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IONOSPHERIC DATA IN JAPAN

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CONTENTS

COMMUNICATIONS RESEARCH LABORATORY
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INTRODUCTION

This Series contains data on ionosphere (I) , solar radio emission (S) and radio propagation (P) obtained at the following stations under the Communications Research Laboratory, Ministry of Posts and Telecommunications of Japan.

Station	Geographic		Geomagnetic		Technical Method
	Latitude	Longitude	Latitude	Longitude	
Wakkanai	45°23.5′N	141°41.2′E	35.3°N	206.5°	Vertical Sounding (I)
Kokubunji	35°42.4′N	139°29.3′E	25.5°N	205.8°	Vertical Sounding (I)
Yamagawa	31°12.1′N	130°37.1′E	20.4°N	198.3°	Vertical Sounding (I)
Okinawa	26°16.9′N	127°48.4′E	15.3°N	196.0°	Vertical Sounding (I)
Hiraiso	36°22.0′N	140°37.5′E	26.3°N	206.8°	Radio Receiving (S,P)
Inubo	35°42.2′N	140°51.5′E	25.6°N	207.0°	Radio Receiving (P)

A. IONOSPHERE

Ionospheic observations are carried out at the above four stations in Japan by means of vertical sounding using ionosondes.The ionosonde produces ionograms,which are recorded digitally on computer storage medium as well as graphically on 35 mm photographic film. The digitally-recorded ionograms are collected from each station by the central computer and reduced to numerical values and Summary Plots by the automatic processing system. The ionograms obtained at Kokubunji are manually scaled as well by experienced specialists to supplement automatically-scaled parameters.

A1. Automatic Scaling

Digital ionograms are automatically scaled by the pattern recognition method. The following five factors of ionospheric characteristics are published for the present. The reliability of these factors has been ascertained by comparison of the automatically-scaled parameters with the manually-scaled values of large amounts of test ionograms.

The published data consist of tabulations of hourly values of three factors (*foF2, fEs, fmin*) and monthly medians of two factors (*h′Es, h′F*) , daily Summary Plots and monthly medians plot of *foF2*.

a. Characteristics of Ionosphere

foF2	Ordinary wave critical frequency for the *F2* layer
fEs	Highest frequency of the *Es* layer whether it may be ordinary or extraordinary
fmin	Lowest frequency which shows vertical ionospheric reflections
h′Es *h′F*	Minimum virtual height on the ordinary wave for the *Es* and *F* layers, respectively

b. Descriptive Letters

The following descriptive letters are used in the tables.

A Impossible measurement because of the presence of a lower thin layer,for example *Es* (for *foF2*).

B Impossible measurement because of absorption in the vicinity of *fmin*.

C Impossible measurement because of any failure in observation.

G Impossible automatic scaling because of too small ionization density of the layer (for *fEs*).

N Impossible automatic scaling because of complex echoes.

Blank No digital record because of trouble in the automatic data processing system, but existence of film record.

c. Definitions of the CNT,MED,UQ and LQ

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

Median (MED) is defined as the middle value when the numerical values 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.

If CNT is less than 10, there are blank spaces left.

d. Reliability of Automatic Scaling

The results of the comparison between automatically-scaled values and manually-scaled ones showed that hourly values of *foF2* , *fEs* and *fmin* were scaled within a difference of 1 MHz from about 90 , 90 and 99% , respectively of the test ionograms.

e. Summary Plot

Daily Summary Plots which are made from quarter-hourly digital ionograms are published to present general ionosphere conditions. The upper and middle parts of a Summary Plot show the diurnal variation of the frequency range of the echoes reflected from the *F* and *E* regions, respectively. The two solid arcing lines indicate the predicted values of *fxE* and *foE* calculated by the method described in the CCIR report 340. The lower part shows the diurnal variation of the virtual height where the echo traces become horizontal.

A2. Manual Scaling

The published data consist of tabulations of hourly values of the ionospheric characteristics and figures of daily *f*-plot.

All symbols and terminology in the tables or figures of ionospheric data are used in accordance with the "URSI Handbook of Ionogram Interpretation and Reduction (Second Edition) 1972 " and its revision of chapters I-4, published in July 1978.

a. Characteristics of Ionosphere

fxI	Top frequency of spread *F* trace
foF2 *foF1* *foE* *foEs*	Ordinary wave critical frequency for the *F2,F1, E* and *Es* including particle *E* layers, respectively
fbEs	Blanketing frequency of the *Es* layer, e.g. the lowest ordinary wave frequency visible through *Es*
fmin	Lowest frequency which shows vertical ionospheric reflections
M(3000)F2 *M(3000)F1*	Maximum usable frequency factor for a path of 3000 km for transmisson by *F2* and *F1* layers, respectively
h′F2 *h′F* *h′E* *h′Es*	Minimum virtual height on the ordinary wave for the *F2*, whole *F, E* and *Es* layers,respectively
Types of *Es*	See below b.(iii)

b. Symbols

(i) Descriptive Letters

The following letters are entered after, or used to replaced a numerical value on the monthly tabulation sheets, if necessary.

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 *fmin*.

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 in use.

E Measurement influenced by, or impossible because of, the lower limit of the normal frequency range in use.

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.

K Presence of particle *E* layer.

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.

P Man-made perturbations of the observed parameter; or spur type spread *F* present.

Q Range spread present.

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 Lacuna phenomena, severe layer tilt.

Z Third magneto-electronic component present.

(ii) Qualifying Letters

The following letters are entered in the first column before a numerical value on the monthly tabulation sheets, if necessary.

A Less than. Used only when *fbEs* is deduced from *foEs* because total blanketing of higher layer is present.

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.

M Mode interpretation uncertain.

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-electronic component.

(iii) Description of Types of *Es*

When more than one type of *Es* trace are present on the ionogram, the type for the trace used to determine *foEs* must be written first. The number of multiple trace is indicated after the type letter.

The types are:

f An *Es* trace which shows no appreciable increase of height with frequency.

l A flat *Es* trace at or below the normal *E* layer minimum virtual height or below the particle *E* layer minimum virtual height.

c An *Es* trace showing a relatively symmetrical cusp at or below *foE*. (Usually a daytime type.)

h An *Es* trace showing a discontinuity in height with the normal *E* layer trace at or above *foE*. The cusp is not symmetrical, the low frequency end of the *Es* trace lying clearly above the high frequency end of the normnal *E* trace. (Usually a daytime type.)

q An *Es* trace which is diffuse and non-blanketing over a wide frequency range.

r An *Es* trace showing an increase in virtual height at the high frequency end similar to group retardation.

a An *Es* trace having a well-defined flat or gradually rising lower edge with stratified and diffuse traces present above it.

s A diffuse *Es* trace which rises steadily with frequency and usually emerges from another type *Es* trace.

d A weak diffuse trace at heights below 95 km associated with high absorption and large *fmin*.

n The designation 'n' is used to denote an *Es* trace which cannot be classified into one of the standard types.

k The designation 'k' is used to show the presence of particle *E*. When *foEs* > *foE* (particle *E*) the *Es* type precedes k.

c. Definitions of the CNT, MED, UQ and LQ

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

Median (MED) is the middle value when the numerical values 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.

B. SOLAR RADIO EMISSION

Solar radio observations at 200, 500 and 2800 MHz are carried out at Hiraiso. The observation equipment consists of two parabolic antennas, one with 10-meter diameter for 200 MHz measurements and one with 2-meter diameter for 500 and 2800 MHz measurements, Observations are continuously carried out almost from sunrise to sunset.

B1. Daily Data at Hiraiso

The three-hourly mean and daily mean values of the solar radio emission intensities are tabulated separately for 200 and 500 MHz measurements. The intensities are expressed by the flux density in 10^{-22} Wm^{-2} Hz^{-1} unit.

The table for 200 MHz measurements also presents the variability indices defined by the number of impulsive radio bursts within the three-hour intervals as follows:

0 quiet or no burst,

1 a few bursts,

2 many bursts,

3 very many bursts.

The daily variability index is defined as the daily mean of three-hourly indices.

The following symbols are used in the tables, when interference or radio bursts prevented measuring the base-level flux densities or determining the variability indices:

* Measurement impossible because of interference.

B Measurement impossible because of bursts.

Daily data within parentheses mean that the observation time does not exceed one third of the period.

B2. Outstanding Occurrences at Hiraiso

The table is a list of outstanding occurrences of solar radio emission bursts observed at 200, 500 and 2800 MHz during a month.

Listed in the table are the date, frequencies, the type of event, the start time and the time of maximum, both in U.T. expressed in hours, minutes and tenths of a minute, the duration in minutes, the peak and mean flux densities in 10^{-22} Wm^{-2} Hz^{-1} unit, and the polarization.

The type of event is expressed by a combination of a numerical code and a letter symbol in accordance with the " Descriptive Text of Solar Geophysical Data, NOAA " as defined by H. Tanaka in the " Instruction Manual for Monthly Report of Solar Radio Emission, WDC-C2 " in January 1975:

SGD Code	Letter Symbol	Morphological Classification
1	S	Simple 1
2	S/F	Simple 1F
3	S	Simple 2
4	S/F	Simple 2F
5	S	Simple
6	S	Minor
7	C	Minor+
8	S	Spike
20	GRF	Simple 3
21	GRF	Simple 3A
22	GRF	Simple 3F
23	GRF	Simple 3AF
24	R	Rise
25	R	Rise A
26	FAL	Fall
27	RF	Rise and Fall
28	PRE	Precursor
29	PBI	Post Burst Increase
30	PBI	Post Burst Increase A
31	ABS	Post Burst Decrease
32	ABS	Absorption
40	F	Fluctuations
41	F	Group of Bursts
42	SER	Series of Bursts
43	NS	Onset of Noise Storm
44	NS	Noise Storm in progress
45	C	Complex
46	C	Complex F
47	GB	Great Burst
48	C	Major
49	GB	Major+

The polarization is expressed by the polarization degree and sense as follows:

R or L	right- or left-handed polarization,
W,M or S	weak,moderate or strong polarization,
0	almost zero or unable to detect polarization due to small increase of flux,
00	polarization degree of less than 1 percent.

One of the following symbols may be attached after numerical values, if necessary.

D	greater than, or later than,
E	less than or earlier than,
U	approximate, or uncertain.

B3. Summary Plots of $F_{10.7}$ at Hiraiso

The 10.7 cm solar radio flux at Hiraiso is plotted over a one month period. The 10.7 cm flux ($F_{10.7}$) is determined by adjusting the 10.7 cm radio flux measured at Hiraiso to the Pentincton 10.7 cm radio flux. The figure on the right-hand side shows the $F_{10.7}$ index estimated at Hiraiso.

C. RADIO PROPAGATION

C1. H.F. Field Strength at Hiraiso

Field strength observation of 15 MHz standard waves transmitted from WWV and WWVH stations which are located respectively at Fort Collins, Colorado and Kauai, Hawaii, is carried out at Hiraiso. In order to avoid interference among the same frequency waves, the upper sideband of WWV or WWVH with the audio tone 600 Hz is picked up by the use of a narrow band-pass filter with 80 Hz bandwidth. Particulars of the transmitters and the receiver are summarized in the following table.

The tabulated *field strength* expressed in dB above one microvolt per meter is the average of quasi-peak values of the incident upper sideband field intensity for 45 seconds after the universal time indicated on the table. Abbreviated symbols are as follows:

CNT	number of observed values,
MED	median,
UD	value of the uppermost decile when they are ranked according to magnitude,
LD	value of the lowest decile when they are ranked according to magnitude,
U	uncertain,
E	less than,
C	innuenced by, or impossible because of, any artificial accident,
S	influenced by, or impossible because of, interferences or atmospherics.

C2. Radio Propagation Quality Figures at Hiraiso

The tabulated six-hourly quality figures are calculated for standard waves WWV transmitted from Fort Collins and WWVH transmitted from Kauai.

Quality figures expressing radio propagation conditions range over five grades as follows:

1	very poor(very disturbed),
2	poor(disturbed),
3	rather poor(unstable),
4	normal,
5	good.

Whole day quality figure ranged in grades of 1o, 1+, 2-, 2o, 2+, 3-, 3o, 3+, 4-, 4o, 4+, 5-, 5o stands for an average of six-hourly quality figures of the two circuits. Abbreviated symbols are as follows:

C	artificial accident,
S	propagational accident,
U	inaccurate.

Characteristics	Transmitter		Receiver
Station Call	WWV	WWVH	
Location	Fort Collins, Colorado	Kauai, Hawaii	Hiraiso, Ibaraki
latitude	40°41´N	22°00´N	36°22´N
longitude	105°02´W	159°46´W	140°38´E
Distance	9150 km	5910 km	--
Carrier Power	10 kW	10 kW	--
Power in each sideband	625 W	625 W	--
Modulation	50 %	50 %	--
Antenna	λ / 2 vertical	λ / 2 vertical	4.5 m vertical rod
Bandwidth	--	--	80 Hz for upper sideband
Calibration	--	--	Every hour

The column of conditions presents a record of the forecast of *radio propagation conditions* which is applicable to forthcoming 12 hours and broadcast six times par hour from JJY (Japan Standard Wave) staion. The conditions are denoted as follows:

N normal,
U unstable,
W disturbed.

Data on *geomagnetic storms* which are often correlated with radio propagation disturbances are tabulated based on reports from observation at Kakioka Magnetic Observatory, Japan Meteorological Agency. *Time* (U.T.) is expressed in hours and minutes (or tenths of an hour) , and *range* in nanotesla. When they are uncertain quantitatively, / 's are used to replace the numerical values. Continuation of a geomagnetic storm is denoted by ---.

C3. Phase Variation in OMEGA Radio Waves at Inubo

The phase values of eight OMEGA radio signals as received at Inubo are depicted for an interval of one month, along with the phase deviation defined as a deviation from a value averaged over the six quietest day within the month. Particulars of the received signals are given in the table below.

In each of the four panels of the figure, the phase (ϕ) is shown in the lower part and the phase deviation ($\Delta\ \phi$) is shown in the upper part. The phase data are sampled every 30 min, so the curves of the phase and phase deviation are composed of 48 data points per day. The phase delay is measured as a positive value.

The polar cap phase anomaly (PCPA) caused by the solar protons are well detected on the Norway signal. The start, end and maximum times of the PCPA are listed in the table next to the figure, where the times are expressed as day / hour & minute in U.T.. The maximum phase deviation in the list is defined as a phase advance (negative values in the figure) in degrees.

C4. Sudden Ionospheric Disturbances

a. Short Wave Fade-out (SWF) at Hiraiso

The table of short wave fade-out (SWF) is prepared from the record of field intensities measured at Hiraiso.

Drop-out intensities of the 10 MHz, the 20 MHz. and the 25 MHz waves are respectively distinguished by marks ´, ´´, and ´´´ from those of the 15 MHz wave for WWV and WWVH. Values of *start, duration, type,* and *importance* are obtained from data of the circuit whose drop-out intensity in dB is underlined as xx. When these quantities could not be determined accurately, they are accompanied by one of the following symbols.

D greater than,
E less than,
U uncertain or doubtful.

Types of fade-out are as follows:

S sudden drop-out and gradual recovery,
SL slow drop-out taking 5 to 15 minutes and gradual recovery,
G gradual and irregular in both drop-out and recovery.

Importance of fade-out is scaled according to its amplitude into nine ascending grades as 1-, 1, 1+, 2-, 2, 2+, 3-, 3, 3+.

Correspondence of solar optical and X-ray flares, and solar radio burst to SWF is marked by X, being determined with data from interchange messages of IUWDS and observations at Hiraiso.

In table (a) SWF, *date* indicates the day to which the *start-time* of the event belongs.

b. Sudden Phase Anomaly (SPA) at Inubo

Data of sudden phase anomaly (SPA) are prepared from the records of phase measurement of VLF radio waves received at Inubo. The transmitting stations are listed in the following table.

Phase advance is shown in unit of degree at its maximum stage. No transmission or no reception during the period is indicated by -, an indistinguishable record is spaced out, and a multi-peak event is marked by *. The most remarkable or distinct phase advance is underlined and listed in the column of *Time*.

In table (b) SPA, *date* indicates the day to which the *start-time* of the event belongs.

The following letters may be attached to the value, if necessary.

D greater than,
E less than,
U uncertain or doubtful.

Transmitting Stations						
Name	Location (Geographic Coordinates)		Call Sign	Frequency (kHz)	Radiation Power (kW)	Arc Distance from Inubo (km)
Norway	66°25´N	013°08´E	Ω / N	13.6	10	7820
Liberia	06°18´N	010°40´W	Ω / L	13.6	10	14480
Hawaii	21°24´N	157°50´W	Ω / H	13.6	10	6100
North Dakota	46°22´N	098°20´W	Ω / ND	13.6	10	9140
La Reunion	20°58´S	055°17´E	Ω / LR	13.6	10	10970
Argentina	43°03´S	065°11´W	Ω / AR	13.6	10	17640
Australia	38°29´S	146°56´E	Ω / AU	13.6	10	8270
Japan	34°37´N	129°27´E	Ω / J	13.6	10	1040
North West Cape	21°49´S	114°10´E	NWC	22.3	1000	6990

HOURLY VALUES OF foF2 AT WAKKANAI

DEC. 1996

LAT. 45.4N LON. 141.7E SWEEP 1MHz TO 25MHz AUTOMATIC SCALING

D \ H	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	52	57	54	53			29		56	60	69	65	A	60	54	57		A	A	32	29	35	34	37
2	38	35	29	A	A	A	29	37	44		66	57	62	58	58	A	A	A	A	40	35	A	35	35
3	35		35	41	34	29	35	44	69	70	62	80	84	80	77	60		37	38	36	35	44	40	
4		56		44	43	38	35	32	58	68	65	71	68	58	60	59		N	A	A	A	A	35	38
5	35	35	A	30	29	28	B	59		56	58		70	63	60	A	44		23	35	35	37	31	22
6	38	38	30	35	28	35	28	28		52	54	53	48	44	63	54		N	A	N	38	N	N	29
7	36	28	B	B	B	N	B	34	37		N	40		A	51	57		A	30	B	29	A	26	30
8	29	28	29	22	N	B	B	38	42			A	58		44	60		A	N	N			B	
9	29	26	29	N		29	B	49	46			N	57	N		29			N	28	29	A	29	29
10	N	29	A	28	28	A	A	34	57	55	57	72	65	57	57			31	N	29	32		58	
11		28	30	28	29	34	32	43	58	56				74		51		30	A	31	29		36	
12	35	37	29	29	30	30	35	43	46	56	57	60	A	52	61	57		A	A	34	41	34	35	31
13	36	36	31	28	38	36	28	29		56			57	53	59	51		A		A	29	29	32	34
14	38	35	35	30	31	N	A	40	35	53	60	58	51	55	57		40		B	35	35	A	31	36
15	35	36	31	30	30	26	35			68	64	68	60	60	64	61		A	24	29		A	A	38
16	42	36	37	44	35	56	38		71	58	68	64	69	60	66		54		35	29	31	37		
17	23	32	31	A	A	25	26	31	60	59	69		52	56	68		42		31	25	36	35	31	35
18	A	28	35	34	36	31	35	A	A	A	67	72		63	63	57		N	29	35	B	35	A	35
19	30	30	29	29	29	29	A	42			59	61	59	A	60	58		A	N	N	35	A	A	35
20	35	35	28	26	32	29	28		57	57	59	60	61	55	A	56		B	A	A	34	28	35	26
21	29		28	30	30	25	31	31	47	55	58	57	70	67		57	A	A	A	24	29	26	32	34
22	38	36	41	38	38	43	38			57		64		58	61	56	N	A	A		B	B	35	35
23	38		35	32	37	34	N	A	58	66	59		80		71	A	57		A	A	28	A	A	32
24	A	A	35	31	38	34	A	50	57	58	57		A	60	57	51	A	A	A	B	30	28	32	N
25	35	29	29	31	31	25	28		55	A	58	67		A	55		29	38	A		B	N	35	36
26	36	35	32	24	23	A	A	31		54	55	57	58	58	56	56				A	31	28	34	32
27	36		29	23	N	30	25	29	50	56	57	57	39		60		42	A	A	23	35	31	A	A
28	28	29	29	26	29	28		32	29		59	57		B	61	48		30	A	A	31	38	40	
29	24	41	38	37	40	38	31	39	40		51	A	54	56	59	57		29	29	A	35	37	A	28
30	A	29	35	30	31	31	27	A	A	58	68		59		65		38		28	30	35	36	34	36
31	A	32	35	29	N	B	A	A	31	56			53		47	59	52	A	35		59		36	31
	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	24	26	27	27	23	23	19	21	22	22	24	20	22	21	27	21			10	16	25	16	22	23
MED	35	35	31	30	31	30	31	37	52	56	59	60	59	58	60	57			30	30	34	35	34	34
U Q	38	36	35	35	37	35	35	43	58	59	65	67	68	61	63	58			35	35	35	37	35	36
L Q	29	29	29	28	29	28	28	31	42	56	57	57	54	55	57	52			28	28	29	28	32	30

COMMUNICATIONS RESEARCH LABORATORY, JAPAN

HOURLY VALUES OF fEs AT WAKKANAI

DEC. 1996

LAT. 45.4N LON. 141.7E SWEEP 1MHz TO 25MHz AUTOMATIC SCALING

D \ H	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	G	G	G		31	26	30	27	28	31	29		61	35	40	29	38	32	36	35	32	29	24	25
2	G	27	31		30	31	31	32	36	37	45	45		34	56	47	60	32	33	34	27	26	G	G
3	G		G		29	G	G	29	32	37	42	40	42	42	35	34	35	36	31	30	30	31	G	G
4	G	G	G	G	G	G	G	27	32	38	38	38	37	36	32	41	G	G	34	47	33	33	29	32
5	30	40	29	29	34	G	B	30	38	42	61			40	30		29	27	34	G	29	27	G	G
6	G	G	G	31	28	32	34	28	32	31	32	29	26	28	24	31	27	29	29	G	G	G	G	G
7	G	G	B	B	B	G	B	G	24	31	40	43	40	39	33	34	29	29	G	B	G	26	G	G
8	G	G	G	G	G	B	B	24	23	31		44	32	29	37	G		24	G	G	G	G	B	G
9	G	G	G	G	G	G	B	G	G	32	32	30	28	26		24	33	G	34	31	28	28	G	25
10	G			24	27	29	28	30	G	30	31	30		28	36		26	G	G	G	G	G	G	G
11	G	G	G	G	26	G	G	G		26	33	30	28	28	29	G	G		34	28	G	G	G	
12	G	G	G			39	G	27	41	28	28	33	34	37	31	32	33	42		36	35	30	G	G
13	G	G		27	24	29	28	36	34	30	30	34	29	35	34	30	29	28	G	29	27	38	G	G
14		G	G	G	30	G		44	35	41	33	36	42	47	39	35	27	G	B	G	G		G	
15	G	G	G	29	24	G	G	G	42	39	41	42	34	33	35	32	28	36	29	34	28		65	41
16	27	24	G	G	25	G	G		30	37	43	38	35	31	48	G	27	34	34	33	43	28	38	G
17	G	G		30	32	G	G	29	29	35	40	31	36	55	38	24	G	34	34	33	34	34	29	27
18	31		G	G	G	G		32	64	61		61	28	26	G	G	G	G	G	G	B	G	37	32
19	G	G	G	G	G	G	28	G			32	33	30	32	29	G	G	31	G	24	G	33	28	24
20	26	G	G	G	G	G	G	27		25	27	38	N	30	26	36	30	B	38		39	35	G	26
21	30	G	G	G	G	G	28	32	28	30	28	27	G	32	G	G	40	30		G	G	G	28	G
22	G	G	G	G	G	G	G			G	G	G	G	G	G	26	32	30	31	G	B	B	G	G
23	G			G	G	29	G	37	36	29	40	39	27	30				30	39		62	47	38	36
24		39		37		35	60	58	60	G	G	G	30	35	G	37	34	35	35	B	G	G	G	G
25	G	G	30	30	27	G	32		24	38	G	G	G		35	34	32	29	39	G	B	G	G	G
26	G	G	G	G	29	30	42	33	G	30	G	G	G	G	G	G	34	G	G	29	G	G	G	G
27		G	G	G	37	30	28	46	41	68	37	38	26	26	22	G	G	35	42	36	25	28	29	28
28	29	27	G	G	G	G	G	G		26	30	G	G	B	G	37	28	25	35	37	32	32	29	30
29	29	G	G	G	G	G	28	30	30	31	28	27	25	G	27	G	G	G	28	36	36	35	38	37
30	29		26	G	G	G	30	36		44	28	G	G	G	G	G	G	G	G	G	G	G	32	27
31	37	26	G	G	G	B	28	36	30	41	28	29	28	30	27	30	34	28	G	G	G	G	33	32
	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	26	25	26	28	29	25	28	25	30	29	29	27	29	29	28	29	29	28	27	28	28	30	29
MED	G	G	G	G	24	G	28	30	32	31	32	33	28	31	30	30	29	29	32	29	27	28	G	G
U Q	28	G	G	27	29	29	30	34	37	38	40	38	35	35	35	34	33	33	34	34	32	32	29	29
L Q	G	G	G	G	G	G	G	25	26	30	28	27	25	27	11	G	G	G	G	G	G	G	G	G

COMMUNICATIONS RESEARCH LABORATORY, JAPAN

HOURLY VALUES OF fmin AT WAKKANAI

DEC. 1996

LAT. 45.4N LON. 141.7E SWEEP 1MHz TO 25MHz AUTOMATIC SCALING

D \ H	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	16	15	15	15	15	15	17	15	15	16	16	15	15	15	15	15	15	16	15	15	16	16	15
2	16	15	15	15	15	15	14	16	15	15	15	16	16	16	15	14	15	16	16	15	15	15	15	15
3	15		15	15	16	15	15	17	14	15	15	15	16	15	16	15	14	15	14	15	15	15	15	15
4	15	15	15	15	15	15	16	16	15	15	15	15	16	15	15	15	16	15	16	15	15	15	15	15
5	15	15	15	16	15	15	B	15	14	15	15		16	15	15	15	15	16	16	16	15	15	18	15
6	15	15	15	15	15	16	16	16	16	15	15	15	17	15	15	15	15	17	16	16	16	15	15	15
7	15	15	B	B	B	17	B	15	17	15	16	16	15	16	15	15	15	16	16	B	20	17	17	17
8	16	17	16	16	16	B	B	15	15	15		15	16	15	15	21	15	17	17	17	16	17	B	15
9	14	16	15	15	16	15	B	15	15	15	15	16	18	16		15	15	15	16	15	16	15	17	15
10	15	15	15	15	15	17	16	16	22	15	16	16	16	16	15	15	15	16	20	17	15	16	15	16
11	18	17	16	16	16	16	16	15	22	16	15	15	15	16	15	18	16	16	16	15	16	15	15	
12	15	15	15	15	15	15	15	15	15	15	16	15	15	15	15	15	15	15	15	15	15	15	15	15
13	15	16	15	15	16	15	16	15	14	16	15	16	15	15	16	15	15	21	16	15	17	15	15	15
14	15	16	17	16	15	15	15	15	15	22	15	16	15	15	15	15	17	15	B	16	15	15	15	15
15	15	15	15	15	15	16	15	14	15	15	15	15	15	14	15	15	15	15	16	16	17	15	15	15
16	15	15	15	15	16	15	16		14	15	15	16	15	15	16	21	15	15	15	15	15	16	15	15
17	15	15	15	15	15	15	16	16	15	16	16	15	16	15	15	16	16	15	15	15	15	15	15	15
18	15	15	15	15	15	15	15	15	16	17	16	18	17	16	24	23	16	16	15	16	B		17	15	15
19	15	15	15	15	16	16	16	16	15		16	16	16	16	16	17	16	16	20	16	15	15	15	15
20	15	16	15	16	16	16	16	15	15	15	16	15	15	16	15	16	15	B		15	15	15	15	15
21	15	15	16	15	15	16	15	15	18	15	16		28		27	20	15	17	15	15	18	16	15	15
22	15	16	15	15	15	15	15			27				46	36	17	15	16	16	18	B	B		16	15
23	15		15	15	15	15		14	15	16	23	17	17	16	16	15	15	16	15	15	15	15	15	15
24	15	16	15	15	15	15	14	15	15	22	26		22	23	27	18	15	15	16	B	15	18	16	17
25	17	16	16	15	16	16	15		22	27		46			21	17	15	15	15		B	16	16	15
26	16	16	15	17	16	14	15	15	21	20		32		29	24	21	15	16		15	18	17	15	15
27	15	16	16	16	15	15	15	15	15	14	15	15	17	17	24	15	16	15	15	15	15	15	16	18
28	16	16	16	15	15	15		15	17	17		32		B	28	17	14	15	15	15	16	15	15	15
29	16	15	15	15	15	15	15	15	17	16	17	17	18	27	18	15	16	20	16	15	15	15	15	15
30	16	15	16	15	14	15	14	15	15	16	18		39		18	22	17	18	15	15	15	14	15	15
31	15	15	14	15	15	B	16	14	15	15	16	16	17	18	15	15	15	16	16	18	15	16	15	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	29	30	30	30	29	25	28	30	30	26	26	27	27	30	31	31	30	29	28	28	30	30	30
MED	15	15	15	15	15	15	15	15	15	15	16	16	16	16	16	15	15	16	16	15	15	15	15	15
U Q	16	16	16	15	16	16	16	16	17	16	16	16	17	16	21	18	16	16	16	16	16	16	16	15
L Q	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15

