
8△	4o	4 4 (4)	4 (4) 4 4	(4) - - -	4 5 - (4)	N N N N			
9	4o	4 4 4	4 C C 4	3 4 - 4	4 (5) - 4	N N N N			
10	4o	5 4 4	4 (4) 4 4	4 4 - 4	4 4 - 4	N N N N			
11	4o	4 4 4	3 - 4 4	4 5 - 4	4 4 - 4	N N N N			
12	4o	4 4 4	4 (4) 4 4	5 4 - 4	4 4 - 4	N N N N			
13	4o	3 4 4	4 - 4 4	4 4 - 4	4 4 - 4	N N N N			
14	4o	5 4 4	4 - 4 4	4 3 - -	4 4 - 4	N N N N			
15	4-	4 4 4	3 - (4) 4	(3) - - -	4 4 - 4	N N N N			
(16)	4-	4 4 4	3 - - 4	3 4 - 4	4 3 - 4	N N N N			
(17)	4-	4 4 3	4 - - 3	4 3 - 4	4 4 - 4	N N N N			
(18)	4-	4 4 4	3 - - 4	4 3 - (4)	4 4 - 4	N N N N			
19	4o	4 4 4	4 - - 4	3 C - 4	4 4 - 4	N N N N			
20	4-	4 3 3	4 - - (4)	4 4 - 4	4 4 - 4	N N N N			
21	4o	4 4 4	4 - (4) 4	4 3 - -	4 4 - 4	N N N N			
22	4o	4 4 4	4 (4) - 4	(4) - - -	4 4 - 4	N N N N			
23	4o	4 4 4	4 - - 4	4 4 - 4	4 4 - 4	N N N N			
24	4o	4 4 3	4 - - 4	4 4 - 4	4 4 - 4	N U U U	22.3	---	71γ
25	4o	4 4 4	4 - - 4	4 3 - C	4 4 - 4	N N N N	---	24xx	
26	4o	3 4 4	(4) - - 4	4 4 - C	4 4 - 4	N N N N			
27	4-	4 4 4	4 - - 4	C (3) - C	4 4 - 4	N N N N			
28	4o	4 4 4	4 - - (4)	C 4 - -	4 4 - 4	N N N N			
29	4-	(4) 4 (3)	4 - - 4	C - - -	4 4 - 4	N N N N			
30	4-	(4) 4 (3)	4 - - 4	C (4) - C	4 4 - 4	N N N N			
31	4o	(4) 4 4	4 - - 4	C (4) - C	4 4 - 4	N N N N			

IQSY GEOALERT and ADALERT (Western Pacific Region)

* = MAGSTORM

o = MAGCALME

△ = COSMIC EVENT

( ) = Regular World Day

\- = impossible to evaluate

( ) = inaccurate

C = artificial accident

--- = continuing magnetic storm

SUDDEN IONOSPHERIC DISTURBANCES

(S.I.D.)

HIRAISO

Time in U.T.

Dec. 1968	S W F									Correspondence		
	Drop-out Intensities (db)						Start-time	Duration	Type	Imp.	Flare	Solar Noise	Mag.
	CO	LM	HA	TO	HB	SH							
13				20			04.13	45	S	2		x	

IONOSPHERIC DATA IN JAPAN FOR DECEMBER 1968

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