HOURLY VALUES OF foF2 AT KOKUBUNJI

DEC. 1996

LAT. 35.7N LON. 139.5E SWEEP 1MHz TO 25MHz AUTOMATIC SCALING

D \ H	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	34	31	44		54		A	50	60			65	66	70	68	61	60		A	69	27	59		A
2	59	35	30	23		B	N	58	58	68	70	A	78		60	59	60		A	38	A	A	A	A
3	26	A	59	59	29	29			63	56		92	86	92		60	A	A	43	34			36	38
4	36	37	35	35	38	B	59	51	56	63		79	68	73	59	52	48		B	69	35		69	59
5	N	N	32	24	29	29			69	63	70	66	64	60	68	64		A			B	59	A	28
6	A	40	35	B	N		B	A		68	62			51	60	51	48	A	A	A	A	B	69	N
7	28	N	29	B	59	B	B	31												B	89	B	B	B
8	B	N		N		B		49	A	69	60	A	55	72	56	50	48	A	A			B	B	N
9	59		25		23	24		44		58	58	51		50	59	66			30			B	34	29
10	29		29	B	N	N	B		46	53	58	68			60	60	56	37	31	N	59		59	35
11			N		N		49	48	57	56	60	65	65		70	60				37		N	69	
12					36	35	N	46	51	60	68	65	62	60		60	58		A	A	A		A	31
13	B	34	31			N	39	A	56	64		68	58	59		45	68	A	32				N	B
14	N		32	32	N	58			74	69	63	68	58					A		A				26
15		30	35	38	30	N	B	58	57		66	76	86	70	59	60	60		59	A	A	A	A	28
16	38	35	35	36	38	34	37	58			71	70	60	64	62	60	50		A			A	37	36
17	40		A	31	35	26			58	68	81	90		61	60	60	A	37		A	A	A	N	35
18	A	N	49		31	31	30		61	51	70	82	77		61	61	59	A		35	B		A	36
19	A	A	A	23		A	A	74	60	68	60	64		67	59			30	A	A	59	36	A	A
20	A		N		A	35	N	48		58	60	63	58	62	53	58	52		A	A	A	36	A	A
21	N	28		31		59		58	58	60	62	62	62	68	66	59	66	A	A	69		49	29	30
22	A	A	32	A	31	31	42	57		63	68	66	65		60	58	48		35		59	A	A	A
23	35	34		36		31			57	68	83	82	72	68		60	69	A	A	34	A	49	46	
24	A	A	35		A	A	A	68	70	63	65	63	54	48		66	57	A	46	A	A	A	A	
25		35			B	B	N	60	68	61	54	67	66	66	52	59	A	A	43	47	A	A	A	
26		35		26	N	29	35	46		68				54	52	51	46	A			A	A	A	A
27		35	25	30			A	37	45	58	60	71			49	55	42		44	A	A	A	A	A
28		30		B				A	57	58	68	68	67		55	45	A	33	A	A	A	A		
29	26	29		32	28				47		66	66	65	56	50	58	61	47		A	A	34	A	A
30	30	N	26	30		34			59		50	70	59	60	66	60	60	37	32	38	36	N	35	39
31	35			28	B	B	B		84	57		54	53	48	45	59	55	45	A		45	A	A	59
	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	13	14	18	16	13	14		18	23	25	24	26	23	22	24	28	21		10	10			10	14
MED	35	34	32	31	31	31		50	58	63	64	68	65	62	60	60	57		39	38			42	35
U Q	39	35	35	35	38	35		58	63	68	69	71	68	68	61	60	60		44	69			69	38
L Q	28	30	29	27	29	29		46	56	58	60	65	58	56	54	56	48		32	35			35	29

HOURLY VALUES OF fEs AT KOKUBUNJI

DEC. 1996

LAT. 35.7N LON. 139.5E SWEEP 1MHz TO 25MHz AUTOMATIC SCALING

D \ H	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	G	G	G	G	G	G	30	40	30	40	33	44	33	36	43	36	33				50	51	29	53
2	29	G	G	G	G	B	G	G	29	34	54	58	90	40	40	50	49	35	32	G	26	30	35	26
3		40	29	G	G	G	G			45	46	52	50	42	41	38	44	48	29	30	G	G	G	G
4	30	G	G	G	29	B	26	28	38	31	38	33	34	28	30	27	G	G	B	G	G	G	G	G
5	G		G	26	G	24	G		31	34	43	48	51	41	38	34	31	32	G	G	B	G	28	25
6	28	24	G	B	G	G	B	30		39	32	29	31	29	29	39	37	34	27	28	28	B	28	G
7	G	G	G	B	G	B	B	26											G	B	G	B	B	B
8	B	G	G	G	G	B	G	26	28	31			40	42	50	43	29	57	31	G	G	B	B	G
9	G	G	G	G	G	G	G		30	30	44	31		31	30	30	48	32	28	G	G	B	G	27
10	G	G	G	B	G	G	B	G	30	33	41	30	28		30	29	G	G	G	G	G	G	G	G
11	G	G	G	G	G	G	G		30	32		42	50	40	28	35	34	G	G	G	G	24	G	G
12	G	G	G	G	G	G	G	G	G		35	44	50	57	41	55	40	57	52	48	34	G	28	G
13	B		27	28		43		36	32	42	41	45	44	34		40	29	27	G	G	G	G	G	B
14	G	G	G	G	G	G	G	G		36	72	29	28					46	G	43		28	G	G
15	G	G	G		G	G	B	26	34	41	46	54	29	28	29	28	G	G	G	25	58	59	41	G
16	G	29	G	G	35	G	25	29	31	26	35	28	31	27	44	44	44		30	28	G	29	G	49
17		25			G	G	G		30	32	42	40	40	50	52	72			52	60	72	32	30	29
18	29	27	G	G	G	G	G		33	41	46	52	39	39	48	27	35	28	G	G	B	G	34	29
19		34	30	G	G	34	55	50	40	46	30	39	60		27	G	G	38	50	30	G	G	30	32
20	32	G	29		27	G	23	32	29	29	34	30	36	35	30	22	37	G	27	29	33	G		53
21		24	27	26	G	G	G	24	28	34	38	40	41	30	29	G	29	35	28	G	G		29	26	27
22	28	45	G	29	30	25	G		29	33	42	39	31	50	54	24	G	G	G	G	G		30	34	32
23	G	G	G	G	30	G	G		36	34	34		54		43	G	36	41	56	G	29	33	29	G
24	32		30	G	35	28	28		39	27	27	G	27	G	G		30		50	42	41	31	27	G
25	34	G	29	G	B	B	G	G	30	30	32	39	38	44	40	49	77	54	43	40	42	32	41	28
26	29	28	G	46	33	G	27	28	29	32	31	29	33	40	29	29	G		G	G		33	34	30
27	G	G	G	23	29	G		34	30	34	41	30	G	29	26	29	29		G		42	34	28	28
28	G	G	G	B	G	G	G		41	31	34	33	44	42	42	45	54	55	52	34	49	26	G	G
29	G	G	G	G	27	G	G	25		31	28	27	24	28	26	29	G	29	G		30	38	29	
30	G	G	G	G	G	G	G		30	29	28	30	30	28	26		G	G	G	23	32	27	G	G
31	G	G	G	G	B	B	B	G	34	29	32		37	31	29	26	29	G	23	G	G	28	29	G
	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	24	28	25	24	20	26	29	28	27	29	26	28	27	28	24	29	27	27	27	28	28
MED	G	G	G	G	G	G	G	26	30	33	36	39	37	36	30	30	30	32	27	G	26	28	28	13
U Q	29	24	G	12	28	G	24	31	34	37	42	44	47	42	42	43	38	43	37	30	41	32	30	29
L Q	G	G	G	G	G	G	G	G	29	30	32	30	30	29	29	27	G	G	G	G	G	G	G	G

COMMUNICATIONS RESEARCH LABORATORY, JAPAN

HOURLY VALUES OF fmin AT KOKUBUNJI

DEC. 1996

LAT. 35.7N LON. 139.5E SWEEP 1MHz TO 25MHz AUTOMATIC SCALING

D \ H	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	15	14	15	14	14	15	16	14	15	15	14	15	15	15	14	14	15	14	14	14	15	14	14
2	14	15	15	14	15	B	14	20	15	15	15	15	15	15	14	14	15	15	14	15	15	15	14	14
3	15	15	14	15	15	15	14		15	14	15	14	15	14	14	15	15	14	14	14	15	14	14	14
4	15	15	14	15	15	B	14	14	14	14	15	14	15	15	15	15	21	14	B	15	14	14	15	15
5	15	14	14	14	14	15	16		14	14	14	14	14	14	15	14	14	15	15	15	B	20	15	14
6	14	14	14	B	14	14	B	14		14	14	14	15	15	15	15	15	14	14	15	14	B	15	14
7	15	15	14	B	14	B	B	16	15										16	B	15	B	B	B
8	B	15	15	15	15	B	16	14	14	15	16	14	14	16	15	15	15	15	15	18		B	B	15
9	16	15	14	14	15	14	15	17	14	14	14	14		18	14	14	15	14	15	15	14	B	16	14
10	15	15	14	B	14	14	B	18	14	15	15	16	16		15	14	17	16	15	16	15	14	15	14
11	16	15	14	14	15	14	17	15	20	14	15	14	15	14	15	14	15	15	15	15	15	14	17	15
12	15	14	15	14	14	16	15	16	24	15	15	15	16	15	16	14	14	15	14	15	14	16	15	14
13	B	14	14	14	14	15	15	15	18	15	14	15	14	16		14	14	14	14	15	14	18	20	B
14	14	15	14	15	15	15		15	15	15	14	15	14					15	16	14		15	14	15
15	14	14	14	14	14	14	B	15	14	15	14	15	15	15	14		16	15	14	14	14	15	14	15
16	14	14	14	14	14	15	15	14	14	15	15	15	16	16	15	15	15		14	15	22	14	16	15
17	14	14	14	15	15	15	16		15	15	14	15	16	16	15	14	14	15	14	15	15	14	14	15
18	14	14	15	15	14	15	16	14	14	15	17	16	17	14	14	18	14	15	15	15	B	16	15	15
19	15	14	14	14	15	14	15	14	14	15	15	18	18	15	14	16	17	15	15	14	20	15	15	15
20	14	15	14	14	14	16	14	15	15	15	14	16	14	18	15	15	15	15		15	14	14	14	15
21	14	14	14	15	15	15	16	16	21	16	15	15	16	16	14		14	15	15	17	17	15	15	14
22	14	15	14	14	15	15	14	15	16	18	14	15	15	14	15	14	21	16	15	15	14	15	15	15
23	16	16	15	14	14	14	15		14	14	15	16	22	14	15	15	14	15	15	17	14	14	14	14
24	15	14	15	14	14	14	14	14	15	15	18	17	21		32	15	15	15	14	15	15	14	16	16
25	14	14	14	14	B	B	14	16	16	18	22	24	20	18	16	15	15	15	15	15	14	14	14	14
26	14	15		14	14	15	14	15	14	17	14	17	15	15	14	14	21	14	14	14	14	15	15	14
27		14	14	14	14	14	14	14	14	14	14	14	15	18	14	14	14		14	15	14	15	14	15
28	16	14	15	B	15	14	14	15	15	14	15	14	15	16	16	15	14	14	14	14	14	14	15	14
29	17	14	14	14	15	14	14	16	15	15	14	18	18	16	14	14	21	15	15	14	14	14	14	15
30	15	14	15	14	14	15	14		14	15	14	18	18		15	15	15	15	15	15	14	14	15	14
31	15	14	14	14	B	B	B	16	15	14	16	14	15	15	14	15	14	15	16	14	15	14	14	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	28	31	30	27	29	25	25	26	30	30	30	30	29	26	28	27	29	28	29	30	27	27	29	29
MED	15	14	14	14	14	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	14	14	15	14
U Q	15	15	15	15	15	15	15	16	15	15	15	16	16	16	15	15	15	15	15	15	15	15	15	15
L Q	14	14	14	14	14	14	14	14	14	14	14	14	15	15	14	14	14	14	14	14	14	14	14	14

COMMUNICATIONS RESEARCH LABORATORY, JAPAN

HOURLY VALUES OF foF2 AT YAMAGAWA

DEC. 1996

LAT. 31.2N LON. 130.6E SWEEP 1MHz TO 25MHz AUTOMATIC SCALING

D \ H	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
1		A	A	59			A	28			70	70	70	68	66	58	70	54	A	49	41	A	79	N
2	32	35	38	A	32		A	42	32		62		84	66	62			52	A	69	32	A	N	
3	A	A	A	A	32		44	32		59			81	86	87		72	53			B		32	
4			32	37		N		41		62		80	61	66	73	71	77			25		59	N	
5		32				31	A		43		76	72		50	68	75	73			53		34		
6	B	89	A		29	A	N	49		53	57	72		66	65	A	A		A	A	A	A	30	N
7	A	A	A	N	A		A	A	A	B	A	B		A	A	A	A		A	A	A	A	A	A
8	B	A	A	A	A		A	A		B		B	B	A	B	A	B	A	A		B	B	N	
9	A	32	B	A	A	32		N	A	B	B	B	B	B	B	B				A			B	B
10		B	B	B	B		B	B	A	71	60	56	82	61	58	60	50	54		49		69	79	
11	N	89	N			59	59		59	69	74	79	79	86	84	72			22				N	49
12	N	89			A		B	69		53	52	66			57	67			53	A	A	32		
13	A	69			32		59	54			72	72	78		59	66	65	67			A	49	42	
14	A	N	N	25	A	39	A	69		72	66	67	66	66		71	69	66		A	A	A	A	A
15	28	A	38	A			N	A	27		70	83	91			60	66	69	A	A		32		79
16	A	A	A	32	A	31		A	66	A	70	73	67	66	66			A	A	A	A	A		59
17	30			40	40	32	28	A	39	57	66		84		62	54	82		A	A	32		N	A
18	A	A	59		30	30			61		72	83	86	87	84	66	73		A	36				
19	30		34	28	A	A		A	73	A	74	70	A		124	110	93		32		A	69	31	30
20		A	69	30	37			24		84		68	69	83		69	60	52	52	31		31		A
21	A	A	A	25			31		60	63		71			60	54	72	65		A	A	30	A	25
22	N	A	28	26	32	A	A	A	82	59	53		81	72	67	62	A	52	A		A	31		30
23	35	N	A	A	59	60	30				74	70	73	71			83	74		32	32	25	31	A
24	25	30		A	29	29	30		52	73	83		64	67	58	66	68			31	31		59	N
25	39	A		30	29	A	30	30	62		63	57	71		72	58	68	66		48		A	A	
26	20			47	A	28		37		62	72	72	67	57	62	55	66	53	A	65		49	A	49
27				59	N	N	N		53	61	66	69	71	66	58	55	77	54	54	31	A	N	N	N
28	31	A	A	30		49	30	40			57	62	74	67		66	71	71	A	A	A	A	A	30
29	A	A	N		53	B	49		31	53	58		67	68	66	48	51	54	52	32	A	49	N	N
30		A	69	A	25	A	A	A	25	53		60			62	60	51	53	A	A	A	A	69	A
31	A	A	A	59		A		28		64	64	71	68	67	58	66		51	53	32		34		B
	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	13	11	10	13	15	17	23	22	22	20	23	23	21	18		14		14		
MED				31	32	32	30	40	53	62	66	70	72	67	65	66	70	54		34		34		
U Q				47	38	49	49	51	62	70	72	72	81	71	72	69	75	66		49		49		
L Q				28	29	30	30	29	32	55	60	67	67	66	59	58	65	53		31		31		

HOURLY VALUES OF fEs AT YAMAGAWA

DEC. 1996

LAT. 31.2N LON. 130.6E SWEEP 1MHz TO 25MHz AUTOMATIC SCALING

D \ H	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		27	30	30	32	26	28	27		29	30	30	46	48	45	39	30	29	36	39	39	32	G	G
2		28	28	31	28	28	29	G	30	33	56		35	46	67	36		38	28	39	37	28	24	23
3	27	32	32	32	G	G	G	G	38	39	45	43	56	120	71	39		26	30	25	B	G	G	
4	28	30	26	28		G	G	30		32	31	34	32	38	38	30	32	27	22	G	G	G	G	G
5	G		G		G	25	30	36		31	30	45		37	37	37	32	28	23	G	28	G	G	G
6	B	G	26	G	25	30	29	23	32			36		37	31			32	32	28	29	29	28	29
7	28	29	29	30		G	29	32	34	B	54	B	G	74	78	60	69	G	31	32	28	29		25
8	B	45		31	35	G	25	32	G	B	G	B	B	70	B	54	B	28	29	G	B	B	G	G
9	30	G	B	31	32	G	G	G	29	B	B	B	B	B	B	B	G	G	G	28	G	G	B	B
10	G	B	B	B	B	G	B	B	29	30	30	36	36	72	50	58	31	32	G	G	G	G	G	G
11	G	G	G	G	G	G	G	G	30	30	31		44	50	45		28		26	G	24	G	G	G
12	G	G	25	31			B	G	26	31	36	30	48	48	56	53			23	25		G	G	G
13	22	G	25	24	24	G	G	24	30	31	31	37	30		45	36	30	38	50	26	27	G	G	G
14	24	G	G	G		50	58	27	29	32	36	29	38	30	27	32	25	27	61	30	48		28	25
15	33	32	26	39	G	G	G	24	31	31	33	47	30		39	38	28	28		30	27	28	25	
16	32	32	28	30			25	46	39	48	43	48	51	54	51			55	92		37	32	G	28
17	G	G	G	G	24	G	G	26	31	34	36		51	52	51		42	72	59	58	48	32	32	32
18	33		32	28	34	G	G	25	30	34		67	46	31	30	36	26	40	30	24	G	25	24	G
19	G	24	28	28	30	32	G	25		58		39	95	31	30		31	28	31	25	33	G	G	G
20	G		28	27	26		G	G		32	30	30	30	30	30	28	30	39	25	26	G	G	G	28
21		45	40	G	G	25	25	G		32	38	38	33	54		32	42	37	32	32	28	32	37	32
22			32	44	37	30	38	38	27	32	50	30	36	37		40	80	48	33			34	28	24
23	31	30	32	30	29	G	G	G	30	30	36	61		61	37	36	35	30		30	28	24	32	26
24	32	26	34	34	33	27	G	G		38	38	32	30	31	30	37	38	32		49	G		27	29
25	58	32	28	30	36	25	25	G	43		34	38	32	31	36	45	30	29	29	32	48	48	37	44
26		28	30	25	29	26	24	G		30	36	29	30	32	33	31	48	51	91	104		54	39	27
27	27	26	24	25	25	24		G	30	38	33		30	34	32	30	45	26	G	32	25	G	G	G
28	G		25	27	G	G	G	G		38	36	35	56		69	37	30	32	32	34	32		30	30
29	27	28	26	G	G	B	G	G	26	31	32	31	26	31	26	30	29	27	25	G	30	25	G	
30	G	32	G		25	25	23	25	31	32		30	31	30	38	34	30	26	50	32	32	32	27	27
31	34	26	29	30	G	24	G	G	27	33	30	38	36	26	29	30	30	28	G	G	24	33	G	B
	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	24	25	28	28	25	27	28	30	22	26	26	24	26	27	27	25	25	29	28	29	26	27	29	26
MED	27	28	28	29	25	24	G	12	30	32	35	36	36	37	38	36	30	29	30	28	28	25	G	24
U Q	31	32	30	31	32	26	26	27	31	34	38	41	46	54	51	39	40	38	34	32	33	32	28	28
L Q	G	G	25	24	G	G	G	G	29	31	31	30	30	31	30	31	29	27	24	12	24	G	G	G

COMMUNICATIONS RESEARCH LABORATORY, JAPAN

HOURLY VALUES OF fmin AT YAMAGAWA

DEC. 1996

LAT. 31.2N LON. 130.6E SWEEP 1MHz TO 25MHz AUTOMATIC SCALING

D \ H	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	15	14	14	14	14	14	14	14	15	16	17	16	16	16	15	14	14	14	14	14	14	18
2	15	14	14	14	14	14	14	14	14	14	16	16	15	15	15	14	14	14	14	14	15	15	14	15
3	15	14	14	15	14		15	14	15	17	15	16	18	17	14	14	14	16	14	14	B	14	14	15
4	14	14	14	14	14	16	15	14		14	15	15	15	14	14	14	14	14	18	15	15	15	14	18
5	18	15	15	14	14	14	16	14	14	15	15	15	16	16	15	14	14	14	14	14	14	14	14	15
6	B	15	14	14	14	15	14	14	14	14	16	16		15	15		42	18	16	17	16	17	14	15
7	17	15	16	15	15	15	15	17	18	B	42	B		44	44	45		21	21	16	16	16	17	15
8	B	17	16	14	15	18	18	17		B	48	B	B	49	B		B	21	15	18	B	B	14	
9	18	16	B	17	15		15			B	B	B	B	B	B	B	49	18	20	15		18	B	B
10	17	B	B	B	B		B	B	22	14	15	14	17	14	17	14	14	14	14	14	14	14	15	18
11	14	14	14	14	14	14	14	14	15	14	15	15	15	16	15	15	14		14	14	14	16	15	14
12	15	14	14	14	14	14	B	14	16	14	15	16	16	16	16	14			15	14	18	14	14	15
13	15	14	14	14	14	15	15	14	14	14	14	15	16		15	17	14	14	14	15	15	15	14	14
14	15	14	15	14	14	14	14	14	14	15	16	15	15	16	14	16	14	15	15	14	14	14	14	14
15	15	14	14	14	14		14	15	14	14	15	17	16	16	14	14	14	15	14	14	15	14	14	14
16	14	14	14	14	14	14	14	14	14	15	15	17	17	16	16	15	14	14	14	14	14	14	14	14
17	15	15	14	24	14	14	14	14	14	14	15	15	16	15	16	16	14	14	14	15	14	14	15	14
18	14	14	14	14	14	14	14	14	14	14	15	16	16	16	15	15	14	14	14	15	14	15	14	15
19	14	14	14	14	15	14	15	14	14	14	16	17	16	18	17	16	15	14	15	14	15	14	14	15
20	14	14	14	14	14	14	14	14	16	14	15	16	16	17	17	17	14	15	14	14	14	14	14	15
21	15	14	14	14	14	14	14	15	14	15	14	16	16	15	17	15	15	15	14	14	14	14	14	14
22	14	14	14	14	14	14	14	14	14	15	14	15	15	14	15	15	14	14	14	14	14	14	14	14
23	14	14	14	14	14	14	15	14	14	14	14	16	14	16	15	15	14	14	14	14	15	15	15	14
24	14	14	14	14	14	14	14	14	15	15	15	16	17	17	15	16	15	15	14	14	14	14	14	15
25	14	14	14	14	14	14	15	14	14		15	15	17	17	14	15	14	17	14	14	14	14	14	14
26	14	14	14	14	14	14	14	14	14	15	16	16	18	20	17	18	14	14	14	15		14	15	14
27	14	14	14	14	15	14	14	14	14	15	15	14	15	15	15	15	14	17	15	14	16	15	17	15
28	14	14	14	15	14	14	15	14	16	14	16	15	17	17	16	15	14	14	15	14	15	14	14	14
29	14	14	14	14	14	B	15	14	16	15	15	15	14	15	14	14	14	17	14	14	15	14	18	14
30	14	14	14	14	14	14	16	14	14	14		15	16	16	17	14	14	16	15	14	14	14	14	14
31	14	14	14	16	14	14	14	15	15	14	15	15	14	15	16	15	14	15	14	14	14	14	71	B
	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	30	29	30	30	26	29	29	28	27	29	28	27	29	29	28	28	29	31	31	27	30	30	28
MED	14	14	14	14	14	14	14	14	14	14	15	16	16	16	15	15	14	15	14	14	14	14	14	14
U Q	15	14	14	14	14	14	15	14	15	15	16	16	17	17	16	16	14	16	15	15	15	15	15	15
L Q	14	14	14	14	14	14	14	14	14	14	15	15	15	15	15	14	14	14	14	14	14	14	14	14

HOURLY VALUES OF foF2 AT OKINAWA

DEC. 1996

LAT. 26.3N LON. 127.8E SWEEP 1MHz TO 25MHz AUTOMATIC SCALING

D \ H	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
1	A	A	B	A	37		A	69		72		83	77	70	61			76	48	B	56	A	A	B
2	B	59	31		A	A	B		63	68	64		80	92	84	89	100		A	89		44		B
3	B	26		58	56	B	56					90	69	80	103	104		A	A	A	B	56		A
4	A	A	A	56	57	A	B	A	49	56		96				98		67	69	A	A		38	A
5	56	B	A	29			B	59	52		83	83		68	68	66		A	A	A	44	38	35	B
6	B	B	59	N	56	B	B	59	48	58		81	83		83	93	81			A	A	A	A	56
7		69	36	32		89	B	49	46	52	A	62	A		97	84	91		47	A	N	B	32	
8	56	B	B	22	B		B		53		64	58	60		91			60		A	56	A		
9		34		38	37		B	38		59	61	59	60	68	73	A	82	82	86	A	A	69	59	
10	B	N		B	36	B	B	69	63	81	71	65	81	79		65	64	66	52		59	65		B
11	N	58		N		B	55		60	60	56	60	73		116	89	71		A	60	52	58	B	
12	A	N		49		A	B	46	52	57	68		76	72				A	A			56	46	
13	B	41	38		65	N	A	58	53	68			70			67		84		A				44
14		29		55	47	N	B		A	71	69		92	86	83	72			56	A	A	A	A	A
15	B	B		59		A	A	A	53	N	84	73			86	86	92		A	A	36	35	31	35
16	38	31	A	A	36	A	B	59		63		83	70	82			68	74	A	A	A	A	30	
17	69	B	31	29	30	B	59		59	67	67		82	100		81	96	118	87	A	57	58		
18	B	B	A	A	35	B	N	89	68	74	94	91	111		149	110	103	93		A	A			56
19	B	B	59	49	59	23	B	89			84		117	146		128	110	114	68	A	45		A	
20	B	B	N	B		B	B	36		68	83		71		107	81	80		57		36	37	38	
21	B		49		A	38	B	44		73	72	64	68	63		60	70		A	A	A	46		B
22	A	A	A	31	38		A	36	43			70	76	80	82	91	97		A	A	A	A	A	A
23	B		38				28			79	81	68	76		96	96	82	92			75	78	46	
24	B	B	29	31	A	29	B	79	59	74	76		91	86	84	83	93	84	A			B	38	B
25	B		A	56	A	A	B	A	75		90			112	118	91	90	120	84	A	86	80		47
26	47		A	68	42	30		A	54	57	66		71	68	65	59	56	54	A	89	A	A	38	B
27	56	B	N	B	B	B	B	59	56			62		83		84		73		36	A	35		B
28	N	B	B	A	28	A	B	69	70	68		57		82	78	70	62	66	A	A	46	A	B	B
29	B	B	B	B	B	B	B	46	50	59	59	56	82	80	A	63	49	66	A	A	59	A	B	B
30		A	A	A	A	59	B	A	41		58	56	62	79		70		60		A	43	44	57	B
31	35	35	A	A	B	B	A		56			50	67	N	A	62	60	56		A	A	B	69	B
	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				15	15			18	22	21	20	21	24	20	19	26	21	19	10		14	15	13	
MED				49	38			59	54	68	70	65	76	80	84	84	82	74	62		54	56	38	
U Q				56	56			69	60	72	83	83	82	86	103	91	94	92	84		59	65	51	
L Q				31	36			46	50	58	64	58	69	71	78	67	66	66	52		44	38	33	

HOURLY VALUES OF fEs AT OKINAWA

DEC. 1996

LAT. 26.3N LON. 127.8E SWEEP 1MHz TO 25MHz AUTOMATIC SCALING

D \ H	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	26	B	36	G	25	29	25		36	38	32	36	32	46		38	32	26	B	G	37	41	B
2	B	G	G	34	39	27	B	G	30	28	42	47	46	41	47	47	68	43			G	G	G	B
3	B	G		G	G	B	G	G		32	42	64	53	55	73	69	72	73	39	40	B	G	G	32
4		34	33	23	G	24	B	24		31	34	42		51	52	38	G	30		41	29		G	26
5	G	B	37	G	G	G	B	23	33	38	43	46	62	59	59		35	66		36	G	G	G	B
6	B	B	G	G	G	B	B	24		50	38	50		44	44	39	60			51	39		38	35
7	G	G	G	G		G	B	G	32	38	56	36	61		36	36	68	32	G	26	G	B	G	G
8	G	B	B	28	B	G	B	G	G	34	34	43		32	38	40		60	55	34	G	25	G	G
9	G	G	G	G	G	G	B	G		36	39	48	52	47	48	74	60	42	32	40	26	G	G	G
10	B	G	G	B	G	B	B	G		52	46	50	38	44	46	43	31	27			G	G	G	B
11	G	G	G	G	G	B	G	G	27	26	34	36	36	56	48	45	42		33	40	G	G	B	G
12		G	G	G		32	B	G		29	44	51	31	34	46	40	68		55	G	G	G	G	G
13	B	G	G	G	G	G	23	47	33	34			40	40	44	36	33	58	41	36	G	G	G	G
14	G	G	G	G	G	G	B	G		30	36	35	43	41	40	35	34	23	28	30	34	39	74	34
15	B	B	G	28	25		29		33	36	37	41	42	42	40	43	35		39		23	G	G	G
16		30		34	68		B	G		47	34	33	37	45		63	60	34			92	39		G
17	G	B	G	G	G	B	G	38	48	36		50	94	63	41	86	52	44			28	26	G	G
18	B	B	49	38	27	B	G	G		33	36	40	44	37	38	38	48	39	25	37	28	25	G	G
19	B	B	G	G	G	G	B	G	28	37	41	38	40	37	37	34	38	G	42	49	26	G	38	G
20	B	B	G	B	G	B	B	G		38	34	32	N	39	36	28	24		31	G	G	G	G	G
21	B	G	58	G	27	G	B	G	27	34	36	35	42		36	48	36	47	57		28	24	27	B
22	25			28	36	G			29	36	34	30	39	39	35	34	34		48	69		41	32	31
23	B	G	G		G		G	G		26	46	58	48	70	40	70	66	70		39	G	39	24	G
24	B	B	G	25	37	25	B	G	30	28	41	38	34	37	36	38	41	35	34	G	G	B	G	B
25	B	G	37	32	26	26	B	26	22	32	42	42	37	35	39	60	38	60	70		35	24	G	G
26	G	G	49	27	40	G	G		31	36	39	36	41	40	34	41	38	34	74	94	62	42	G	B
27	G	B	G	B	B	B	B	G		34	34	36	36	36	41	35	25	G	11		37	G	28	B
28	G	B	B	32	28	24	B	G	23	32	38	40	49	39	48	46	42	40	34	41	29	45	B	B
29	B	B	B	B	B	B	B	G	23		36	38	37	53	58	65	56	56		45	29		B	B
30	G		27	27		G	B	27	34	37	38	37	35	38	36	36	36	29	33	38	27	G	28	B
31	37	25	32	32	B	B	24	G	45	38		38	40		97	50	36	30		46	26	B	G	B
	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	17	24	26	24	18	10	28	18	30	28	30	27	28	30	29	30	25	21	22	29	25	27	19
MED	G	G	G	24	G	G	G	G	30	35	38	39	40	40	41	41	38	39	34	40	26	G	G	G
U Q	G	13	32	32	27	25	24	23	33	37	42	47	48	49	48	55	60	57	51	45	29	38	28	26
L Q	G	G	G	G	G	G	G	G	27	32	35	36	37	37	37	36	35	30	29	34	G	G	G	G

COMMUNICATIONS RESEARCH LABORATORY, JAPAN

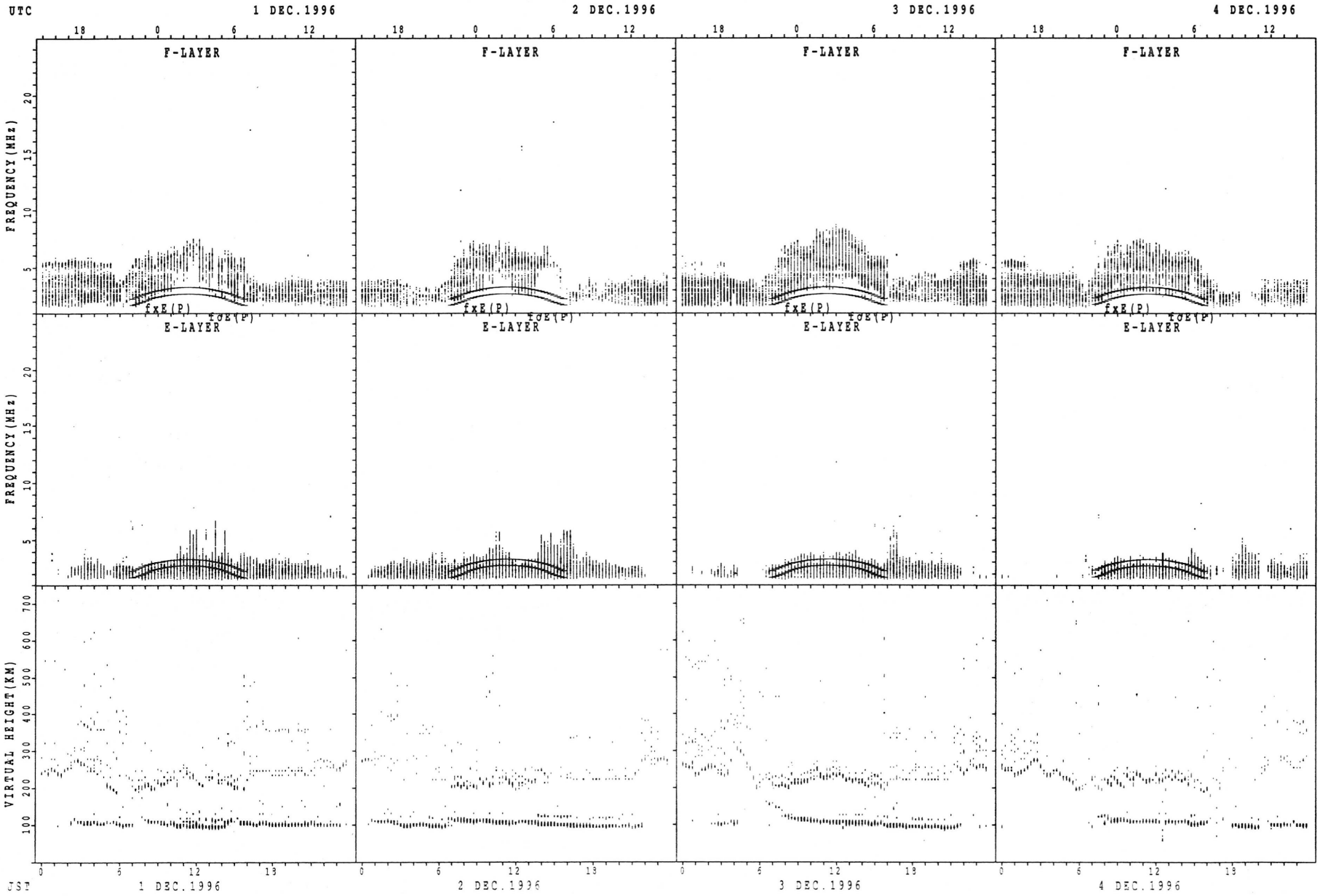
HOURLY VALUES OF fmin AT OKINAWA

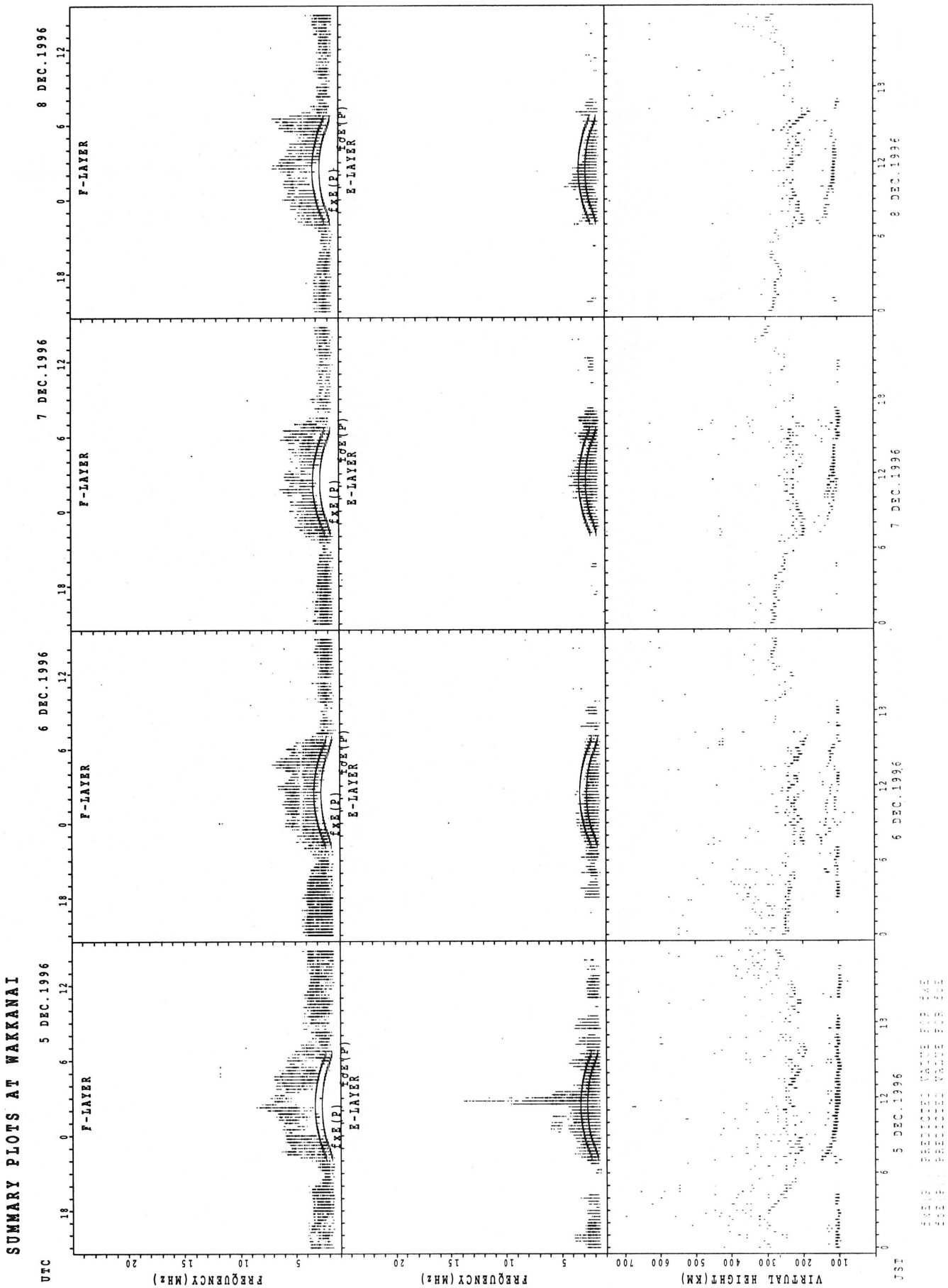
DEC. 1996

LAT. 26.3N LON. 127.8E SWEEP 1MHz TO 25MHz AUTOMATIC SCALING

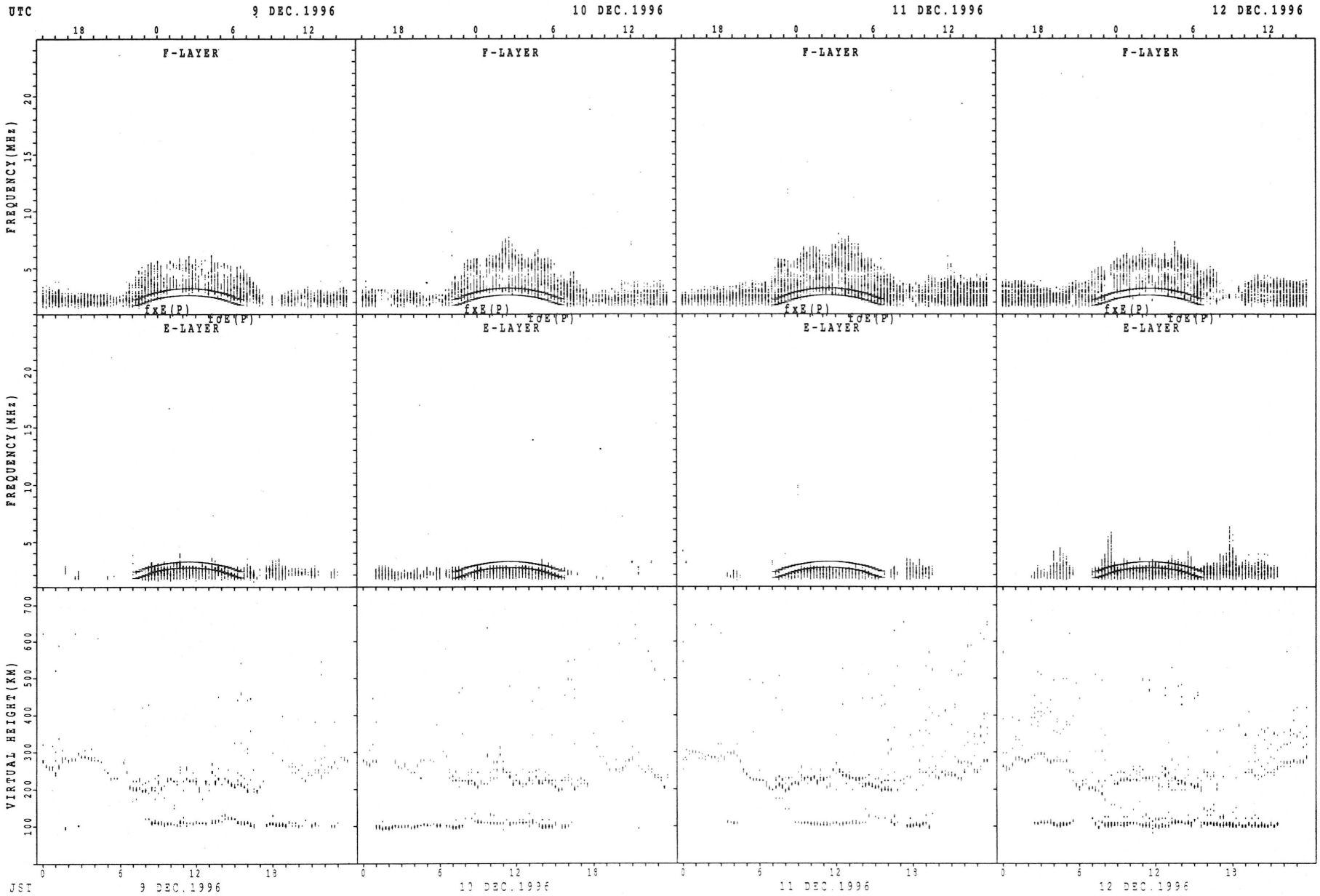
D \ H	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
1	15	14	B	15	14	15	14	14		17	18	23	18	17	16	16	15	15	14	B	17	15	14	B
2	B	18	14	15	14	16	B	15	15	15	16	16	16	17	15	15	14	14	14	14	16	15		B
3	B	16		15	16	B	16	15	18	14	15	16	21	18	15	17	15	14	14	14	B	14	16	15
4	14	14	15	14	14	15	B	15	15	14	15	17	16	14	15	14	16	15	14	14	14		16	15
5	15	B	14	15	15	16	B	15	14	14	15	16	16	16		15	15	14	14		15	14	15	B
6	B	B	15	14	15	B	B	15	14	14	15	16	15	15	14	14	14			14	14	14	15	16
7	17	16		15		14	B	14	14	14	15	15	17		15	14	14	14	14	14	16	B	14	
8	15	B	B	15	B	14	B	15	14	14	15	15			16	15	14	15	14	14	17	14	15	17
9	16	18	15	14	15	16	B	14		14	15	16	16	15	15	15	14	15	14	15	18	14	15	
10	B	15	15	B	16	B	B	15	14	14	15	18	21	17	16	14	15	14	14		15	16	15	B
11	14	15	16	15		B	16	14	14	14	16	18	16	17	17	15	14		14	14	29	16	B	18
12	14	16	15	15		15	B	14	16	14	14	17	16	17	17	14	15	14	14	15	16	15	17	
13	B	17	15	15	15	17	16	18	14	14			17	17	17	15	14	14	14	14		20		16
14		14	15	14	14	14	B	18	14	14	16	17	21	16	17	16	14	14	15	14	15	15	15	15
15	B	B	15	15	15	14	14	14	14	15	15	15	16	16	16	14	14		15	15	15	15	15	21
16	14	14	14	14	14	14	B	14		18	15	17		28	15	15	14	16	14	15	14	14	14	
17	16	B	15	14	15	B	16	14	14	14	15	15	16	17	15	15	15	14	14	14	14	15	15	15
18	B	B	15	15	15	B	14	14	14	14	15	21	16	20	18	15	15	14	15	15	18	15	16	15
19	B	B	16	15	15	15	B	14	14	14	17	17	17	18	15	14	15	22	14	14	18	17	14	22
20	B	B	16	B	16	B	B	15	15	14	16	17	22	18	22	15	14		14	15	16	14	15	14
21	B	17	15	15	14	15	B	15	14	14	16	16	17	20	17	16	15	14	14	14	14	14	14	B
22	14	15	14	14	14	15	15	14	15	14	15	16	16	16	15	15	15		16	15	15	15	16	15
23	B	16	18	15	15		15	14	15	14	15	15	15	16	16	15	14	14		15	15	16	15	20
24	B	B	15	14	15	16	B	14	14	14	15	21	17	18	16	16	15	15	14	14		B	17	B
25	B	18	16	14	14	15	B	14	15	16	15	17	17	17	17	15	15	15	14	14	15	16	16	16
26	14	15	15	15	16	15		14	14	14	14		16	18	17	15	16	16	14	14	16	15	15	B
27	16	B	14	B	B	B	B	14	20	16	15	18	18	17	14	14	15	18	14	15	16		15	B
28	16	B	B	15	14	16	B	14	23	16	20	17	21	27	16	14	15	14	14	15	15	15	B	B
29	B	B	B	B	B	B	B	15	14	15	15	16	17	15	15	14	14	14	14	14	15	16	B	B
30	15	14	14	16	14	15	B	14	14	14	15	17	17	16	16	14	14	14	14	15	15	14	15	B
31	15	16	16	14	B	B	15	15	15	14		15	15	15	15	14	14	14		14	16	B	15	B
	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	16	19	25	27	24	20	10	31	28	31	29	29	29	29	30	31	31	26	28	28	28	26	26	15
MED	15	16	15	15	15	15	15	14	14	14	15	17	17	17	16	15	15	14	14	14	15	15	15	16
U Q	16	17	15	15	15	16	16	15	15	15	16	17	17	18	17	15	15	15	14	15	16	16	16	18
L Q	14	14	14	14	14	14	14	14	14	14	15	16	16	16	15	14	14	14	14	14	15	14	15	15

SUMMARY PLOTS AT WAKKANAI

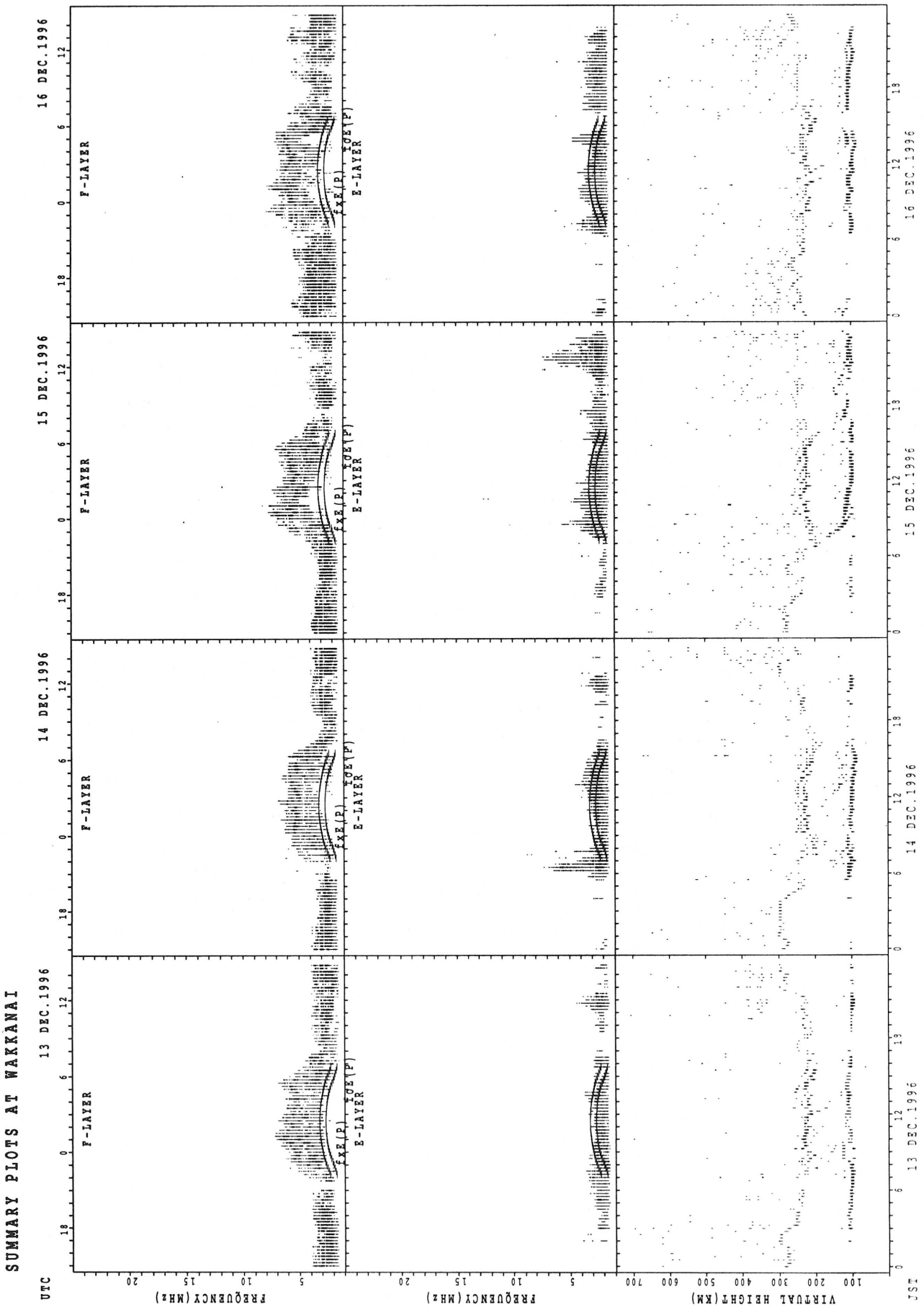



SUMMARY PLOTS AT WAKKANAI
UTC
JST
5 DEC.1996
6 DEC.1996
7 DEC.1996
8 DEC.1996
F-LAYER
E-LAYER
fxE(P)
foE(P)
FREQUENCY(MHz)
VIRTUAL HEIGHT(KM)

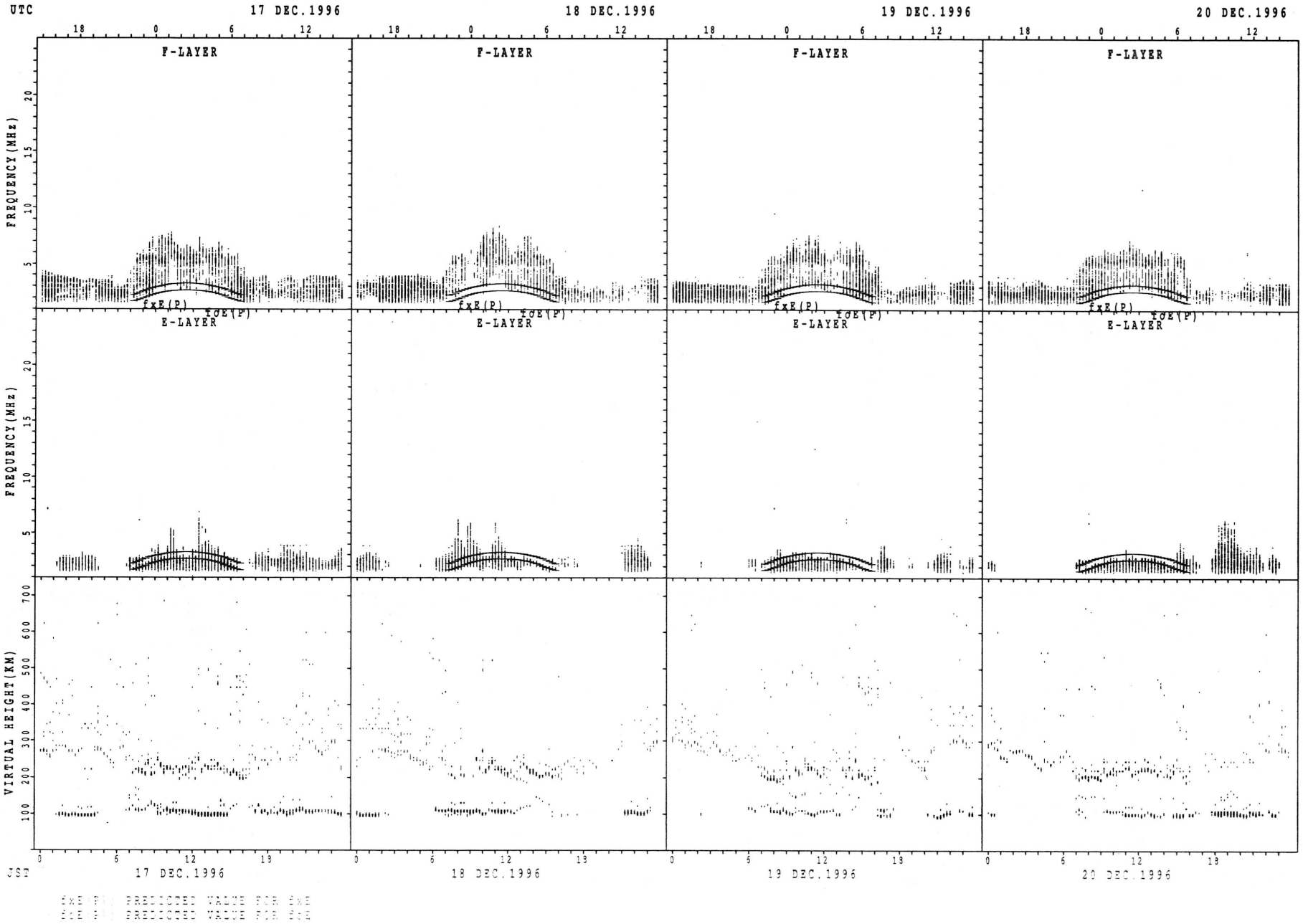
SUMMARY PLOTS AT WAKKANAI

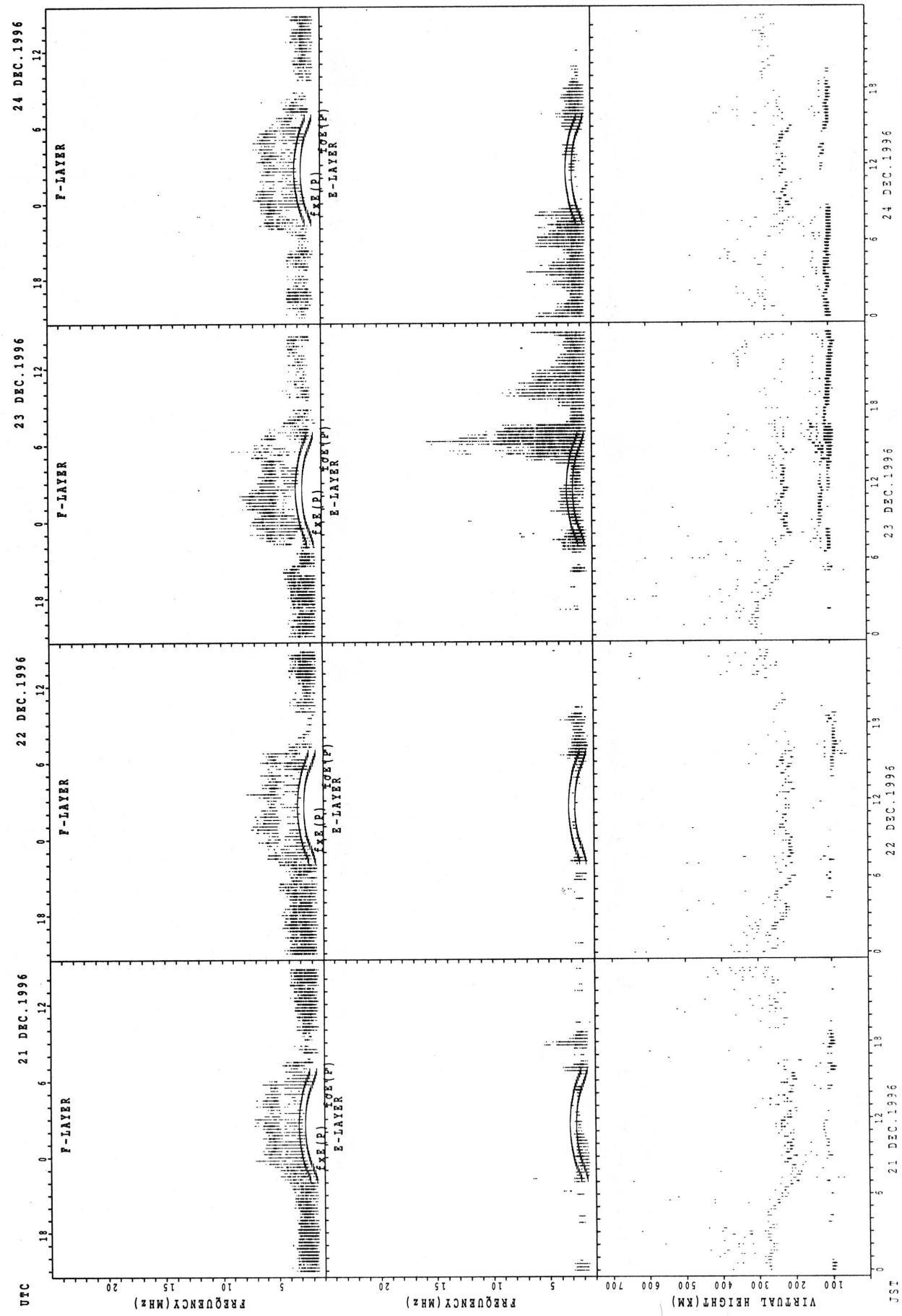


fxE(P): PREDICTED VALUE FOR fxE
fσE(P): PREDICTED VALUE FOR fσE

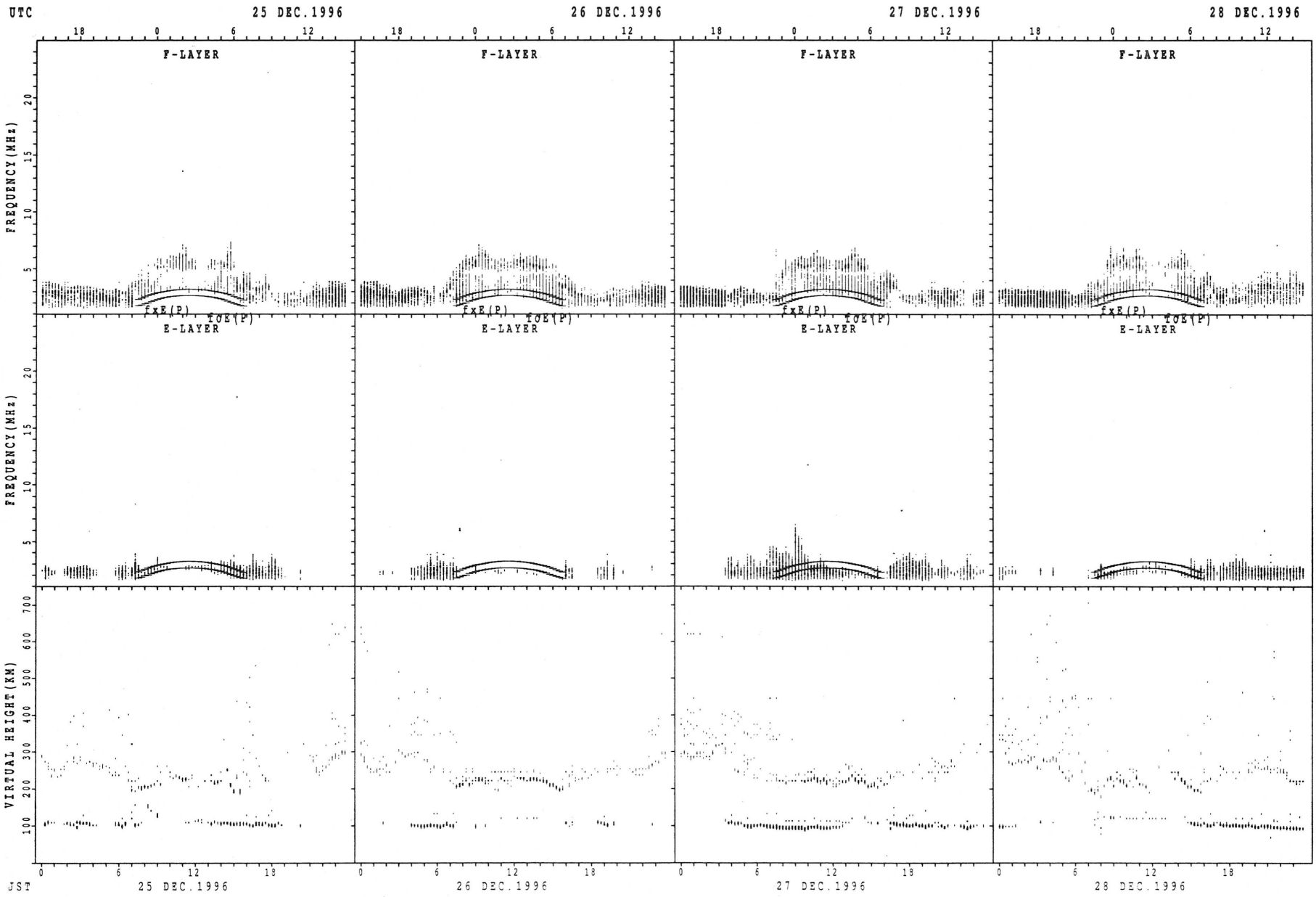

SUMMARY PLOTS AT WAKKANAI
UTC
JST
13 DEC.1996
14 DEC.1996
15 DEC.1996
16 DEC.1996
F-LAYER
E-LAYER
FREQUENCY(MHz)
VIRTUAL HEIGHT(KM)

SUMMARY PLOTS AT WAKKANAI

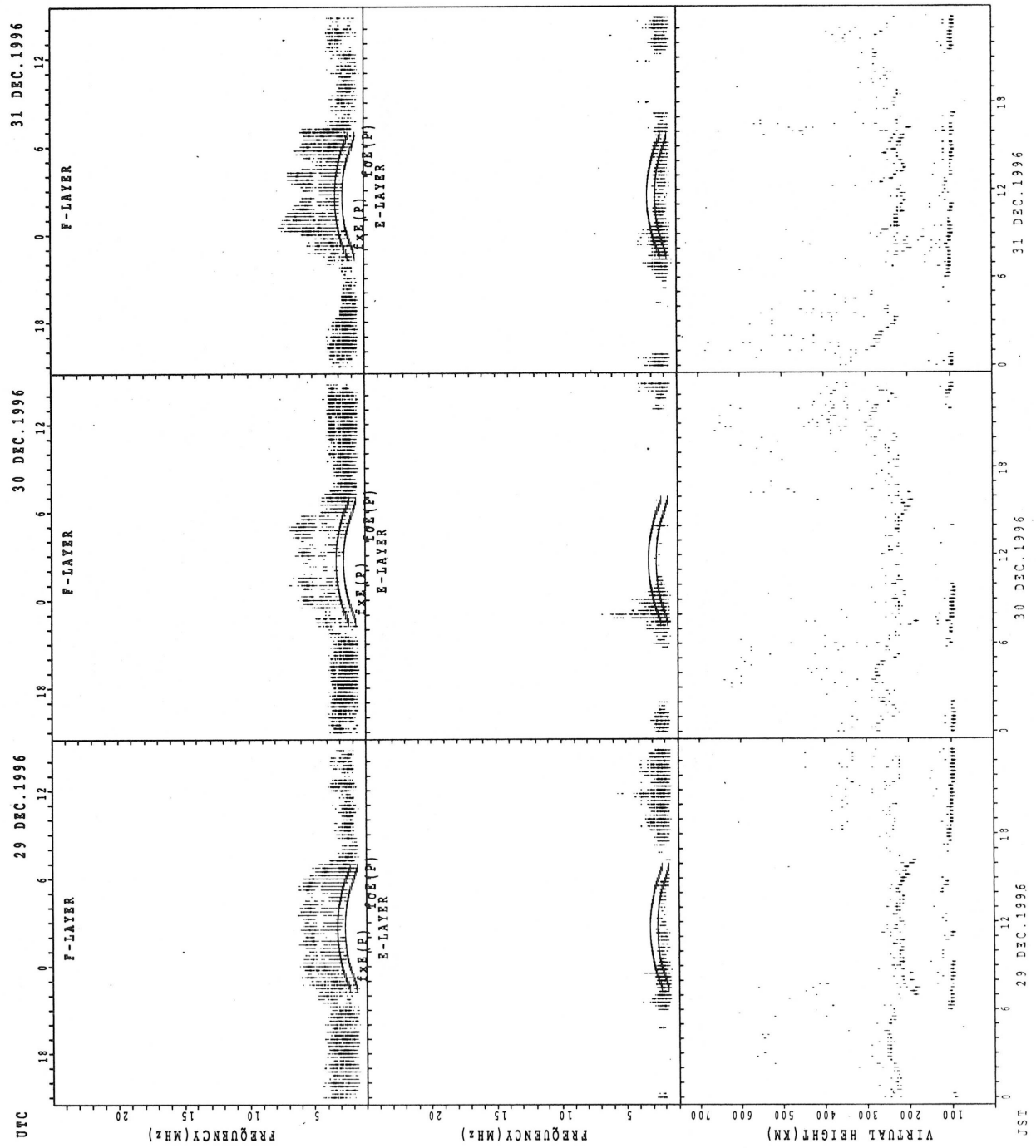



SUMMARY PLOTS AT WAKKANAI
UTC
21 DEC.1996
22 DEC.1996
23 DEC.1996
24 DEC.1996
F-LAYER
E-LAYER
fxE(P)
foE(P)
FREQUENCY(MHz)
VIRTUAL HEIGHT(KM)
JST
21 DEC.1996
22 DEC.1996
23 DEC.1996
24 DEC.1996
fxE(P) : PREDICTED VALUE FOR fxE
foE(P) : PREDICTED VALUE FOR foE

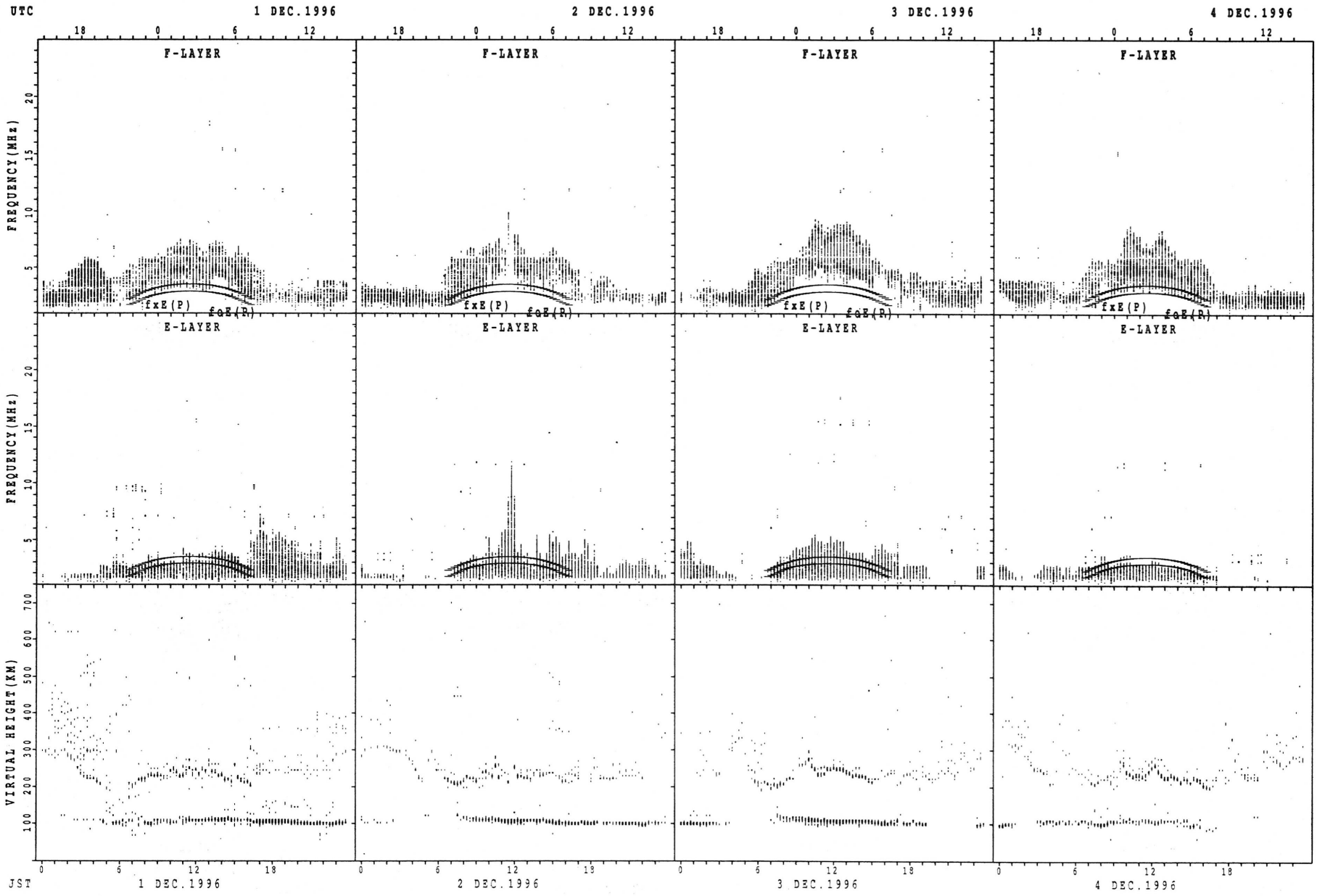
SUMMARY PLOTS AT WAKKANAI

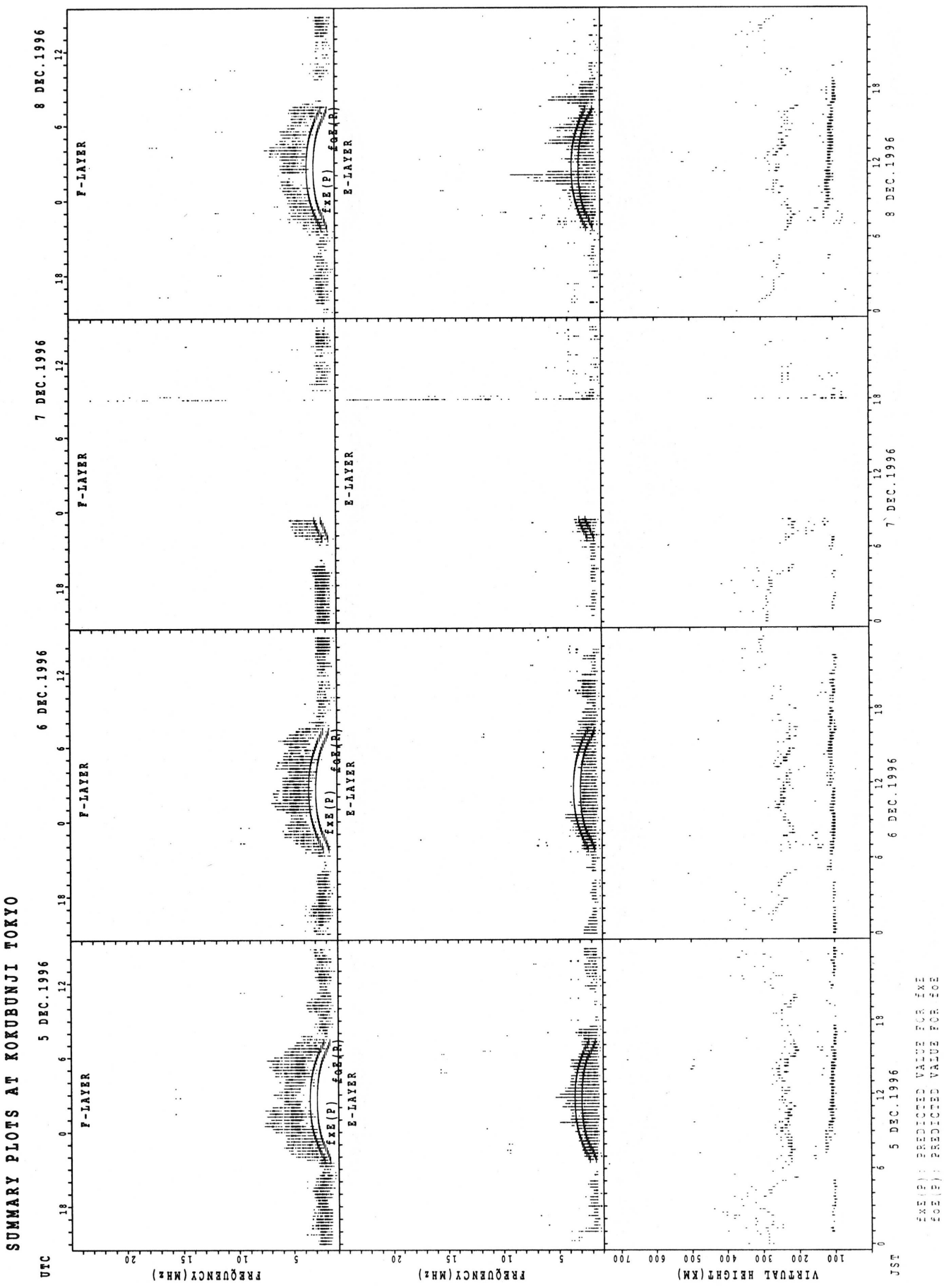


fxE(P): PREDICTED VALUE FOR fxE
foE(P): PREDICTED VALUE FOR foE

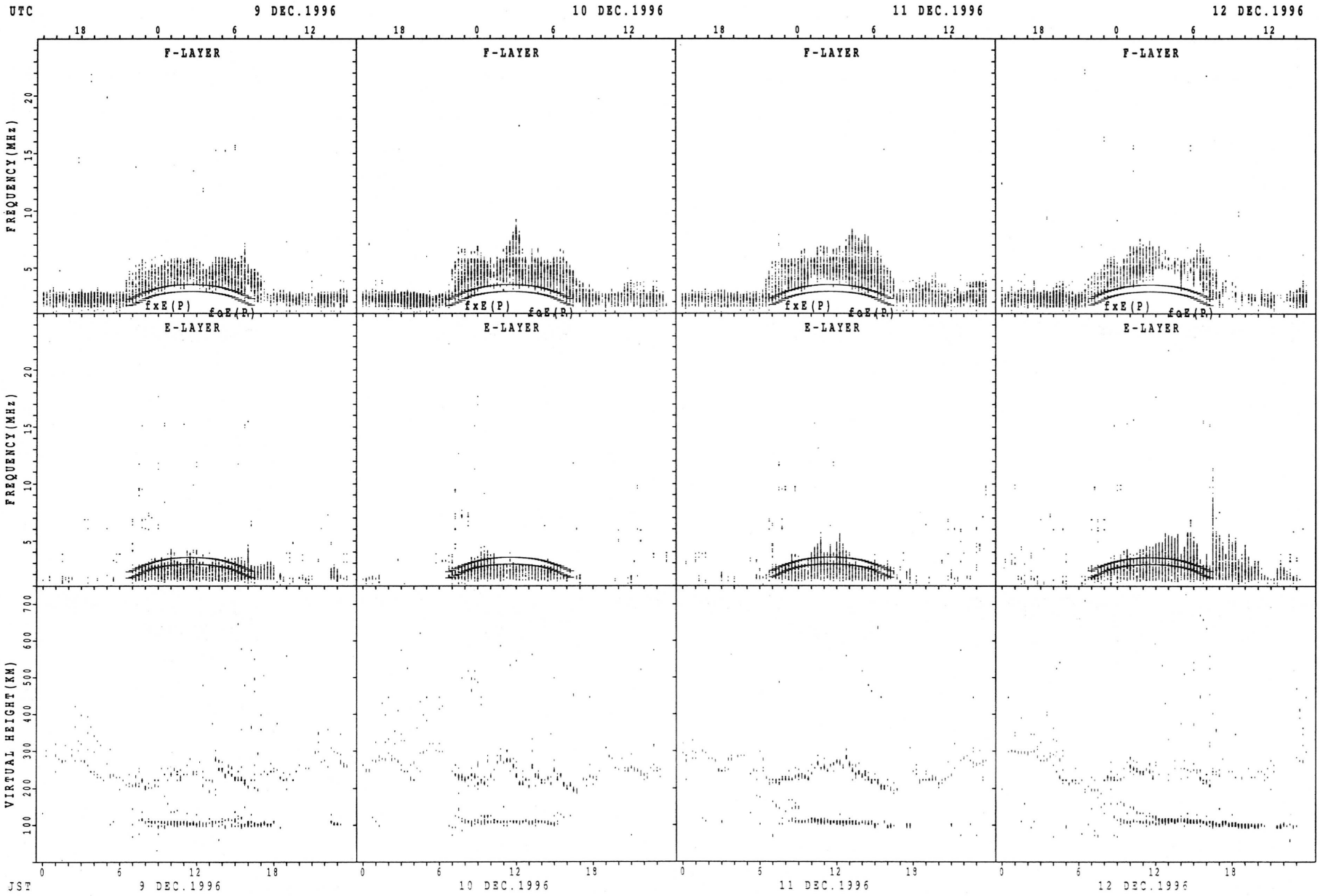

SUMMARY PLOTS AT WAKKANAI
UTC
29 DEC.1996
30 DEC.1996
31 DEC.1996
F-LAYER
E-LAYER
fxE(P)
foE(P)
FREQUENCY(MHz)
VIRTUAL HEIGHT(KM)
JST
fxE(P) : PREDICTED VALUE FOR fxE
foE(P) : PREDICTED VALUE FOR foE

SUMMARY PLOTS AT KOKUBUNJI TOKYO

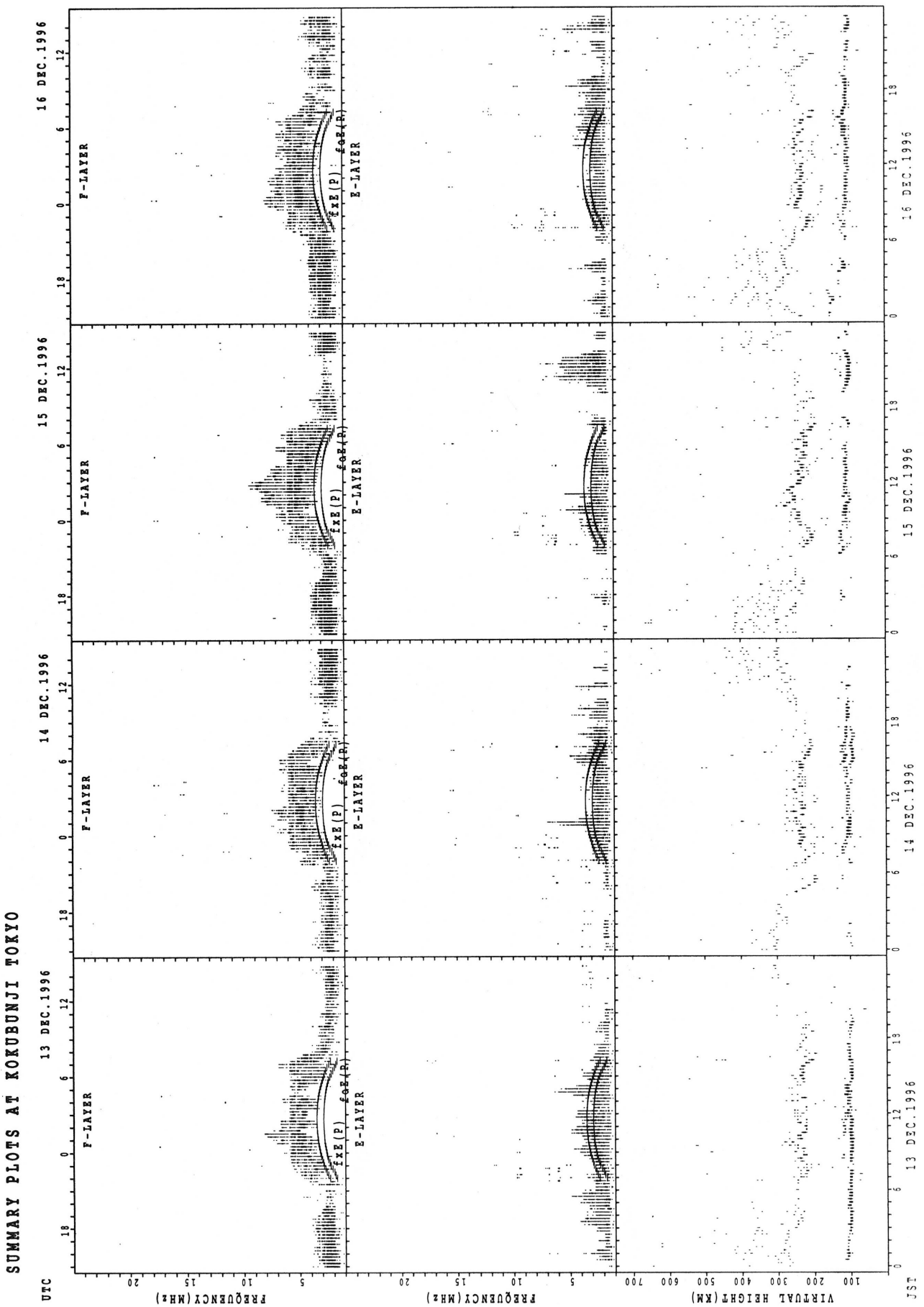



SUMMARY PLOTS AT KOKUBUNJI TOKYO
UTC
JST
5 DEC.1996
6 DEC.1996
7 DEC.1996
8 DEC.1996
F-LAYER
E-LAYER
FREQUENCY(MHz)
VIRTUAL HEIGHT(KM)
fxE(P)
foE(P)
fxE(R)
foE(R)
fxE(P): PREDICTED VALUE FOR fxE
foE(P): PREDICTED VALUE FOR foE

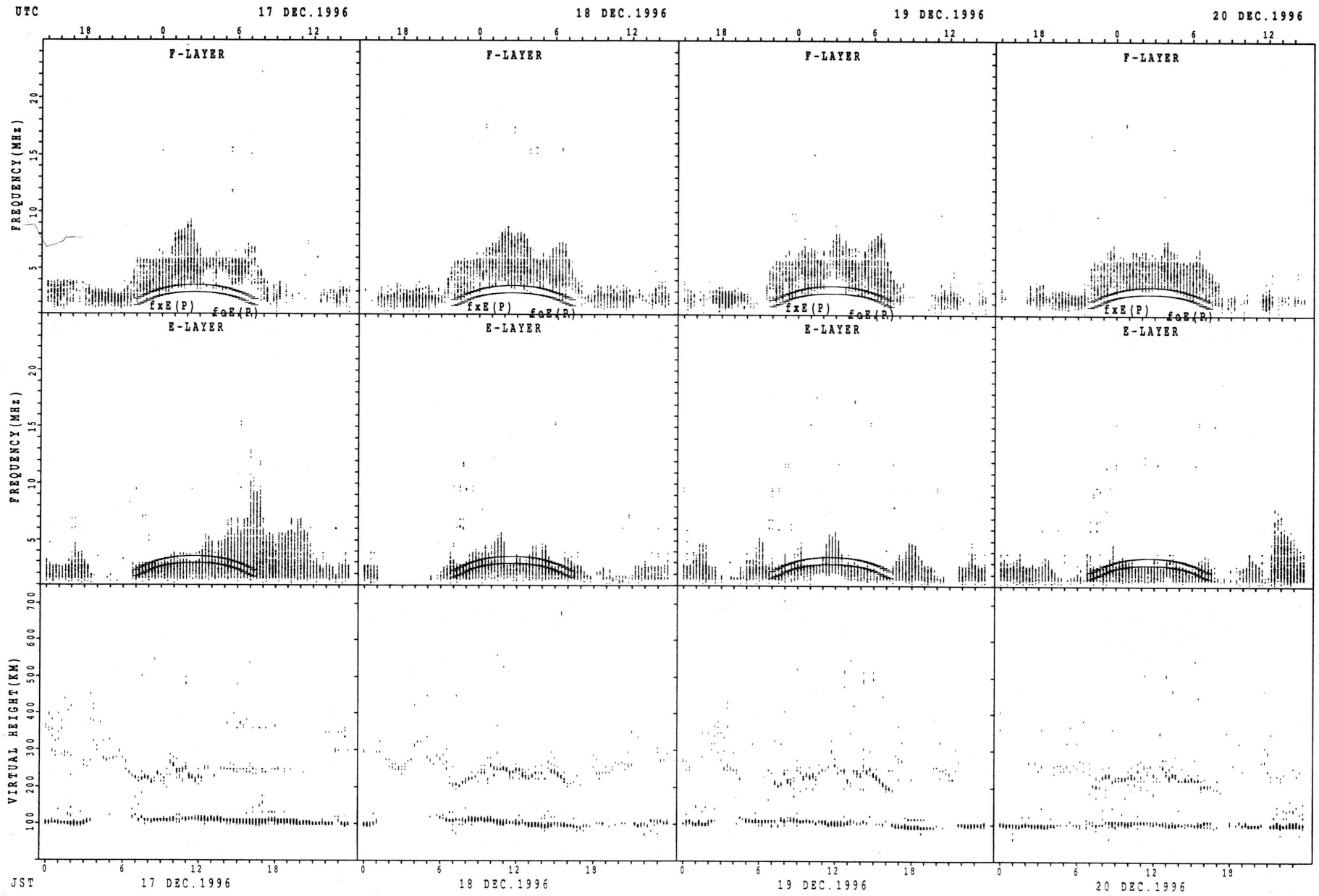
SUMMARY PLOTS AT KOKUBUNJI TOKYO

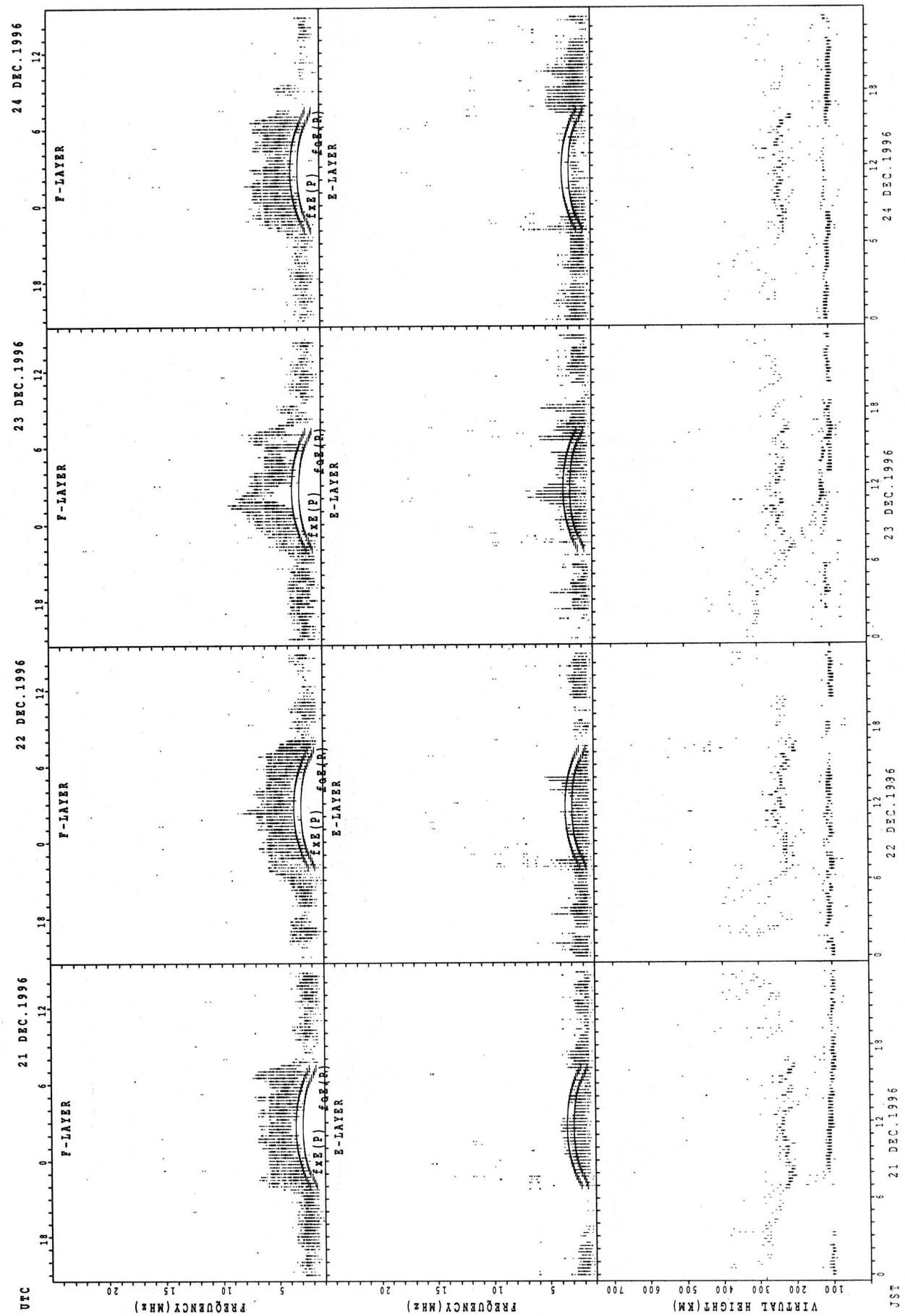


fxE(P): PREDICTED VALUE FOR fxE
foE(P): PREDICTED VALUE FOR foE

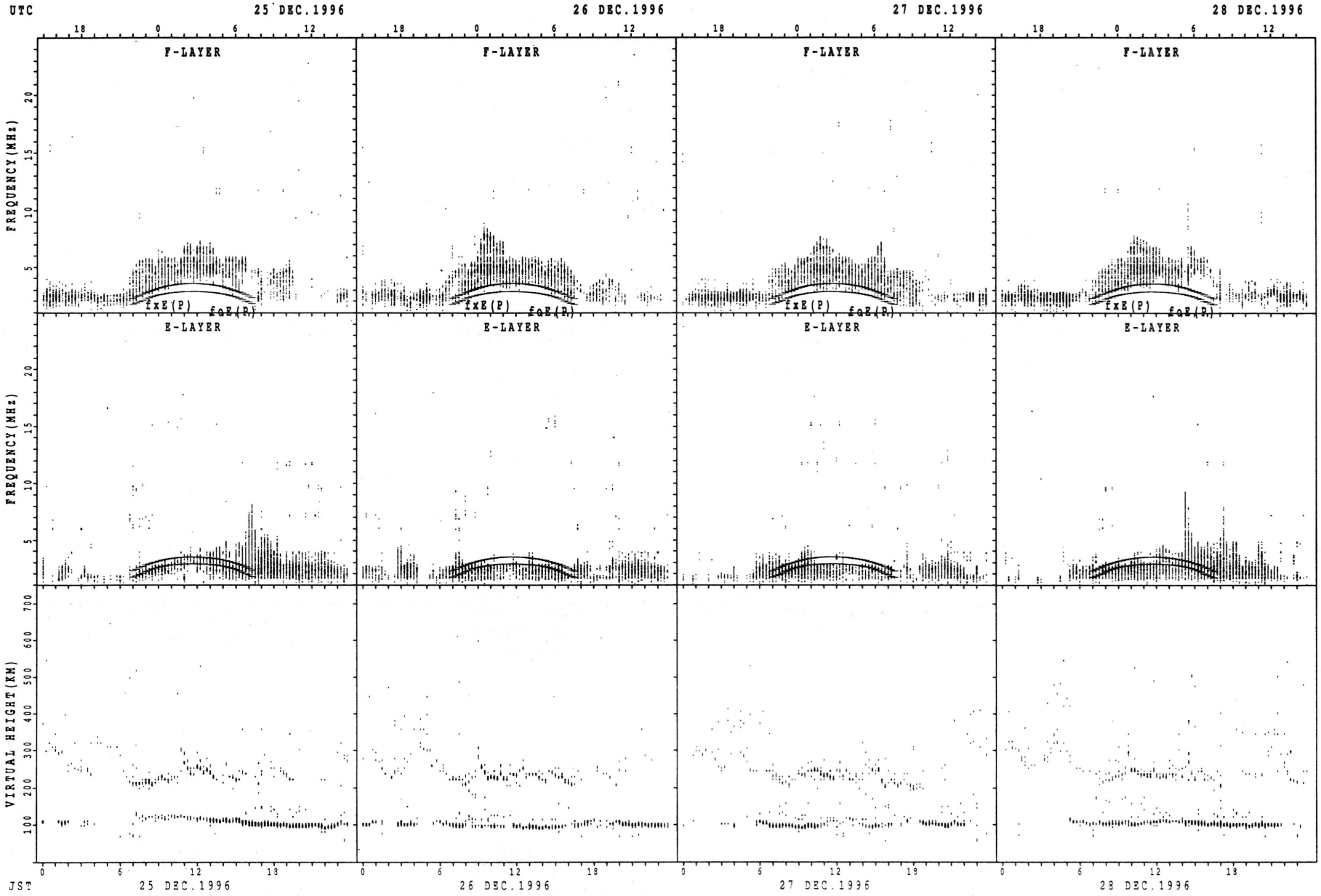

SUMMARY PLOTS AT KOKUBUNJI TOKYO
UTC
JST
13 DEC.1996
14 DEC.1996
15 DEC.1996
16 DEC.1996
F-LAYER
E-LAYER
FREQUENCY(MHz)
VIRTUAL HEIGHT(KM)
fxE(P)
foE(P)
fxE: P): PREDICTED VALUE FOR fxE
foE: P): PREDICTED VALUE FOR foE

SUMMARY PLOTS AT KOKUBUNJI TOKYO

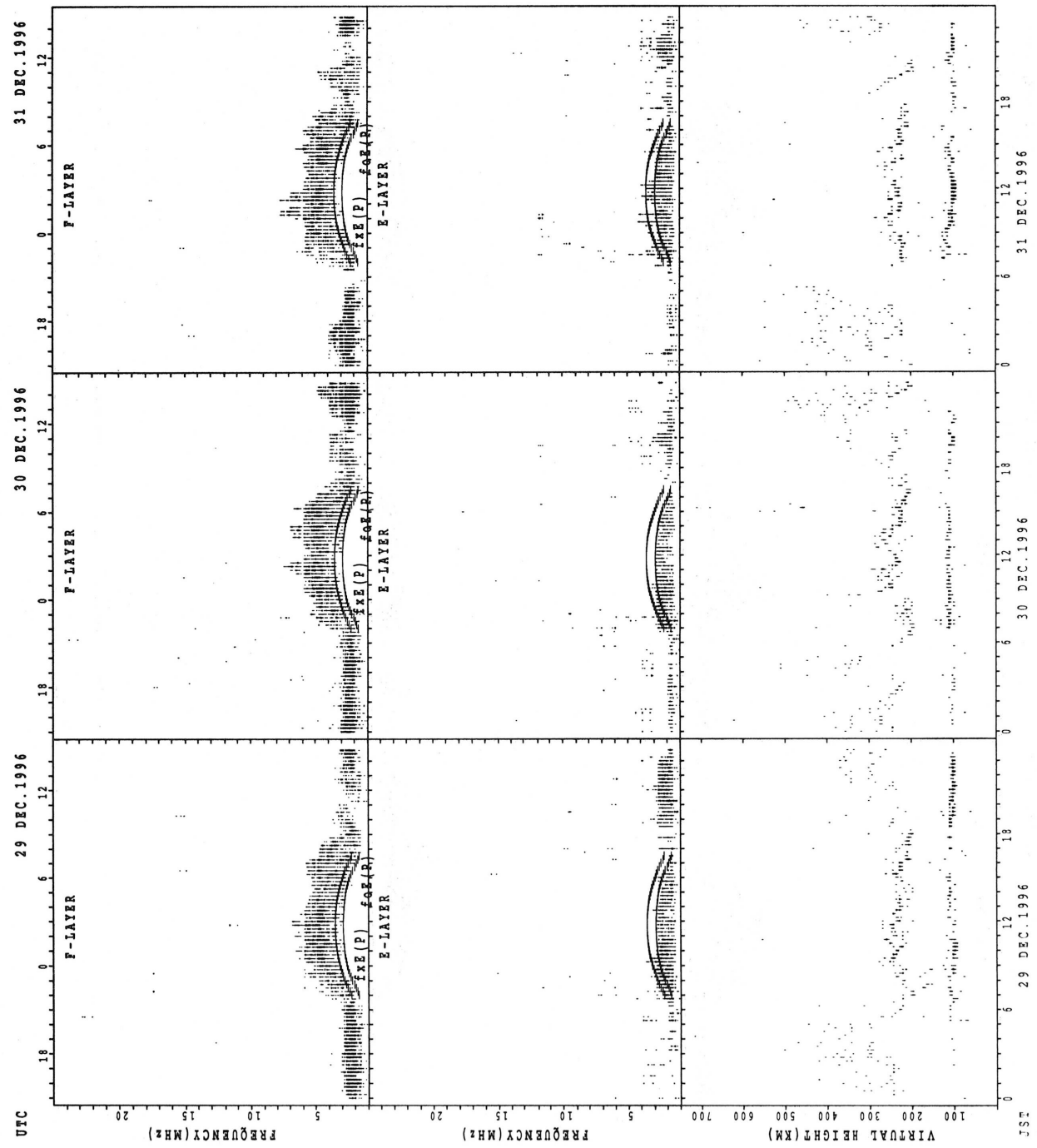



SUMMARY PLOTS AT KOKUBUNJI TOKYO
UTC
JST
21 DEC.1996
22 DEC.1996
23 DEC.1996
24 DEC.1996
F-LAYER
E-LAYER
FREQUENCY(MHz)
VIRTUAL HEIGHT(KM)
fxE(P)
foE(P)
fxE : PREDICTED VALUE FOR fxE
foE : PREDICTED VALUE FOR foE

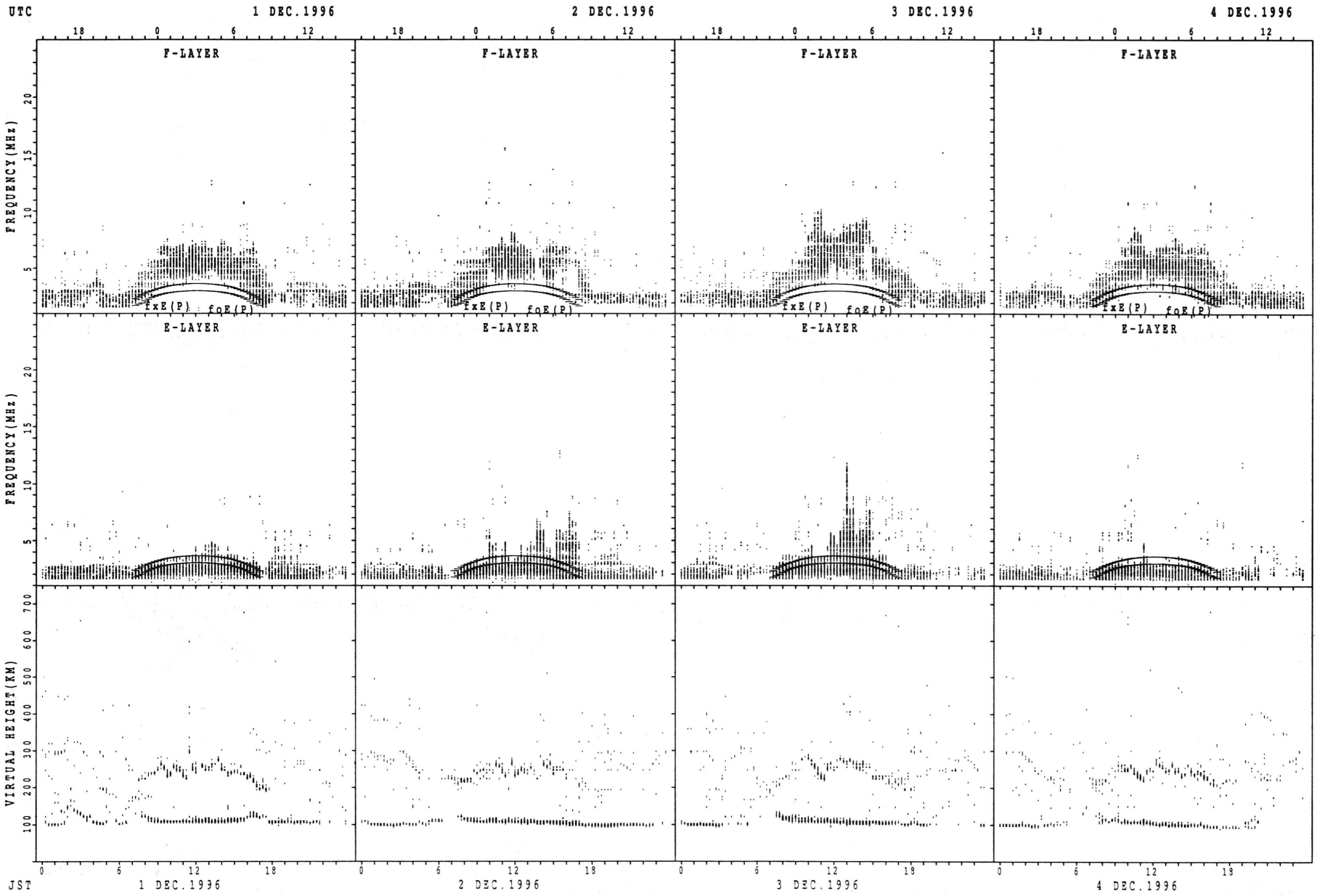
SUMMARY PLOTS AT KOKUBUNJI TOKYO



fxE(P) : PREDICTED VALUE FOR fxE
foE(P) : PREDICTED VALUE FOR foE

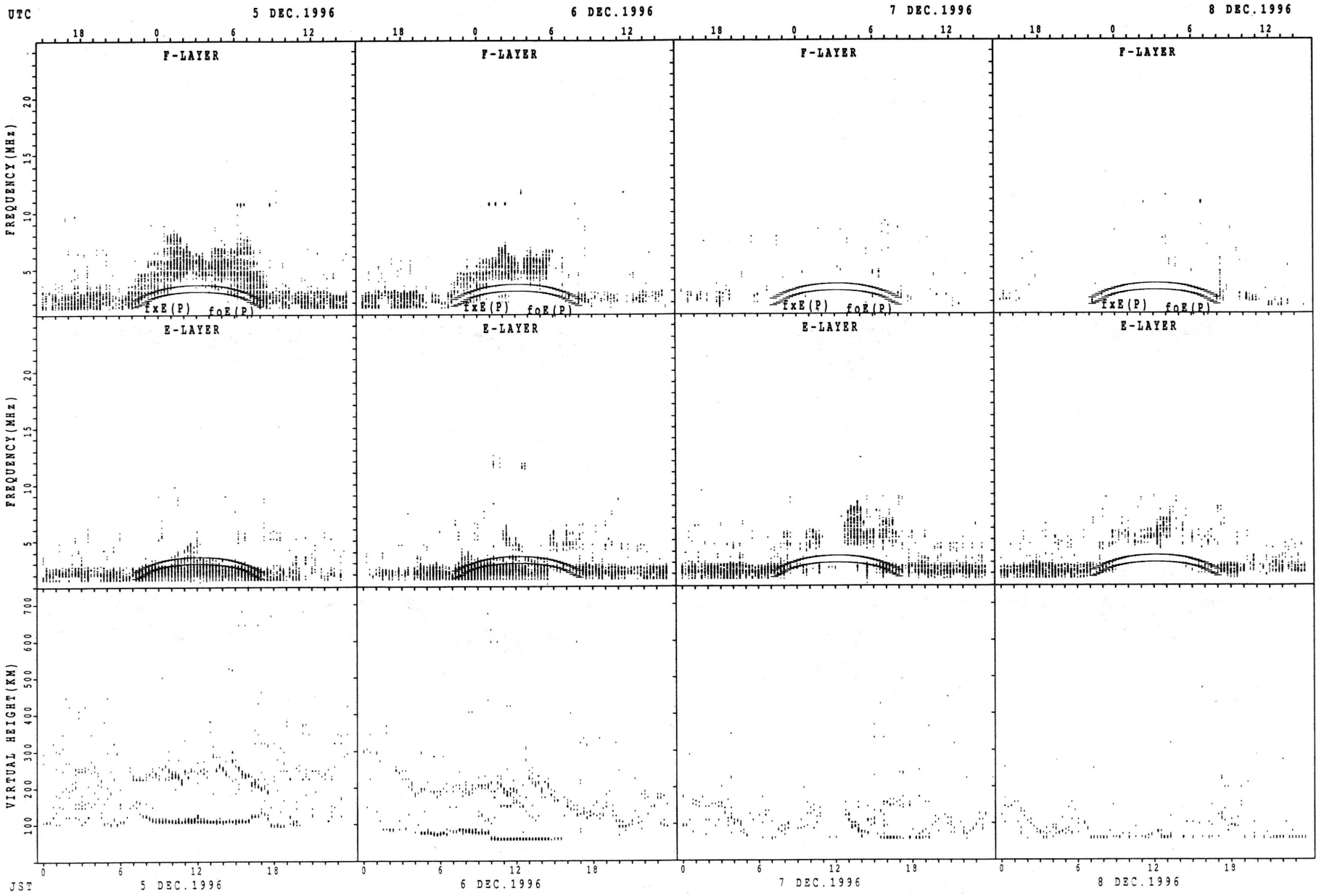

SUMMARY PLOTS AT KOKUBUNJI TOKYO
UTC
29 DEC.1996
30 DEC.1996
31 DEC.1996
F-LAYER
E-LAYER
fxE(P)
foE(P)
FREQUENCY(MHz)
VIRTUAL HEIGHT(KM)
JST
fxE(P) : PREDICTED VALUE FOR fxE
foE(P) : PREDICTED VALUE FOR foE

SUMMARY PLOTS AT YAMAGAWA



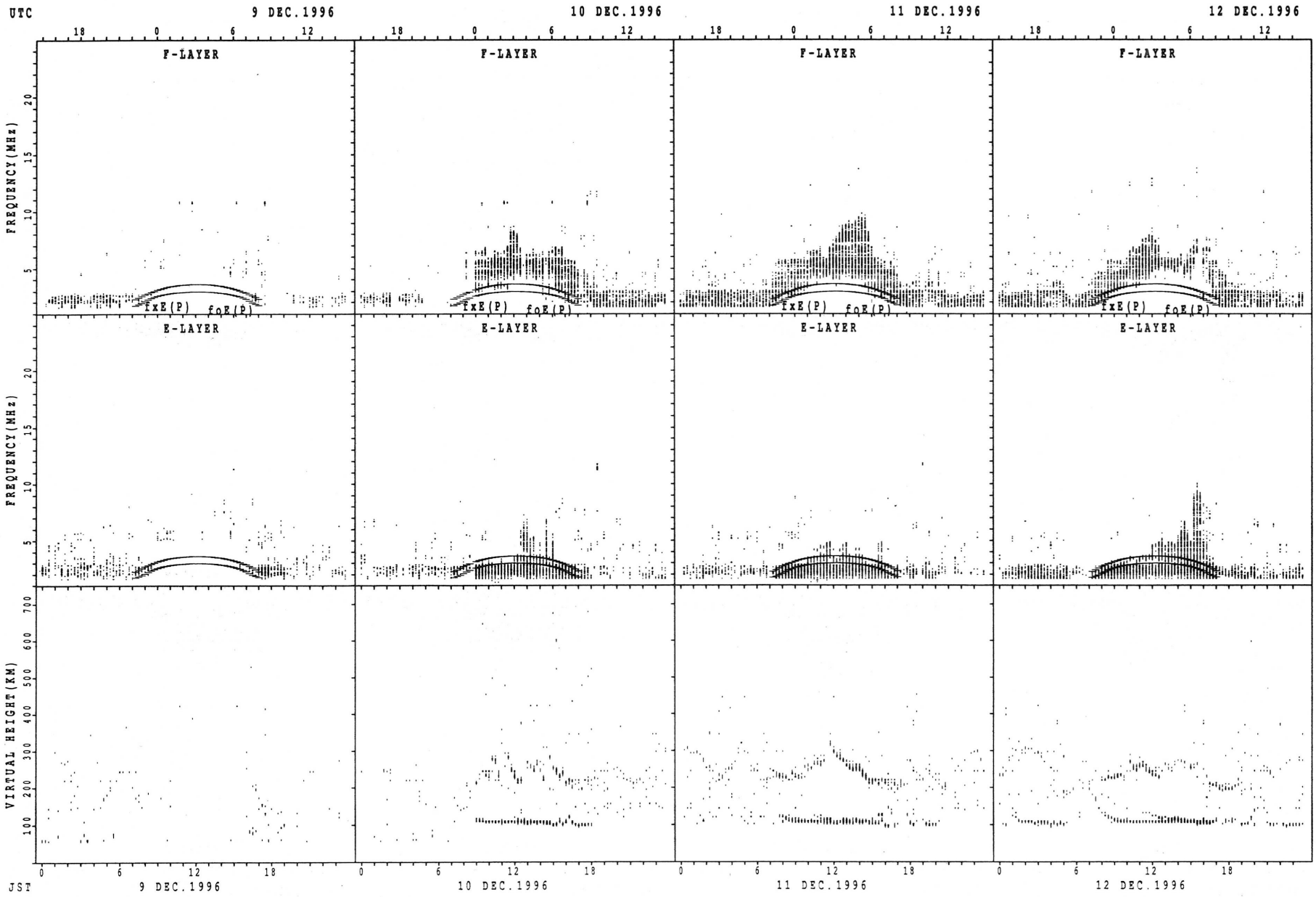
fxE(P) : PREDICTED VALUE FOR fxE
foE(P) : PREDICTED VALUE FOR foE

SUMMARY PLOTS AT YAMAGAWA

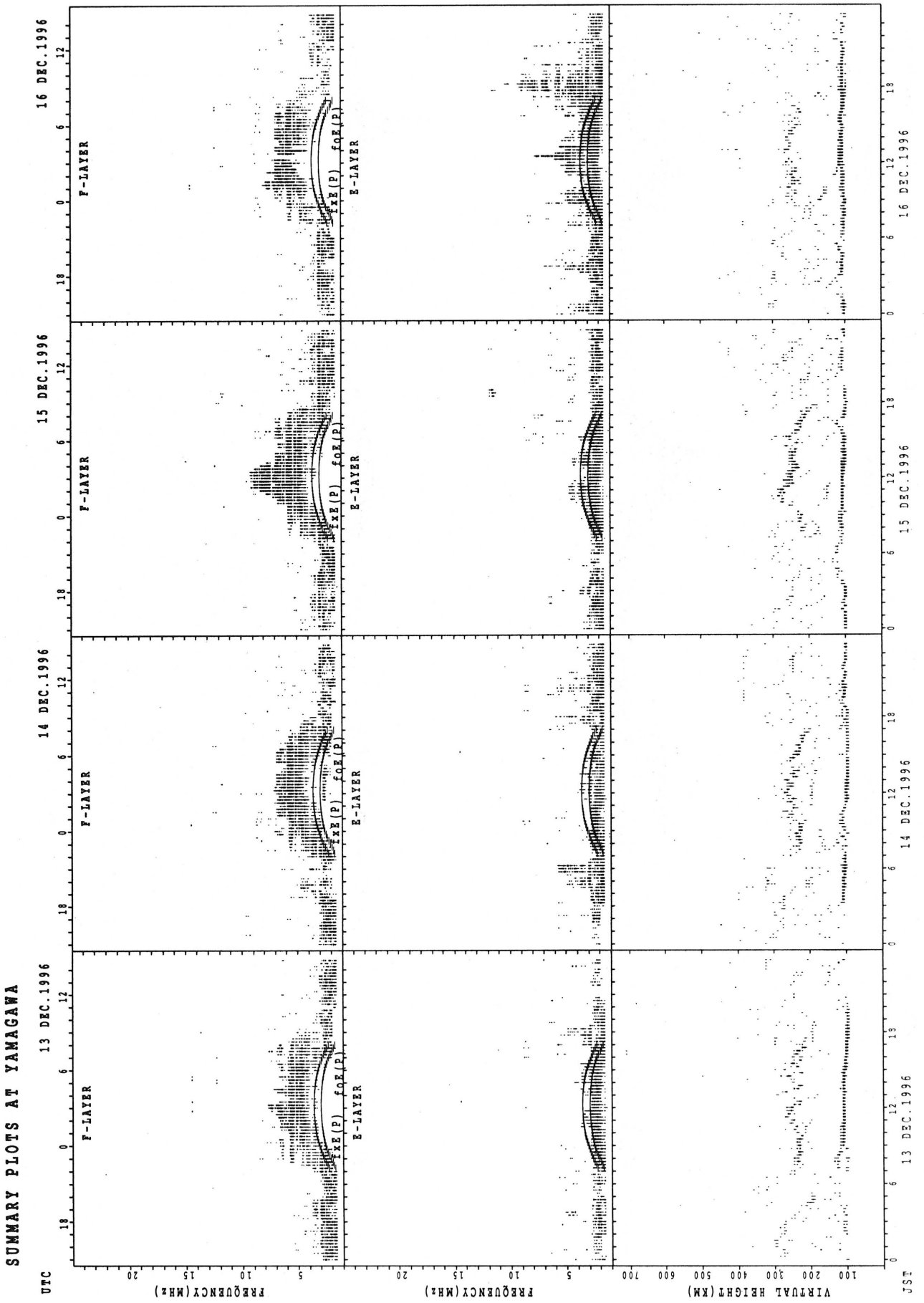


fxE(P): PREDICTED VALUE FOR fxE
foE(P): PREDICTED VALUE FOR foE

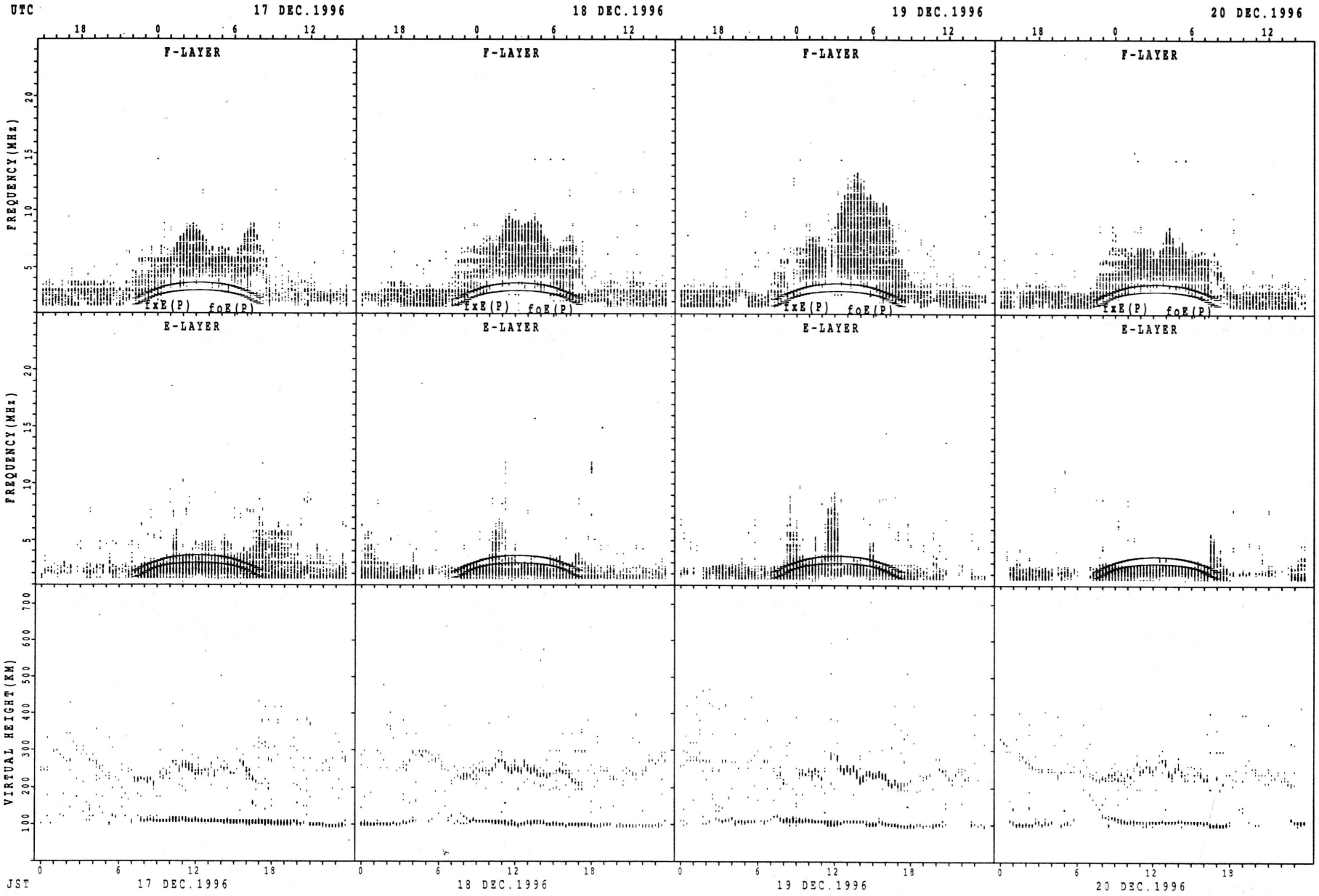
SUMMARY PLOTS AT YAMAGAWA



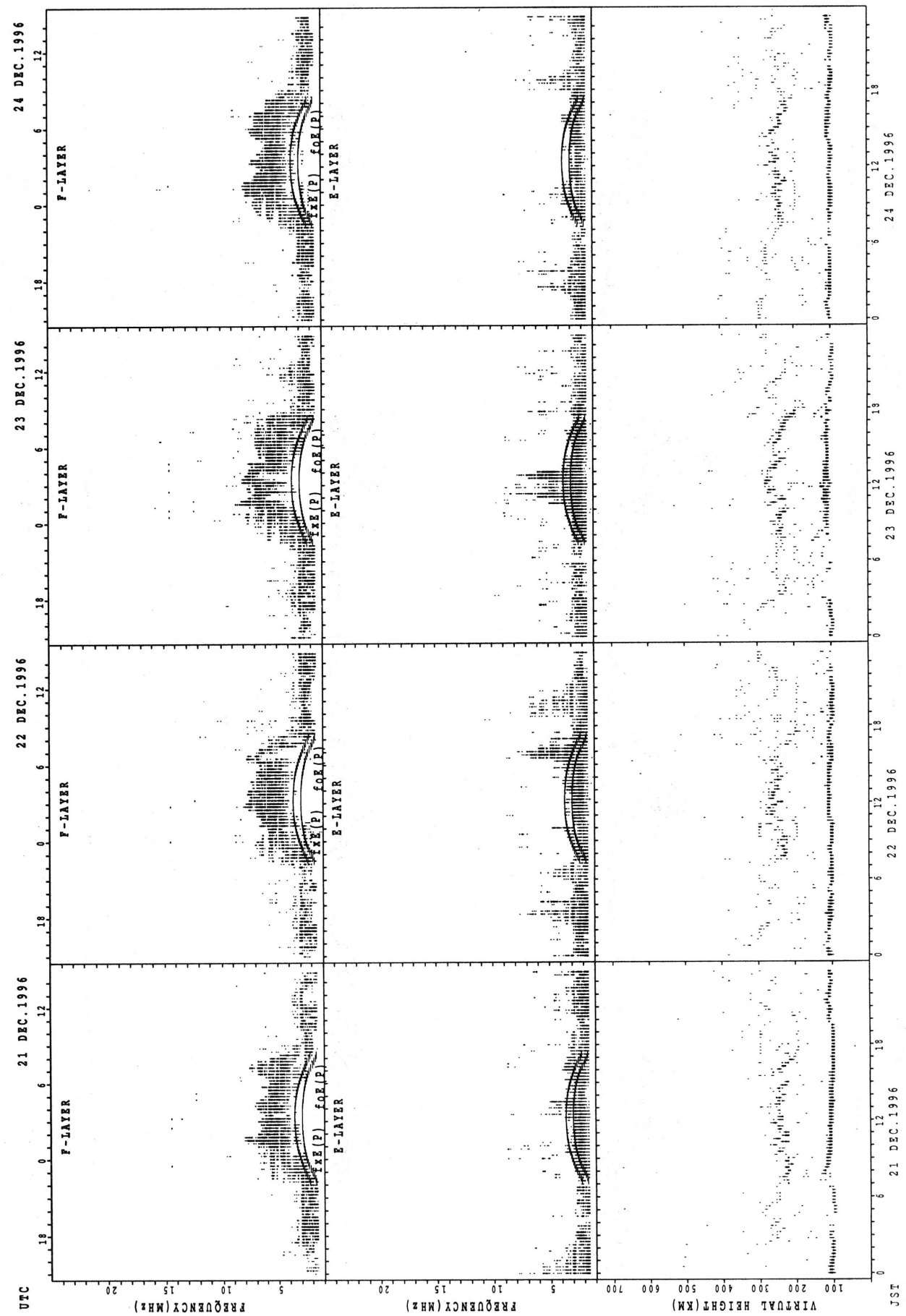
fxE(P); PREDICTED VALUE FOR fxE
foE(P); PREDICTED VALUE FOR foE


SUMMARY PLOTS AT YAMAGAWA
UTC
JST
13 DEC.1996
14 DEC.1996
15 DEC.1996
16 DEC.1996
F-LAYER
E-LAYER
FREQUENCY(MHz)
VIRTUAL HEIGHT(KM)
fxE(P)
foE(P)
foF(P)
fxE(P) : PREDICTED VALUE FOR fxE
foE(P) : PREDICTED VALUE FOR foE

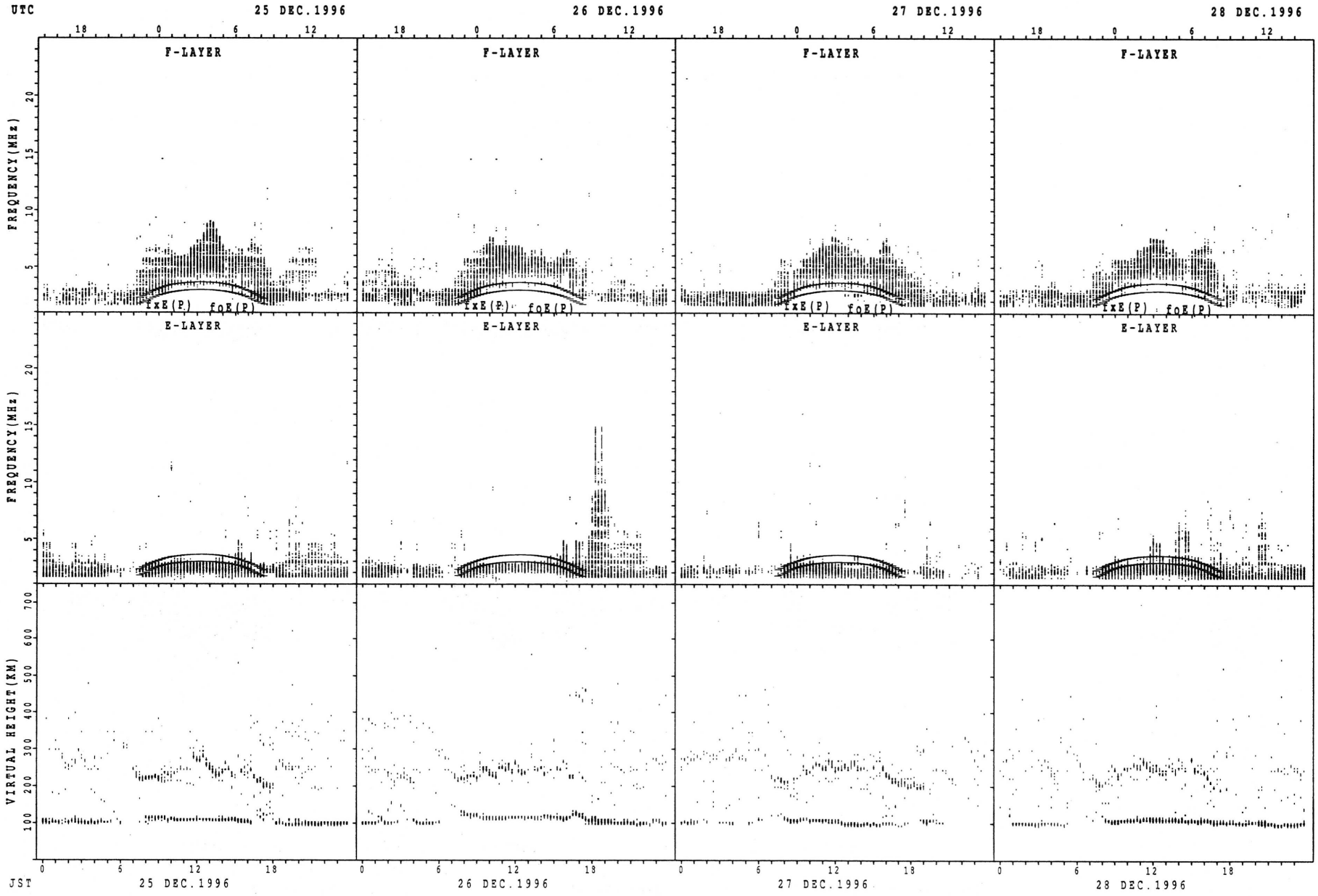
SUMMARY PLOTS AT YAMAGAWA



fxE(P): PREDICTED VALUE FOR fxE
foE(P): PREDICTED VALUE FOR foE

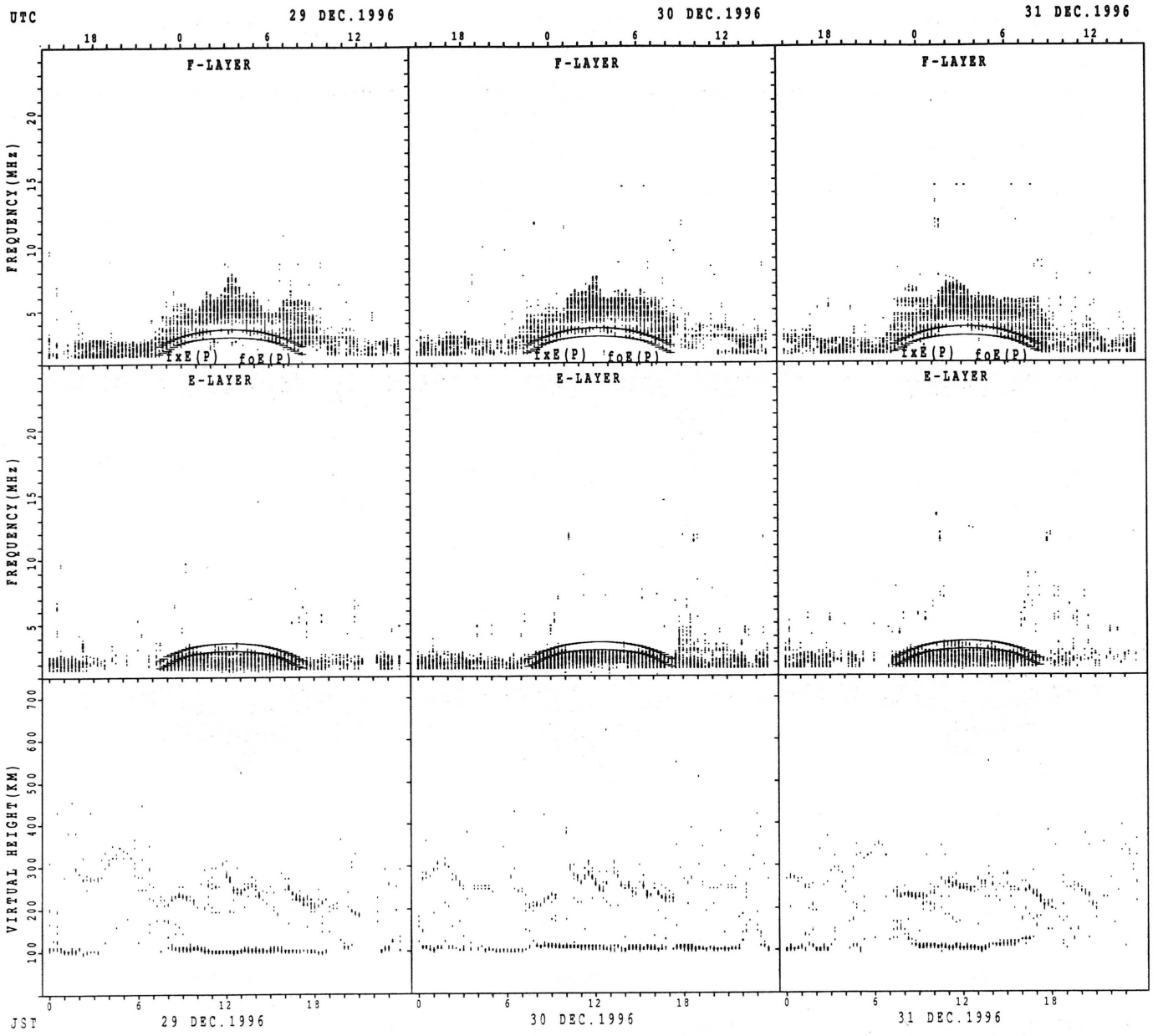

SUMMARY PLOTS AT YAMAGAWA
UTC
21 DEC.1996
22 DEC.1996
23 DEC.1996
24 DEC.1996
F-LAYER
E-LAYER
FREQUENCY(MHz)
VIRTUAL HEIGHT(KM)
fxE(P)
foE(P)
JST
fxE(P) : PREDICTED VALUE FOR fxE
foE(P) : PREDICTED VALUE FOR foE

SUMMARY PLOTS AT YAMAGAWA



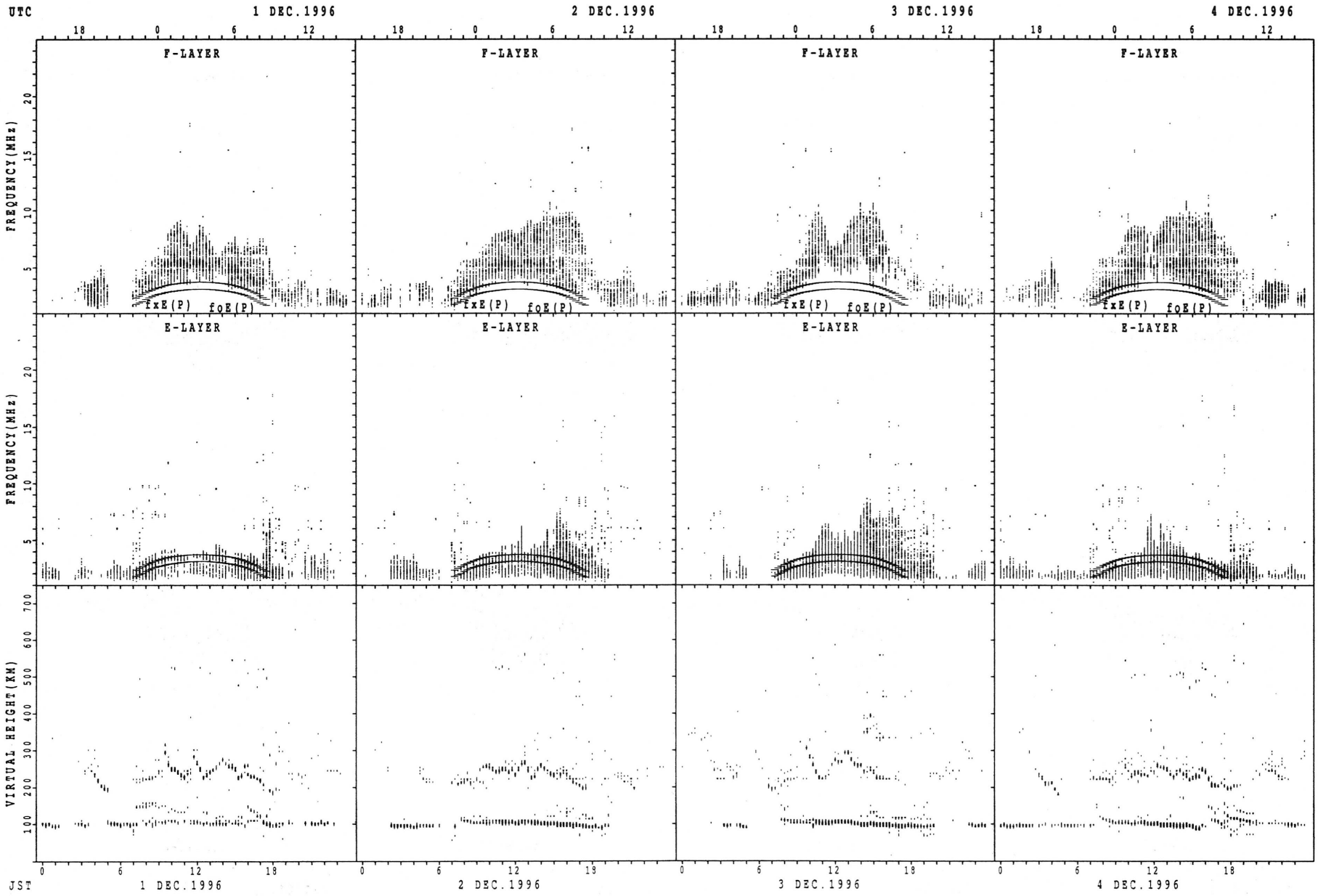
fxE(P) : PREDICTED VALUE FOR fxE
foE(P) : PREDICTED VALUE FOR foE

SUMMARY PLOTS AT YAMAGAWA

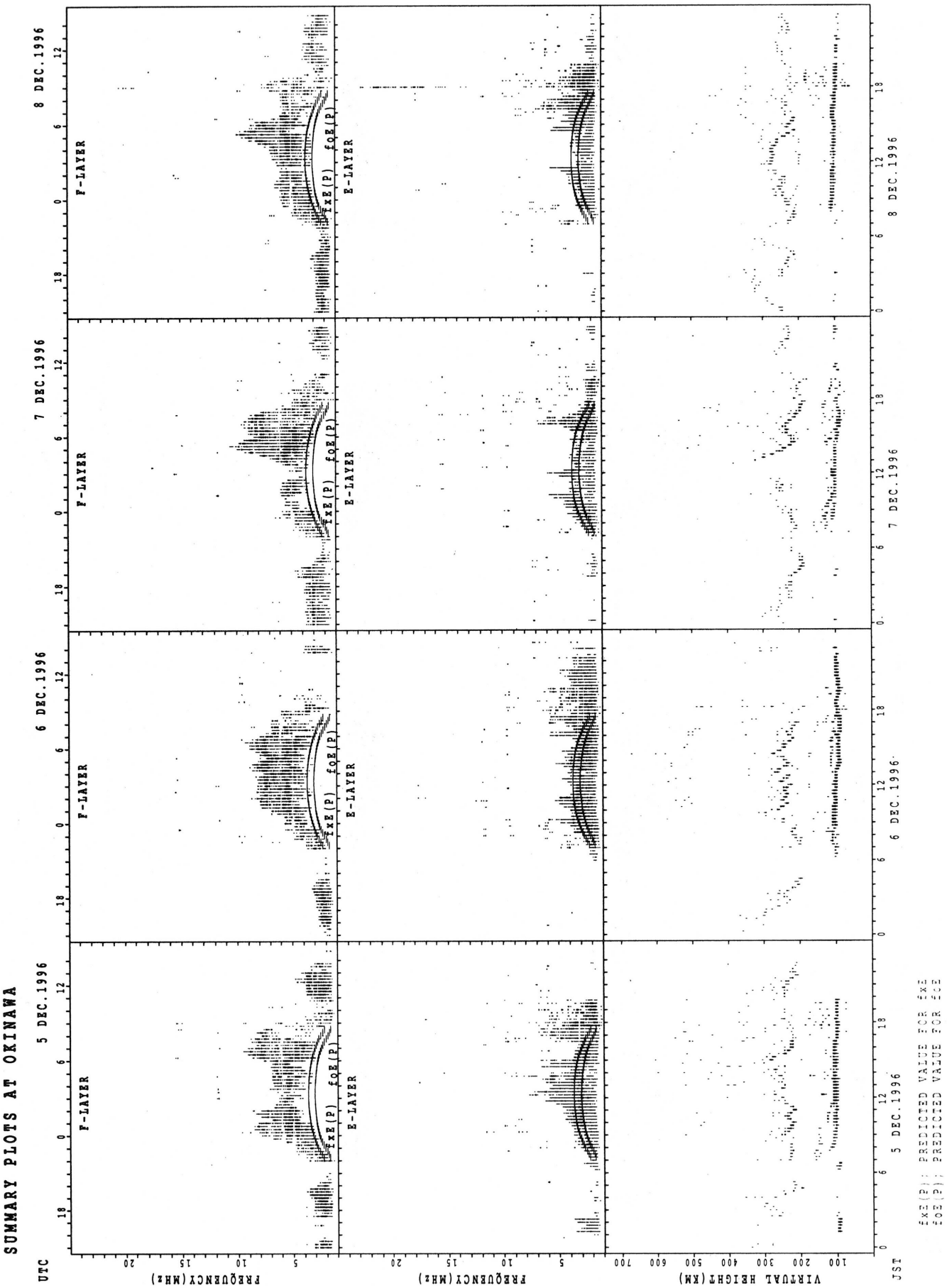


fxE(P): PREDICTED VALUE FOR fxE
foE(P): PREDICTED VALUE FOR foE

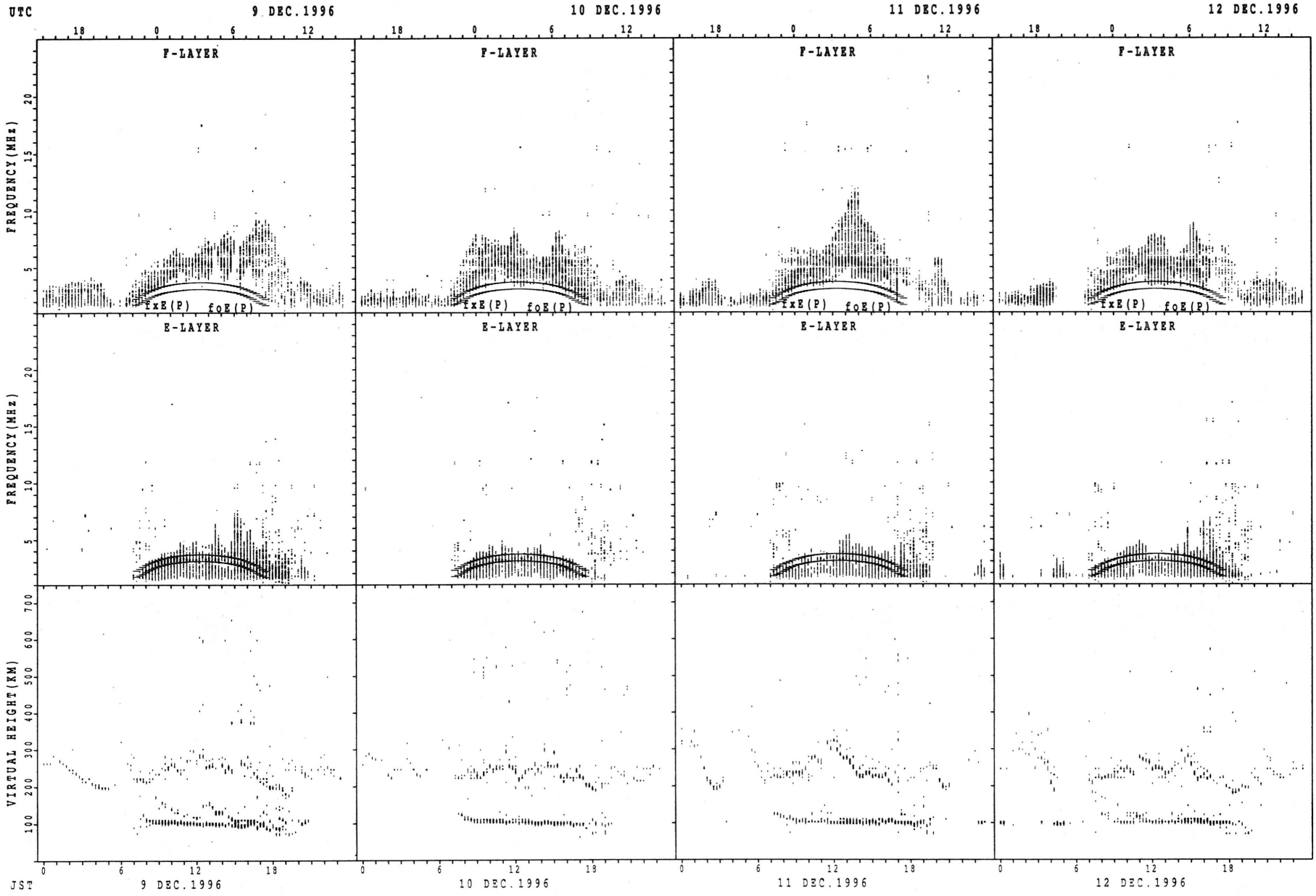
SUMMARY PLOTS AT OKINAWA



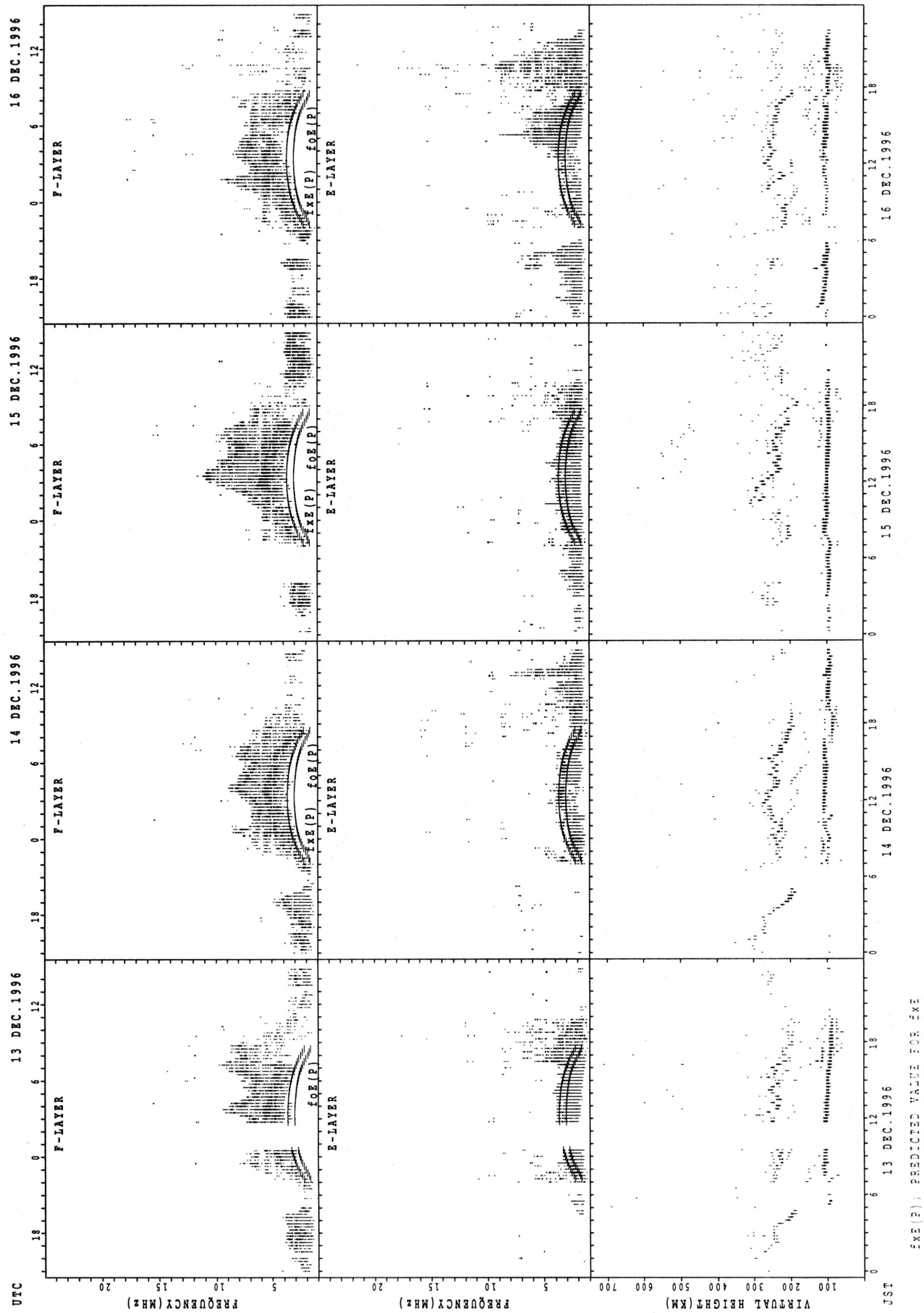
fxE(P): PREDICTED VALUE FOR fxE
foE(P): PREDICTED VALUE FOR foE


SUMMARY PLOTS AT OKINAWA
UTC
JST
5 DEC.1996
6 DEC.1996
7 DEC.1996
8 DEC.1996
F-LAYER
E-LAYER
fxE(P)
foE(P)
FREQUENCY(MHz)
VIRTUAL HEIGHT(KM)
fxE(P) : PREDICTED VALUE FOR fxE
foE(P) : PREDICTED VALUE FOR foE

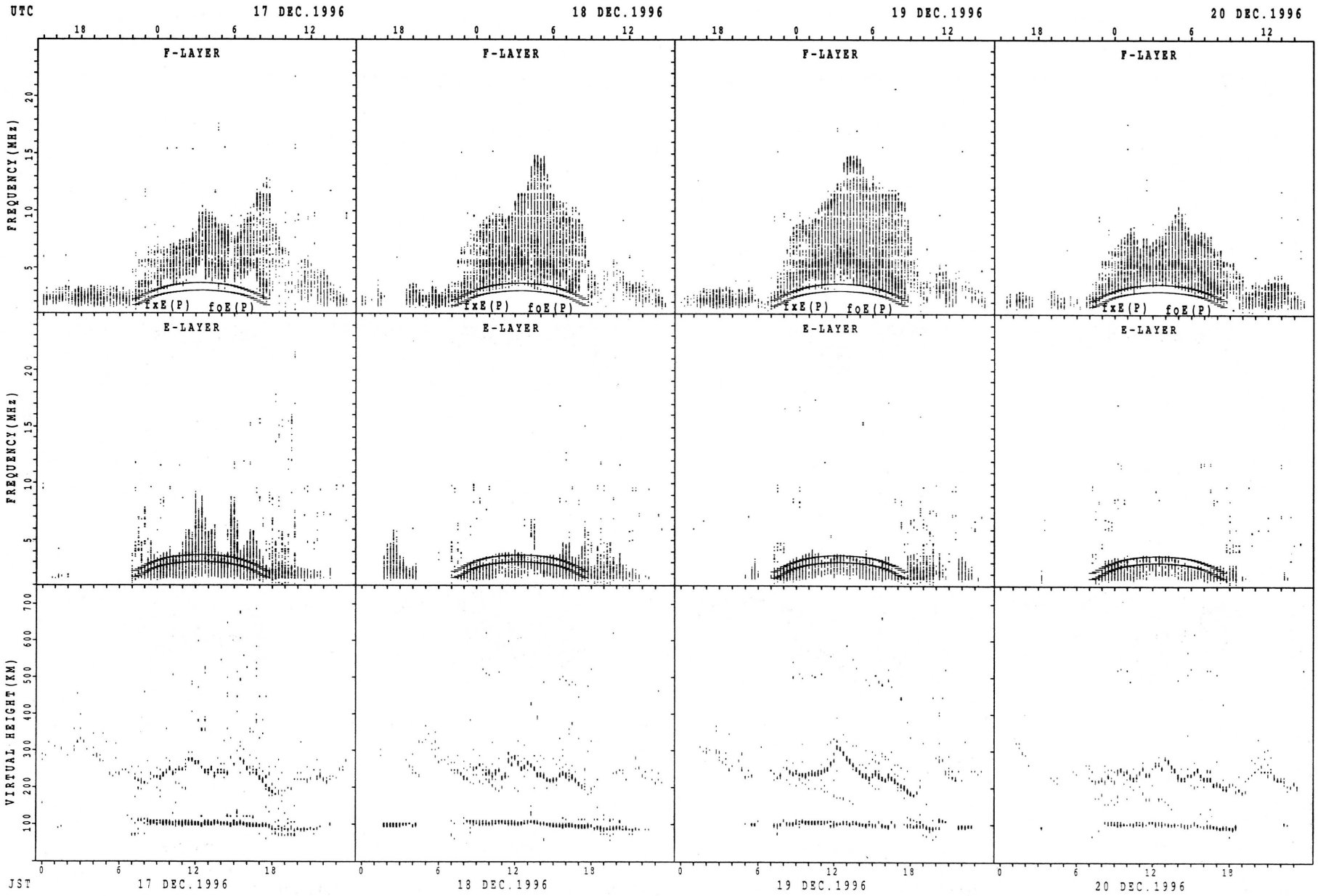
SUMMARY PLOTS AT OKINAWA



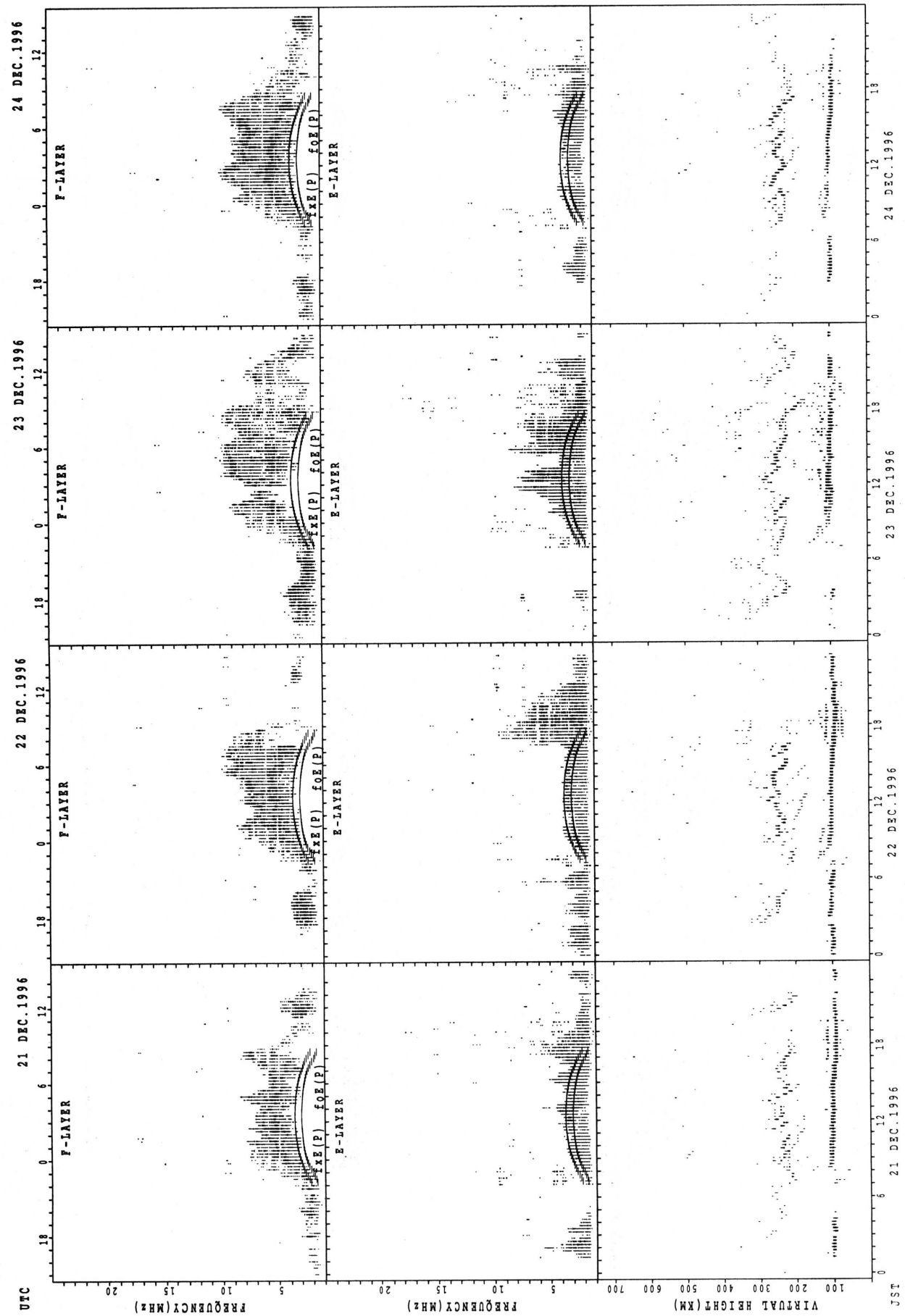
fxE(P): PREDICTED VALUE FOR fxE
foE(P): PREDICTED VALUE FOR foE


SUMMARY PLOTS AT OKINAWA
UTC
JST
13 DEC.1996
14 DEC.1996
15 DEC.1996
16 DEC.1996
F-LAYER
E-LAYER
FREQUENCY(MHz)
VIRTUAL HEIGHT(KM)
fxE(P)
foE(P)
fxE(P) : PREDICTED VALUE FOR fxE
foE(P) : PREDICTED VALUE FOR foE

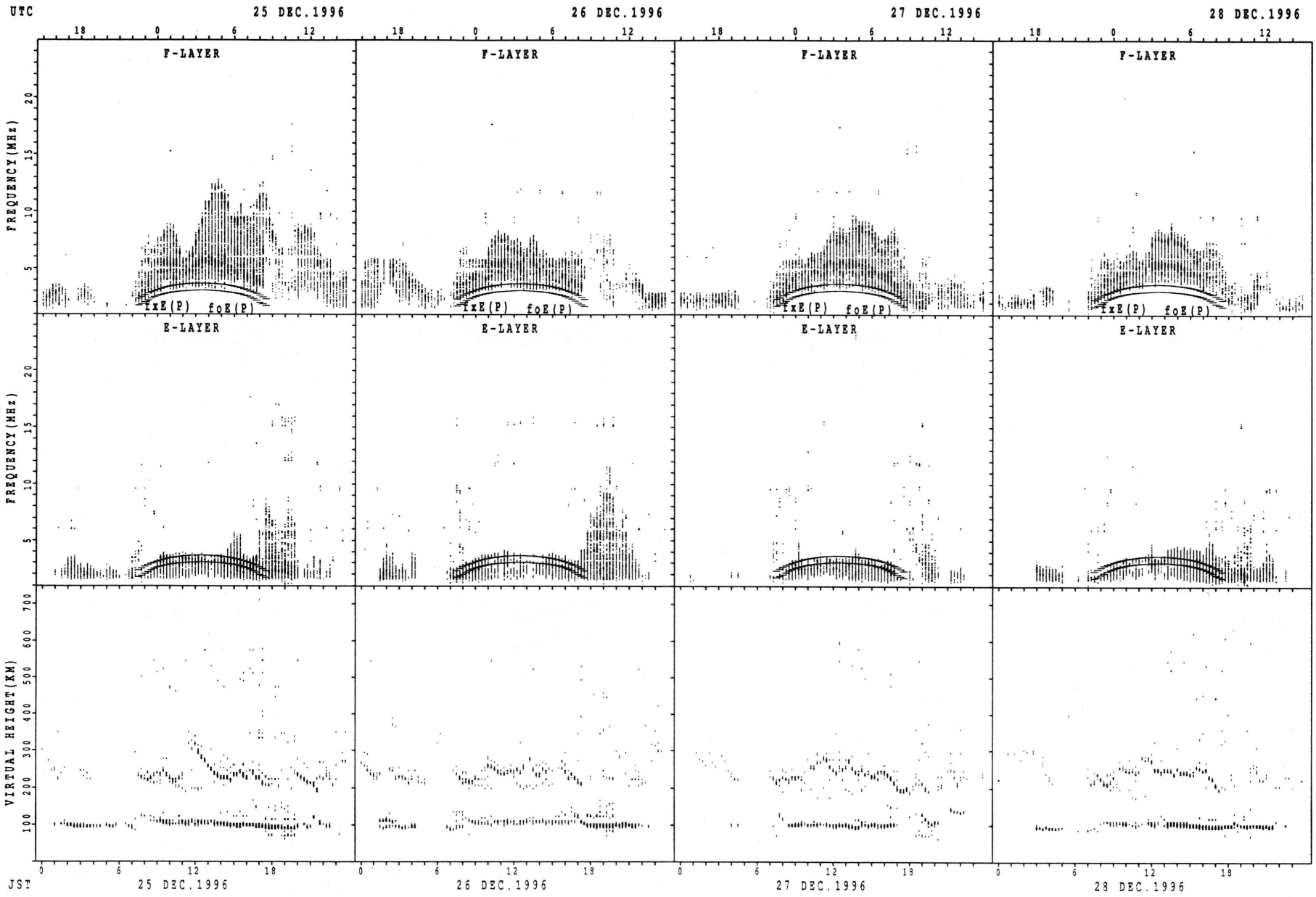
SUMMARY PLOTS AT OKINAWA



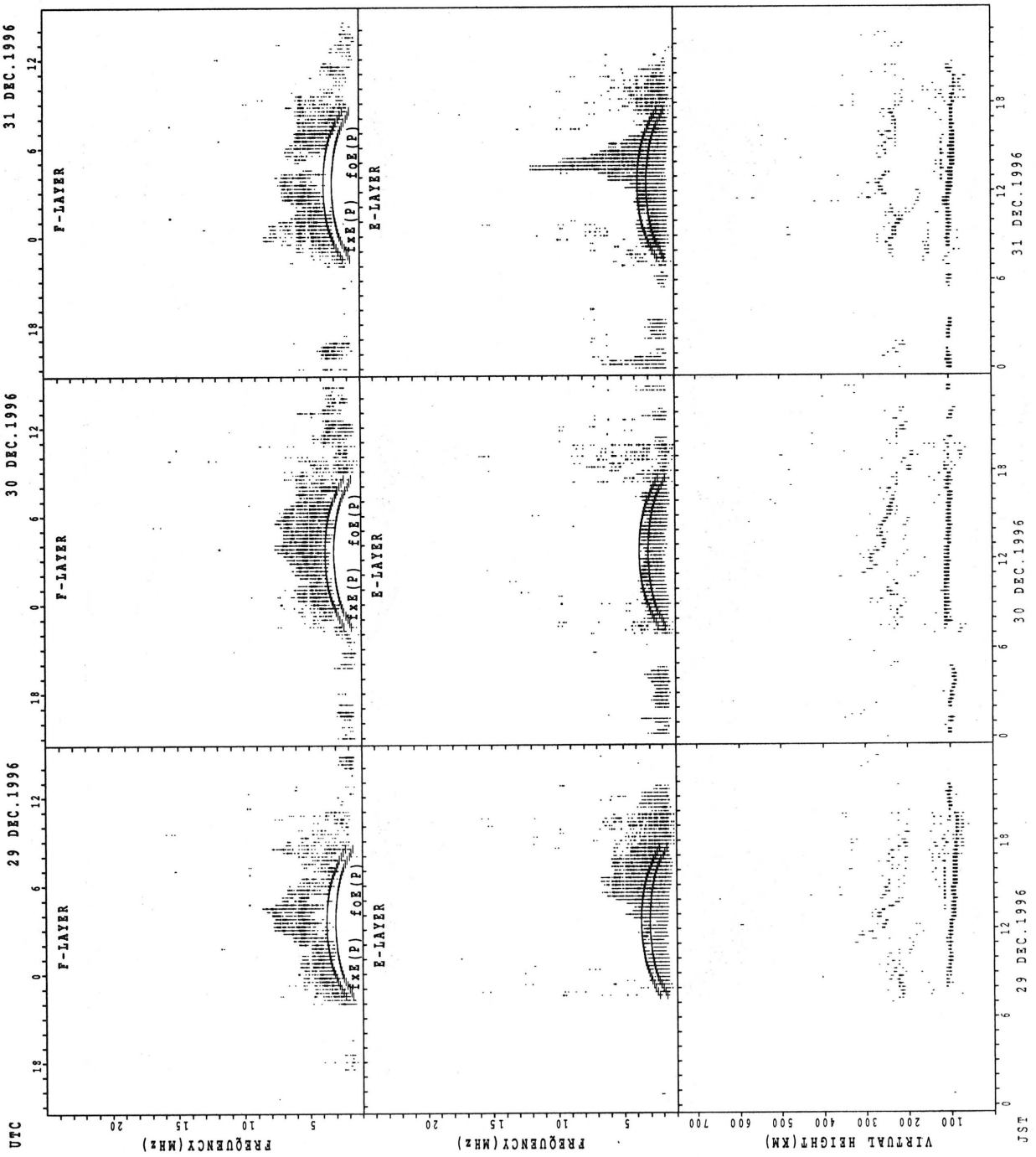
fxE(P): PREDICTED VALUE FOR fxE
foE(P): PREDICTED VALUE FOR foE


SUMMARY PLOTS AT OKINAWA
UTC
21 DEC.1996
22 DEC.1996
23 DEC.1996
24 DEC.1996
F-LAYER
E-LAYER
fxE(P)
foE(P)
FREQUENCY(MHz)
VIRTUAL HEIGHT(KM)
JST
fxE(P) : PREDICTED VALUE FOR fxE
foE(P) : PREDICTED VALUE FOR foE

SUMMARY PLOTS AT OKINAWA



fxE(P): PREDICTED VALUE FOR fxE
foE(P): PREDICTED VALUE FOR foE


SUMMARY PLOTS AT OKINAWA
UTC
JST
29 DEC.1996
30 DEC.1996
31 DEC.1996
F-LAYER
E-LAYER
fxE(P)
foE(P)
FREQUENCY(MHz)
VIRTUAL HEIGHT(KM)
fxE(P): PREDICTED VALUE FOR fxE
foE(P): PREDICTED VALUE FOR foE

MONTHLY MEDIANS OF h'F AND h'Es

DEC.1996 135E MEAN TIME(UTC+9H) AUTOMATIC SCALING

h'F STATION WAKKANAI LAT. 45.4N LON. 141.7E

	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	15	16		15									
MED											232	236	236		240									
U Q											250	252	253		258									
L Q											225	228	232		232									

h'Es

	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	12			12	17	10	16	22	27	28	26	24	24	26	23	21	23	22	21	18	16	19	14	15
MED	105			104	105	104	105	104	113	114	116	111	112	112	113	107	105	107	103	105	105	101	103	105
U Q	107			109	111	107	110	115	137	126	125	120	125	119	121	114	109	111	105	109	107	107	105	111
L Q	98			103	104	103	104	99	105	107	109	103	107	105	105	99	101	101	101	99	98	99	97	97

h'F STATION KOKUBUNJI LAT. 35.7N LON. 139.5E

	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											16	20	16	16										
MED											256	247	255	240										
U Q											278	258	259	246										
L Q											242	239	242	236										

h'Es

	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	13	12			10			20	29	30	30	29	28	27	27	26	21	20	17	16	15	18	19	15
MED	103	107			103			108	113	113	113	111	111	109	107	108	103	103	103	106	103	103	103	105
U Q	106	111			107			148	129	137	131	119	115	115	113	113	106	112	109	111	107	105	105	105
L Q	101	103			103			100	108	109	109	107	107	105	105	105	99	99	101	100	99	99	99	99

h'F STATION YAMAGAWA LAT. 31.2N LON. 130.6E

	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											18	22	20	16	20	11	11							
MED											258	254	246	252	251	246	248							
U Q											264	264	257	265	267	268	254							
L Q											246	240	238	248	243	238	240							

h'Es

	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	19	23	24	24	22	17	14	15	29	27	28	28	26	29	29	30	28	27	27	24	22	19	15	18
MED	105	105	105	107	109	107	106	107	119	113	113	114	113	113	111	107	107	105	107	105	105	105	103	106
U Q	109	111	112	113	113	112	115	129	138	119	131	121	119	124	114	111	113	119	113	108	109	109	113	113
L Q	103	105	103	105	103	103	105	103	111	111	111	111	109	106	107	105	105	103	101	102	103	103	99	101

MONTHLY MEDIANS OF h'F AND h'Es

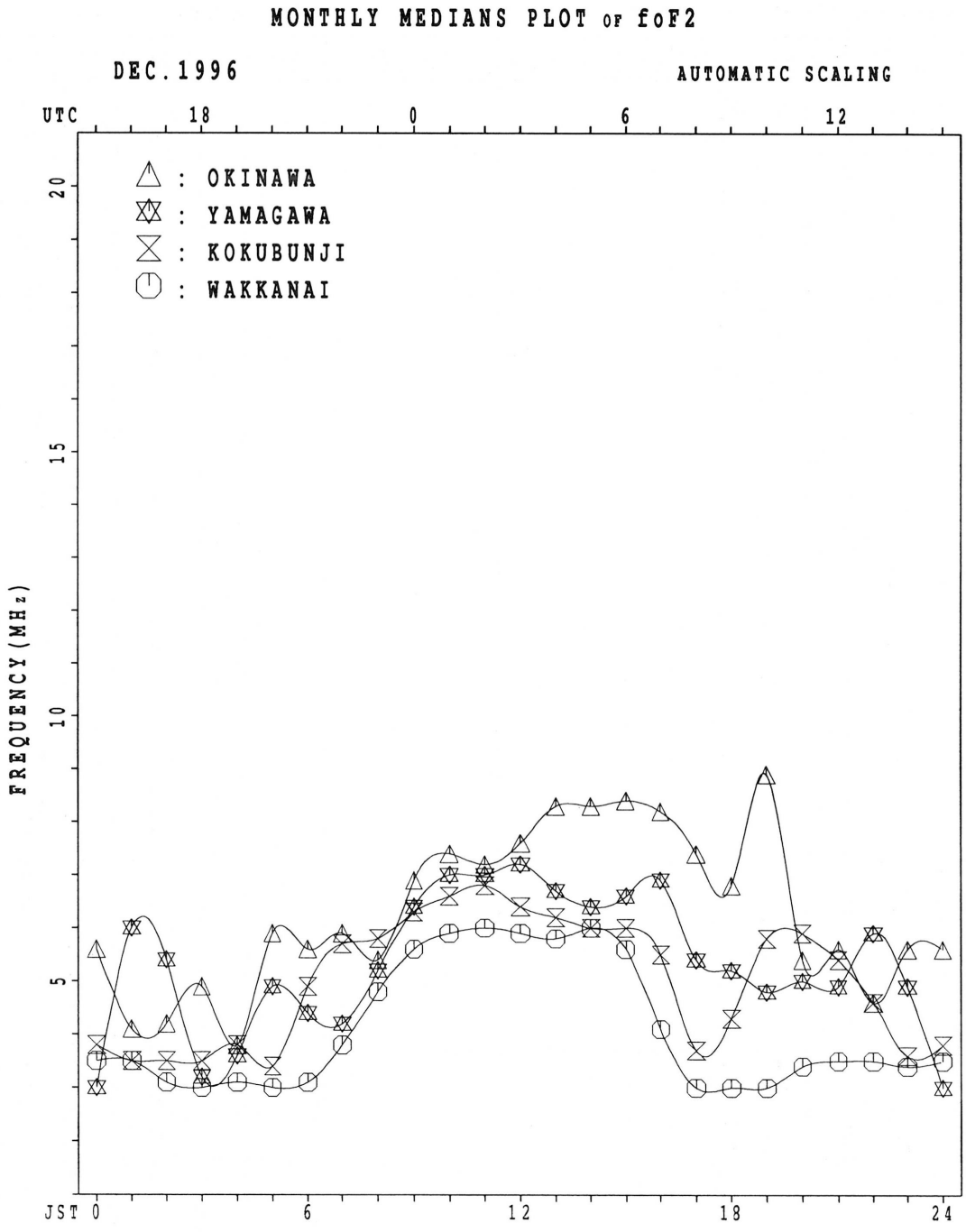
DEC. 1996 135E MEAN TIME (UTC+9H) AUTOMATIC SCALING

h'F STATION OKINAWA LAT. 26.3N LON. 127.8E

	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										15	23	17	29	29	26	25	22	17						
MED										252	250	240	272	254	243	238	240	224						
U Q										472	264	251	280	273	258	261	252	253						
L Q										238	238	227	253	245	238	229	232	211						

h'Es

	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			10	15	11			11	27	31	29	30	30	30	31	31	30	24	27	26	18	14	10	
MED			102	97	99			97	119	111	111	109	107	107	103	103	103	97	97	95	99	99	103	
U Q			107	103	103			115	145	125	128	115	113	109	107	107	109	105	101	107	105	103	103	
L Q			99	97	95			91	113	107	107	105	105	105	99	99	97	95	91	91	97	95	97	


MONTHLY MEDIANS PLOT OF foF2
DEC.1996
AUTOMATIC SCALING
UTC
18
0
6
12
△ : OKINAWA
⊠ : YAMAGAWA
⊠ : KOKUBUNJI
○ : WAKKANAI
FREQUENCY(MHz)
20
15
10
5
JST 0
6
12
18
24

IONOSPHERIC DATA STATION Kokubunji

DEC. 1996 fxI (0.1MHz) 135°E MEAN TIME (G.M.T. + 9 H)

LAT.35°42.4'N LON.139°29.3'E SWEEP 1.0MHz TO 25.0MHz IN 24.0SEC IN MANUAL SCALING

D \ H	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	41	37	49	56	60	40	X 42											A	X 38	X 36	37	A	40	39
2	38	X 34	35	X 33	X 34	X 30	X 33											X 34	X 36	X 44	X 36	X 32	A	X 31
3	X 31	X 33	X 35	X 35	35	X 34	52											50	49	42	X 39	X 43	41	X 41
4	44	42	42	X 38	X 40	X 30	X 33											X 36	X 31	X 38	X 38	X 34	37	35
5	X 34	X 34	37	33	33	X 32	X 25											X 38	X 32	X 39	X 28	X 31	32	X 32
6	X 33	X 34	36	32	X 30	X 26	X 24											X 34	X 29	C	C	X 29	X 33	30
7	31	31	X 31	32	X 36	X 25	X 22			C	C	C	C	C	C	C	C	C	O X 27	X 34	X 34	X 28	X 28	X 31
8	X 30	X 31	X 33	X 33	X 30	X 26	X 27											A	A	X 39	X 26	X 29	X 26	X 32
9	X 32	X 34	X 32	32	34	X 30	X 31											X 46	X 35	X 32	X 32	X 29	X 32	34
10	X 33	X 31	X 32	33	33	28	28											X 42	X 37	X 33	X 36	X 39	X 38	X 35
11	X 32	X 34	X 34	X 36	X 34	X 33	X 30											X 33	X 39	X 43	X 40	X 32	X 34	41
12	36	X 34	X 34	X 34	36	37	30											A	X 40	X 33	X 33	X 30	X 30	X 33
13	35	41	X 36	38	38	X 28	X 28											X 38	X 36	X 34	X 34	X 28	X 31	X 34
14	X 34	X 34	X 34	X 34	X 32	X 40	X 27											X 39	X 36	O X 33	35	37	34	34
15	34	34	40	40	36	29	X 30											X 40	X 40	X 36	O X 35	A	34	37
16	41	37	40	41	41	41	42											X 42	X 39	X 38	X 47	X 31	44	X 46
17	46	41	41	38	35	33	33											X 40	X 39	A	A	X 33	X 33	36
18	X 36	X 37	X 38	X 38	X 34	X 36	X 34											X 35	X 37	X 37	X 37	X 34	X 31	X 37
19	X 36	X 32	X 33	36	X 34	X 30	A											X 39	A	A	X 40	X 39	X 30	X 33
20	35	X 34	X 38	X 38	X 34	X 32	30											X 41	X 33	X 35	X 34	X 36	X 37	O X 33
21	32	X 33	X 34	37	X 36	X 36	35											X 38	X 30	X 39	X 36	36	36	36
22	X 36	40	41	X 38	36	36	42											X 46	X 40	X 36	X 37	X 33	X 34	X 37
23	X 36	X 38	X 40	40	X 40	38	X 35											X 44	X 49	X 37	X 41	X 38	X 36	X 35
24	X 36	X 35	X 36	X 36	X 36	37	X 35											O X 37	X 51	X 45	X 32	X 34	X 35	X 34
25	X 33	36	X 36	X 34	X 27	X 28	X 30											X 39	X 51	X 56	O X 36	A	A	X 36
26	X 37	X 39	X 40	X 34	32	35	X 34											X 39	X 38	X 42	X 35	A	X 34	X 35
27	O X 31	X 32	X 33	X 33	32	X 34	X 30											X 49	X 45	X 35	X 31	X 29	29	X 31
28	35	37	36	X 31	33	29	X 31											X 37	X 40	X 39	X 34	X 34	38	X 37
29	X 29	34	35	36	33	32	34											X 48	X 35	X 38	X 34	X 34	34	34
30	35	30	34	X 33	32	31	X 32											X 41	X 34	X 42	X 41	33	40	50
31	37	36	42	35	33	28	X 27											X 54	X 28	X 39	X 51	X 32	31	35
	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	30											27	29	28	29	27	29	31
MED	X 35	X 34	X 36	X 35	34	X 32	X 31											X 39	X 37	X 38	X 36	X 33	X 34	X 35
U Q	36	37	40	38	X 36	36	34											X 44	X 40	X 40	X 38	X 36	37	X 37
L Q	X 32	X 33	X 34	33	33	X 29	X 28											X 37	X 34	X 35	X 34	X 30	X 31	X 33

DEC. 1996 fxI (0.1MHz) COMMUNICATIONS RESEARCH LABORATORY, JAPAN

IONOSPHERIC DATA STATION Kokubunji

DEC. 1996 foF2 (0.1MHz) 135°E MEAN TIME (G.M.T. + 9 H)

LAT. 35°42.4'N LON. 139°29.3'E SWEEP 1.0MHz TO 25.0MHz IN 24.0SEC IN MANUAL SCALING

D \ H	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 32	F 29	F 35	F 48	F 52	F 32	36	48	54	58	65	65	65	68	67	61	60	A	32	30	F 29	A	F 31	F 32
2	F 30	28	F 28	27	28	24	27	55	56	58	68	63	75	58	58	64	52	28	30	38	30	26	A	25
3	25	27	28	29	F 28	28	F 37	48	52	58	74	86	83	86	75	61	45	F 43	F 41	33	33	37	F 31	35
4	F 34	F 34	F 33	32	34	24	27	50	52	51	81	V 73	67	71	59	V 53	50	30	25	32	32	28	F 29	F 27
5	28	28	F 30	F 26	F 27	26	19	42	52	63	71	65	64	59	67	65	46	J S 32	26	33	22	25	F 27	26
6	27	28	F 28	F 26	24	20	R 18	38	54	48	62	63	58	H 54	55	50	49	28	23	C	C	23	F 25	F 23
7	F 25	F 25	25	F 24	F 26	19	R 16	43	R 46	C	C	C	C	C	C	C	C	C	U S 21	28	28	22	22	25
8	23	25	27	27	24	20	21	R 41	46	48	56	A	54	69	53	47	49	A	A	34	20	24	20	26
9	26	28	26	F 26	F 26	24	25	42	J R 52	46	53	51	52	48	60	R 54	48	40	28	26	26	23	26	F 27
10	27	25	26	F 24	F 24	F 20	F 20	42	J R 63	70	54	61	86	50	56	57	50	36	31	27	30	33	32	29
11	26	28	28	30	28	27	24	48	55	56	59	65	63	76	71	60	H 47	27	33	37	34	26	28	F 33
12	F 30	28	28	28	F 28	F 30	F 22	40	49	50	65	67	62	61	54	60	58	A	34	27	27	24	24	27
13	F 27	F 33	30	F 30	F 30	22	22	43	52	60	69	64	58	60	55	R 53	64	33	30	28	28	J R 22	25	28
14	28	28	28	28	26	34	21	J R 46	53	60	60	69	59	57	60	64	46	33	29	27	F 26	F 29	F 27	F 25
15	J F 24	F 26	F 32	F 32	F 30	F 22	24	45	52	60	68	76	86	69	58	54	58	34	34	30	29	A	28	F 27
16	F 31	F 27	F 32	F 32	F 32	F 33	F 32	51	52	73	69	70	58	64	61	60	49	36	33	32	41	25	34	F 41
17	F 34	F 32	F 32	F 30	F 25	F 25	F 25	52	58	61	78	86	65	61	56	58	68	34	33	A	A	27	27	F 29
18	30	31	32	32	28	30	28	52	54	57	70	80	78	65	61	66	58	29	31	31	31	28	S 26	31
19	30	26	27	F 28	28	24	A	50	R 62	62	65	61	77	66	60	74	53	33	A	A	34	33	24	27
20	F 28	S 28	32	32	28	26	F 22	48	56	58	60	R 61	60	71	53	56	48	36	H 27	29	28	F 29	J R 31	27
21	F 25	28	28	F 30	30	30	F 28	51	56	54	62	R 63	61	62	66	60	64	32	24	33	30	F 28	F 28	F 28
22	30	F 33	F 33	32	F 26	F 29	F 36	53	57	61	63	70	62	65	57	56	58	40	34	30	31	27	28	31
23	30	32	33	F 32	34	F 30	29	44	52	68	75	82	70	65	57	56	70	H 38	43	31	35	32	30	29
24	30	29	30	30	30	F 28	29	46	67	59	64	62	60	50	63	65	50	U A 31	45	J R 39	26	28	29	28
25	27	F 28	30	28	21	22	24	46	56	57	54	67	68	67	50	55	51	33	45	50	30	A	A	30
26	31	33	34	28	F 25	F 26	28	43	50	62	78	68	55	54	51	52	47	33	32	36	29	A	28	29
27	25	26	27	27	F 24	28	24	41	49	52	61	71	57	57	H 49	56	42	43	39	29	25	23	U S 23	25
28	F 26	F 28	F 29	25	F 24	F 22	25	S 33	47	54	71	70	67	56	54	61	52	31	34	33	28	28	F 30	31
29	23	F 26	F 27	F 28	F 25	F 25	F 26	38	45	49	61	62	64	54	48	50	54	42	29	32	28	28	F 26	F 26
30	F 27	F 23	F 25	27	F 24	F 23	26	37	49	44	57	68	56	59	65	55	R 46	35	28	36	35	F 24	F 30	F 40
31	F 28	F 27	F 33	F 28	F 23	F 21	F 18	39	56	53	62	59	57	H 52	51	58	56	48	22	33	45	26	F 25	F 28
	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	30	31	31	30	30	29	30	30	30	30	30	27	29	28	29	27	29	31
MED	28	28	29	28	F 27	25	25	45	52	58	64	67	62	61	58	58	50	33	31	32	29	27	28	28
U Q	F 30	F 29	F 32	32	30	F 29	28	50	56	61	70	70	68	67	61	61	58	38	34	34	32	28	30	31
L Q	26	26	27	F 27	F 24	22	22	41	50	52	60	62	58	56	54	54	48	31	28	29	28	24	25	26

DEC. 1996 foF2 (0.1MHz) COMMUNICATIONS RESEARCH LABORATORY, JAPAN

IONOSPHERIC DATA STATION Kokubunji

DEC. 1996 foF1 (0.01MHz) 135°E MEAN TIME (G.M.T. + 9 H)

LAT. 35°42.4'N LON. 139°29.3'E SWEEP 1.0MHz TO 25.0MHz IN 24.0SEC IN MANUAL SCALING

D \ H	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	U L 364	L 420	L 432	U L 436	U L 420	U L 344	L 344								
2									U L 328	L	A	U L 428	U A 432	L		L								
3											L 420	U A 412	U L 424	L 416	U L 396	L								
4										L 360	L 416	L 412	U L 424	L 396	L 336	U L 304								
5										U L 416	U L 408	U A 384	U A 416	L 384	L	L								
6									L		U L 412	L 408	L 400	L	L									
7										C	C	C	C	C	C	C	C	C						
8											U L 400	A	U L 400	L 400	L 372	U L 336								
9										316	L	U L 404	L	L 392	U L 372	L								
10									L 356	L 364	U L 400	L	L 420		L	L 324								
11									U L 328	L 336	L	U L 424	L 412	L 424	L 380									
12								L		328	U L 420	L 420	L	A	L									
13									304	L	L 424	L 428	400	U L 428	A									
14								216			L	U L 416	U L 416	L	L	L								
15									L 312	L	U L 440	L	L 444	L 428	328	L								
16									L 312	L	L	L 424	L 372	380	U A 336									
17									L	L	L 428	U L 436	U L 436	U L 412	L 380									
18									L	L	L 424	408	L 436	L 424	L 388	L								
19									L	L	U L 420	L 436	L 444	U L 420	U L 384	L								
20									L 320	L	L	L 416	U L 420	L 416		L								
21									L	L	U L 412	L 412	U L 432	L 416	L 364	L								
22									L	L	L 436	L 448	U L 416	U L 416	L	L								
23										L	L	A	L 432	L	L	L								
24									L	L	L	L 412	L 420	L	L 376	L								
25											L	L 436	L 436	U L 416	L	L								
26									L	L 396	L 408	L 412	U L 416	L 396	L	292								
27									L 276	L	U L 412	L 412	U L 408	L 404	L 360									
28									264	U L 396	L 408	L 412	L 408	L	L									
29									264		L 408	L 412	L 408	L 404	L	L								
30									U L 260	L	U L 392	416	404	L 408	U L 380	L								
31										L	L 400	U L 392	U L 388	U L 396		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	11	9	21	26	28	22	15	5								
MED								216	L 312	L 364	L 412	L 414	L 418	L 414	L 372	L 324								
U Q									U L 328	U L 396	L 422	L 428	L 432	L 420	U L 380	L 340								
L Q									264	332	L 408	L 412	L 408	L 396	344	298								

DEC. 1996 foF1 (0.01MHz) COMMUNICATIONS RESEARCH LABORATORY, JAPAN

IONOSPHERIC DATA STATION Kokubunji

DEC. 1996 foE (0.01MHz) 135°E MEAN TIME (G.M.T. + 9 H)

LAT.35°42.4'N LON.139°29.3'E SWEEP 1.0MHz TO 25.0MHz IN 24.0SEC IN MANUAL SCALING

D \ H	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								180	236	264	304	A	A	288	A	A	A							
2								168	236	268	292	A	A	A	A	A	A							
3								176	240	272	A	A 300	A	A	A	A	A							
4								A	244	268	292	300	300	280	268	244	180							
5								A	A	272	A 292	U A 300	A	300	292	A	A							
6								B	A	A	288	300	A	292	256	A	A							
7								A	228	C	C	C	C	C	C	C	C	C						
8								180	224	268	272	A 296	A	A	268	A	184							
9								B	228	268	288	A 304	300	284	276	A	A							
10								A	232	272	A 288	304	R 308	296	276	240	180							
11								152	232	264	A 280	A 296	A	292	268	228	A							
12								B	216	260	292	304	H 304	292	268	A	A							
13								B	220	268	284	A 296	304	A	268	A	A							
14								A	228	276	A	300	308	292	260	232	A							
15								A	A	276	304	A	308	296	272	224	184							
16								184	236	284	292	300	A	292	A	A	A							
17								B	228	268	A	A	A	A	A	A	A							
18								184	A	A	A 292	304	304	292	A	236	A							
19								B	A	272	292	304	A	300	272	244	160							
20								172	220	268	288	304	308	292	272	240	188							
21								160	224	A	A	A	A	304	A	228	188							
22								A	228	A	284	A	R 308	A	A	240	192							
23								160	244	272	288	U A 308	312	296	276	240	A							
24								A	A	252	292	304	300	A	280	R	A							
25								B	A	A	A	304	308	296	276	A	A							
26								B	212	264	296	300	A	A	276	A	176							
27								B	A	260	A	300	308	288	272	232	180							
28								B	200	252	284	296	A 304	280	264	U A 220	A							
29								B	196	260	288	296	300	292	268	228	176							
30								B	A	256	288	300	308	296	280	240	172							
31								B	A 192	252	280	296	304	288	268	240	U A 192							
	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								10	22	25	24	24	18	22	22	16	13							
MED								174	228	268	288	300	306	292	272	238	180							
U Q								180	236	272	292	304	308	296	276	240	188							
L Q								160	220	260	286	298	304	288	268	228	176							

DEC. 1996 foE (0.01MHz) COMMUNICATIONS RESEARCH LABORATORY, JAPAN

IONOSPHERIC DATA STATION Kokubunji

DEC. 1996 foEs (0.1MHz) 135°E MEAN TIME (G.M.T. + 9 H)

LAT. 35°42.4'N LON. 139°29.3'E SWEEP 1.0MHz TO 25.0MHz IN 24.0SEC IN MANUAL SCALING

D \ H	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 B 16	E B 13	E B 14	19	18	J A 21	J A 22	24	G 23	J A 34	33	38	33	32	J A 36	36	J A 28	J A 63	J A 52	J A 49	J A 45	J A 45	28	J A 46
2	J A 23	E B 14	21	E B 14	E B 13	19	E B 13	G	G	30	J A 47	J A 51	J A 84	J A 36	J A 34	J A 43	J A 42	35	31	21	22	28	34	J A 23
3	J A 37	J A 35	27	21	20	E B 15	E B 16	G	30	38	J A 40	J A 45	J A 44	J A 36	J A 34	J A 34	J A 37	J A 42	J A 22	J A 22	E B 15	E B 14	E B 14	E B 14
4	J A 24	22	E B 13	20	J A 22	20	J A 19	J A 22	J A 32	G 24	32	32	34	29	G 24	29	J A 19	20	E B 14	17	18	E B 14	E B 14	E B 14
5	E B 15	J A 30	20	24	20	23	17	20	30	30	J A 36	J A 42	J A 44	J A 36	J A 34	J A 27	J A 24	32	18	E B 15	18	J A 21	J A 20	J A 20
6	26	J A 18	19	21	20	19	21	22	29	J A 32	G 21	32	32	30	27	J A 32	J A 32	J A 27	J A 22	C	C	21	J A 22	18
7	E B 15	20	21	E B 13	20	20	J A 21	26	29	C	C	C	C	C	C	C	C	C	28	19	E B 13	17	E B 14	E B E B 13
8	E B E B 13	E B 14	E B 14	19	E B 13	20	19	25	J A 26	32	J A 36	J A 86	J A 33	J A 35	J A 45	J A 43	J A 22	J A 51	28	20	20	E B 15	E B 14	E B 14
9	E B E B 13	E B 13	E B 13	E B 14	E B E B 14	E B E B 15	18	J A 19	J A 28	31	36	32	38	30	31	J A 30	J A 42	J A 25	J A 22	E B 13	19	E B 14	E B 14	J A 21
10	18	18	19	E B 14	E B E B 14	E B E B 14	E B 13	23	G 22	32	36	34	33	32	29	G 21	G	E B 16	E B E B 14	E B E B 14	E B E B 13	E B E B 15	E B E B 13	E B E B 12
11	E B E B 13	E B 13	E B 13	21	19	E B J A 14	14	22	30	32	J A 36	40	J A J A 44	35	G J A 22	32	J A E B 28	E B 17	E B 14	E B 14	E B 13	22	E B 14	E B 13
12	E B E B 14	E B 15	E B 15	E B E B 14	E B E B 14	E B E B 14	E B E B 14	16	26	31	35	37	J A 42	J A 52	J A 34	J A 52	J A 34	57	J A 46	J A 41	J A 27	16	J A 22	20
13	E B 13	J A 28	25	27	J A 29	J A 36	J A 32	34	26	J A 35	40	J A 39	J A 38	32	J A 50	J A 34	J A 23	J A 20	19	J A 21	19	E B 14	E B 14	18
14	E B 14	J A 18	19	E B 14	E B E B 15	13	20	J A 24	30	32	J A 64	36	G	33	30	J A 40	J A 45	J A 41	J A 20	J A 36	21	J A 22	20	E B 14
15	E B 14	E B E B 15	E B 14	J A E B 25	E B 14	18	18	20	J A 28	34	J A 42	J A 48	G	G 23	G	G	G 18	J A 22	E B 15	J A 18	J A 50	J A 54	J A E B 37	14
16	19	J A 23	20	21	32	E B 13	J A 18	J A 22	J A 25	33	35	G 29	31	31	J A 38	J A 38	J A 38	J A 29	28	J A 21	18	J A 22	18	J A 45
17	J A 27	J A 22	J A 31	J A E B 36	E B 13	19	E B 15	25	34	30	J A 36	33	J A 35	J A 44	J A 46	J A 65	J A 125	J A 71	J A 48	60	J A 64	J A 27	29	J A 23
18	28	J A 22	E B 14	E B 14	E B E B 13	E B 14	24	J A 28	J A 28	J A 36	J A 41	J A 46	J A 32	J A 33	J A 42	G 22	G J A 30	J A 22	19	18	18	19	J A J A 23	22
19	J A 25	J A 31	J A 28	20	20	J A 27	J A 50	J A 29	J A 33	J A 40	30	J A 38	J A 54	J A 35	21	G 28	19	J A 34	J A 45	30	20	E B 14	J A 26	J A 27
20	J A 27	30	30	J A 26	26	E B 12	22	J A 28	28	G 26	34	G	36	33	32	26	J A 32	18	J A 20	J A 22	J A E B 27	12	J A J A 69	50
21	J A 29	22	J A 20	J A 20	18	E B 15	E B 14	G	G	J A 29	J A 35	J A 34	J A 36	G 29	30	27	21	32	27	21	J A 21	28	J A 19	J A 20
22	J A J A 22	A 40	E B 13	28	J A 23	24	J A J A 21	21	G	29	34	32	G	J A 44	A 48	G	G 19	E B 14	J A E B 25	13	E B 14	J A 24	J A 28	28
23	J A E B 20	15	J A J A 21	20	J A J A 26	20	E B 13	G	30	34	34	J A 63	J A 48	J A 36	J A 36	G	J A 33	33	J A E B 48	14	28	J A 26	J A 22	J A 20
24	J A J A 34	34	J A 24	J A J A 20	J A J A 28	22	J A 22	52	J A 32	G	32	32	32	38	G	G	J A 23	47	J A 44	J A 36	J A J A 35	24	J A 23	19
25	J A E B 29	13	J A 23	19	E B 13	E B 13	J A E B 19	15	28	28	33	37	38	J A 38	34	J A 42	J A J A 70	48	J A 40	J A 35	J A 36	33	J A 35	J A 22
26	28	J A E B 22	J A 13	J A 44	J A E B 28	13	J A 22	26	J A 24	G 20	32	G 25	34	J A 33	31	28	20	J A 23	19	J A 20	J A J A 33	36	27	24
27	J A E B 20	15	16	21	26	17	J A 38	J A 31	29	32	J A 36	G 22	G 28	G	G 18	27	24	21	21	J A 31	J A J A 27	28	28	19
28	E B E B 14	E B 12	E B 13	E B 14	E B E B 15	E B 14	J A 20	26	J A 22	G 24	34	33	36	37	J A 36	J A 40	J A 48	J A 48	J A 49	J A 27	J A 44	26	15	19
29	E B E B 14	E B 13	E B 14	E B J A 15	E B J A 22	E B 13	18	24	26	31	30	31	G 20	G 18	G	24	22	J A E B 22	J A 12	J A 23	J A J A 25	J A 32	J A 22	J A 22
30	19	18	19	20	17	E B 14	E B J A 14	23	J A 24	27	G	G	G	G	G	G	22	E B 15	20	21	J A 26	J A 20	21	19
31	E B 15	21	E B E B 15	14	18	19	E B 15	20	33	28	G 27	G 22	34	30	29	26	23	20	22	22	E B 14	J A 22	J A 24	21
	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	30	30	30	30	30	30	30	30	31	30	30	31	31	31
MED	19	18	19	20	19	17	19	23	28	31	35	34	34	33	32	28	J A 26	J A 28	J A 22	21	21	22	22	20
U Q	J A 27	J A 23	J A 21	21	J A 23	J A 20	J A 22	J A 26	30	33	J A 36	J A 40	J A 38	J A 36	J A 36	J A 38	J A 37	J A 42	J A 40	J A 30	J A 28	J A 28	28	J A 23
L Q	E B 14	E B 14	E B 14	E B 14	E B 14	E B 14	E B 15	20	G 24	G 28	G 32	G 32	G 32	G 30	G	G 24	22	20	E B 19	E B 18	E B 18	E B 15	E B 14	E B 14

DEC. 1996 foEs (0.1MHz) COMMUNICATIONS RESEARCH LABORATORY, JAPAN

IONOSPHERIC DATA STATION Kokubunji

DEC. 1996 fbEs (0.1MHz) 135°E MEAN TIME (G.M.T. + 9 H)

LAT.35°42.4'N LON.139°29.3'E SWEEP 1.0MHz TO 25.0MHz IN 24.0SEC IN MANUAL SCALING

D \ H	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 B 16	E B 13	E B 14	E B 13	E B 15	E B 13	21	22	G 21	29	32	36	31	30	28	28	20	A A 63	23	19	19	A A 45	18	18
2	18	E B 14	E B 14	E B 14	E B 13	17	E B 13	G	G	29	43	37	43	31	29	26	27	23	22	16	17	21	A A 34	17
3	17	19	17	18	E B 14	E B 15	E B 16	G	28	34	35	41	39	32	29	22	27	E B 16	E B 14	20	E B 15	E B 14	E B 14	E B 14
4	21	E B 14	E B 13	E B 14	E B 16	17	17	19	G 21	G 22	30	31	33	29	G 23	G 23	G 18	17	E B 14	16	E B 15	E B 14	E B 14	E B 14
5	E B 15	18	16	16	17	E B 14	E B 14	20	24	30	34	38	42	G 24	G 25	25	22	20	E B 15	E B 15	E B 14	14	18	E B 14
6	17	16	E B 14	17	17	16	E B 14	22	26	29	G 20	32	30	30	26	26	20	19	18	C	C	17	17	E B 13
7	E B 15	E B 15	E B 14	E B 13	E B 14	E B 13	14	20	27	C	C	C	C	C	C	C	C	C	18	17	E B 13	15	E B 14	E B 13
8	E B 13	E B 14	E B 14	16	E B 13	E B 14	E B 14	G	U Y 26	32	31	A A 86	32	34	G 20	27	G 18	A A 51	A A 28	18	16	E B 15	E B 14	E B 14
9	E B 13	E B 13	E B 13	E B 14	E B 14	E B 15	E B 12	E B 16	24	28	34	32	35	30	U Y 31	27	34	24	E B 16	E B 13	E B 13	E B 14	E B 14	17
10	E B 14	E B 14	14	E B 14	E B 14	E B 14	E B 13	18	G 19	28	33	U Y 34	33	31	29	G 18	G	E B 16	E B 14	E B 14	E B 13	E B 15	E B 13	E B 12
11	E B 13	E B 13	E B 13	17	E B 14	E B 14	E B 15	20	27	30	34	33	35	G 25	G 20	G 18	24	E B 17	E B 14	E B 14	E B 13	17	E B 14	E B 13
12	E B 14	E B 15	E B 15	E B 14	E B 14	E B 14	E B 14	E B 16	26	30	34	36	37	45	30	33	26	A A 57	25	17	21	16	17	16
13	E B 13	16	16	17	17	18	E B 16	32	24	G 22	G 25	35	37	30	42	24	20	16	E B 14	17	17	E B 14	E B 14	E B 14
14	E B 14	E B 13	E B 13	E B 14	E B 15	E B 13	16	18	27	31	35	34	G	33	29	31	21	18	E B 14	21	E B 14	E B 15	E B 14	E B 14
15	E B 14	E B 15	E B 14	E B 14	E B 14	E B 13	E B 13	19	25	33	G 27	33	G	G 22	G	G	G	18	E B 15	17	21	A A 54	19	E B 14
16	16	16	16	E B 14	E B 14	E B 13	16	G	G 20	33	34	G 27	31	30	34	32	34	28	17	E B 14	18	16	E B 15	21
17	17	E B 14	18	17	E B 13	E B 15	E B 15	18	26	28	32	31	32	30	30	38	46	24	17	A A 60	A A 64	20	17	16
18	17	E B 14	E B 14	E B 14	E B 13	E B 14	E B 14	G	24	28	32	G 26	G 25	G 23	G 29	G 20	22	17	E B 14	17	E B 13	E B 13	E B 15	18
19	E B 15	20	20	E B 13	17	19	A A 50	22	24	G 23	G 23	G 26	40	G 24	G 19	27	19	20	A A 45	A A 30	18	E B 14	E B 14	20
20	18	U S 21	18	17	18	E B 12	E B 14	G	G	G 22	30	G	34	33	29	25	G 17	17	17	19	22	E B 12	25	18
21	17	E B 14	18	17	E B 14	E B 15	E B 14	G	G	27	31	33	32	G 26	28	27	G 16	25	16	E B 14	16	19	17	E B 13
22	18	22	E B 13	22	18	16	E B 13	18	G	28	34	32	G	34	31	G	G 16	E B 14	E B 14	E B 13	E B 14	18	21	19
23	17	E B 15	E B 15	E B 14	17	E B 13	E B 13	G	28	33	33	57	36	G 23	33	G	24	18	21	E B 14	18	18	E B 14	E B 13
24	17	17	18	E B 14	20	18	E B 15	22	24	G	32	G 30	32	36	G	G	20	U A 26	24	31	18	19	19	E B 14
25	17	E B 13	17	17	E B 13	E B 13	E B 13	E B 15	24	28	32	35	36	35	32	24	35	19	21	22	25	A A 33	A A 35	18
26	17	17	E B 13	E B 14	E B 13	E B 13	E B 13	19	G 18	G 18	31	G 20	31	28	30	25	19	E B 16	E B 12	E B 13	17	A A 36	18	20
27	E B 13	E B 15	E B 13	E B 14	E B 14	E B 14	17	24	22	G 23	31	G 20	G 26	G	G 18	27	21	16	16	20	18	18	18	18
28	E B 14	E B 12	E B 13	E B 14	E B 15	E B 14	E B 15	E B 16	G 18	G 20	33	32	34	34	33	30	32	18	20	20	19	16	15	E B 13
29	E B 14	E B 13	E B 14	E B 15	E B 14	E B 13	E B 15	E B 16	22	30	30	31	G 17	G 18	G	23	19	18	E B 12	18	17	E B 15	E B 12	17
30	16	14	E B 14	17	E B 14	E B 14	E B 14	E B 15	22	G 21	G	G	G	G	G	G	20	E B 15	E B 14	18	19	16	16	11
31	E B 15	E B 14	E B 15	E B 14	16	E B 14	E B 15	E B 14	28	27	G 26	G 20	33	G 22	28	25	22	17	E B 14	17	E B 14	17	15	17
	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	30	30	30	30	30	30	30	30	31	30	30	31	31	31
MED	E B 16	E B 14	E B 14	E B 14	E B 14	E B 14	E B 14	18	24	28	32	32	32	30	29	25	20	18	16	17	17	16	15	14
U Q	17	16	16	17	17	15	16	20	26	30	34	35	36	33	30	27	26	24	21	20	19	19	18	18
L Q	E B 14	E B 14	E B 13	E B 14	E B 14	E B 13	E B 13	G	G	G 23	G 30	G	G 30	G 25	G	G	G 19	E B 17	E B 14	E B 14	E B 14	E B 14	E B 14	E B 13

DEC. 1996 fbEs (0.1MHz) COMMUNICATIONS RESEARCH LABORATORY, JAPAN

IONOSPHERIC DATA STATION Kokubunji

DEC. 1996 fmin (0.1MHz) 135°E MEAN TIME (G.M.T. + 9 H)

LAT. 35°42.4'N LON. 139°29.3'E SWEEP 1.0MHz TO 25.0MHz IN 24.0SEC IN MANUAL SCALING

D \ H	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	13	14	13	15	13	14	16	15	17	16	15	13	13	14	15	16	16	14	15	15	15	15	15
2	15	14	14	14	13	13	13	15	14	16	15	16	14	14	16	15	14	15	14	13	15	16	15	14
3	15	15	13	14	14	15	16	15	15	14	16	14	14	15	15	16	16	16	14	14	15	14	14	14
4	15	14	13	14	16	15	14	14	14	16	15	13	16	15	14	14	14	15	14	14	15	14	14	14
5	15	15	15	14	14	14	14	15	16	16	14	14	14	14	16	13	14	16	15	15	14	14	16	14
6	14	15	14	13	14	14	14	15	15	15	14	14	13	15	15	15	13	14	14	C	C	15	15	13
7	15	15	14	13	14	13	14	14	14	C	C	C	C	C	C	C	C	C	16	14	13	12	14	13
8	13	14	14	12	13	14	14	14	14	14	14	13	14	15	14	16	15	14	14	13	13	15	14	14
9	13	13	13	14	14	15	12	16	14	14	14	14	14	14	13	14	14	14	16	13	13	14	14	14
10	14	14	14	14	14	14	13	15	12	14	15	14	14	14	14	14	12	16	14	14	13	15	13	12
11	13	13	13	14	14	14	15	12	14	14	14	14	16	15	14	12	15	17	14	14	13	16	14	13
12	14	15	15	14	14	14	14	16	16	16	14	15	14	14	15	14	14	16	14	13	14	14	14	14
13	13	13	14	13	14	14	16	17	16	14	13	13	13	14	14	14	15	14	14	14	14	14	14	14
14	14	13	13	14	15	13	14	16	16	14	13	14	12	15	15	14	15	15	14	13	14	15	14	14
15	14	15	14	14	14	13	13	14	14	16	16	13	13	15	14	14	14	15	15	14	16	12	14	14
16	12	14	13	14	14	13	14	14	14	13	14	13	16	14	15	15	15	15	13	14	14	13	15	14
17	14	14	14	14	13	15	15	14	15	14	15	14	16	15	15	14	15	15	14	16	14	13	15	15
18	14	14	14	14	13	14	14	14	15	14	16	15	15	15	14	14	14	15	14	14	13	13	15	15
19	15	14	15	13	14	14	14	15	15	15	16	19	17	16	14	15	14	16	15	14	15	14	14	13
20	15	14	14	15	15	12	14	14	15	13	14	14	14	15	16	16	14	15	14	14	15	12	14	15
21	14	14	14	14	14	15	14	14	13	15	16	14	17	16	14	13	13	17	14	14	12	15	14	13
22	13	14	13	14	15	15	13	13	16	16	14	14	14	14	15	14	13	14	14	13	14	14	14	13
23	13	15	15	14	14	13	13	12	15	13	13	16	22	15	15	16	14	14	14	14	14	14	14	13
24	15	14	15	14	14	14	15	14	13	15	14	14	17	23	22	18	14	14	14	14	14	13	15	14
25	14	13	14	13	13	13	13	15	15	18	20	20	18	16	16	14	15	14	13	15	14	12	14	14
26	14	14	13	14	13	13	13	16	14	14	13	13	16	15	15	14	14	16	12	13	12	13	13	13
27	13	15	13	14	14	14	14	14	15	14	15	14	18	16	16	13	13	13	13	14	14	14	15	16
28	14	12	13	14	15	14	15	16	15	14	14	14	14	15	15	14	13	14	14	16	15	12	12	13
29	14	13	14	15	14	13	15	16	14	15	14	17	14	15	16	13	14	14	12	15	14	15	12	14
30	13	12	14	14	14	14	14	15	14	14	14	14	16	17	14	15	14	15	14	14	14	15	13	11
31	15	14	15	14	14	14	15	14	14	14	15	14	14	16	14	14	13	15	14	13	14	13	14	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	30	30	30	30	30	30	30	30	31	30	30	31	31	31
MED	14	14	14	14	14	14	14	15	15	14	14	14	14	15	15	14	14	15	14	14	14	14	14	14
U Q	15	15	14	14	14	14	15	16	15	16	15	15	16	15	15	15	15	16	14	14	15	15	15	14
L Q	13	13	13	14	14	13	13	14	14	14	14	14	14	14	14	14	14	14	14	13	13	13	14	13

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DEC. 1996 M(3000)F2 (0.01) 135°E MEAN TIME (G.M.T. + 9 H)

LAT. 35°42.4'N LON. 139°29.3'E SWEEP 1.0MHz TO 25.0MHz IN 24.0SEC IN MANUAL SCALING

D \ H	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 301	F 313	F 304	F 326	F 332	F 365	332	376	368	370	364	370	350	334	362	340	385	A	367	349	F 328	A	F 325	F 285
2	F 300	304	F 291	320	319	324	325	367	355	379	365	383	356	375	364	357	383	324	312	354	366	359	A	306
3	310	299	331	350	F 302	315	F 371	382	371	330	328	349	339	351	370	376	381	F 352	F 341	340	337	321	F 323	317
4	F 316	F 288	F 299	328	378	322	343	363	363	344	362	357	349	376	352	V 343	376	368	334	342	335	313	F 322	F 329
5	314	311	F 311	F 290	F 317	345	395	348	363	349	359	384	360	361	341	374	379	J S 288	325	356	376	329	F 298	306
6	310	324	F 319	F 314	349	403	R 291	365	387	376	347	352	375	H 317	359	362	376	365	323	C	C	330	F 317	F 322
7	F 316	F 326	322	F 324	F 348	387	R 352	374	R 369	C	C	C	C	C	C	C	C	C	U S 341	339	337	394	351	313
8	307	315	317	350	350	336	351	R 366	377	359	360	A	339	366	377	392	351	A	A	350	361	310	350	320
9	311	301	308	F 331	F 345	368	356	347	J R 421	373	370	364	367	372	361	R 372	393	341	359	367	335	319	321	F 322
10	336	329	302	F 317	F 341	F 306	F 300	342	J R 349	377	376	332	340	385	388	354	389	337	353	306	335	332	353	343
11	334	312	312	323	312	321	311	366	366	361	346	355	339	335	346	363	H 358	363	304	336	364	338	316	F 306
12	F 308	308	316	320	F 319	F 353	F 392	373	347	372	343	344	347	373	341	343	373	A	350	352	342	337	298	337
13	F 326	F 308	325	F 333	F 350	336	370	377	344	347	365	365	367	353	356	R 362	350	351	346	365	353	J R 309	320	304
14	299	295	307	313	324	377	326	J R 411	352	348	352	375	339	353	342	361	390	361	377	342	F 316	F 297	F 294	F 305
15	J F 301	F 313	F 328	F 342	F 358	F 343	325	365	371	353	333	328	368	377	374	374	369	370	343	387	353	A	292	F 307
16	F 348	F 325	F 280	F 302	F 316	F 293	F 334	377	361	355	369	368	368	358	350	347	373	328	356	338	342	364	307	F 304
17	F 279	F 298	F 305	F 319	F 304	F 319	F 335	372	373	361	347	350	362	344	356	343	366	350	334	A	A	325	295	F 299
18	308	304	317	324	295	307	321	372	370	347	348	364	351	369	364	344	376	366	315	336	341	331	S 314	311
19	323	296	300	F 325	328	317	A	374	R 347	338	372	335	355	375	358	356	383	323	A	A	333	341	333	287
20	F 289	S 304	311	332	323	336	F 332	357	357	359	355	R 356	362	367	374	358	377	364	H 297	330	324	F 315	J R 316	371
21	F 342	325	313	F 301	309	321	F 320	358	376	372	367	R 344	354	378	379	345	381	387	329	338	324	F 330	F 313	F 304
22	308	F 293	F 308	352	F 318	F 313	F 315	369	356	357	351	331	360	368	341	351	388	350	358	320	343	339	318	295
23	292	301	298	F 306	315	F 307	359	381	351	348	336	357	363	373	336	337	382	H 308	356	308	344	327	320	314
24	323	323	327	335	294	F 293	337	349	361	346	363	371	384	382	360	359	373	A	356	J R 387	320	306	332	310
25	318	F 316	306	342	372	318	318	367	370	354	369	338	338	361	373	367	395	311	352	353	A 317	A	A	308
26	315	302	341	366	F 305	F 296	334	380	364	333	374	380	373	357	379	358	374	377	330	345	369	A	318	317
27	318	316	314	319	F 309	309	341	376	374	363	338	361	351	382	H 341	342	357	351	389	386	354	288	298	U S 309
28	F 328	F 308	F 319	314	F 305	F 306	349	S 362	358	355	335	363	370	358	365	373	390	324	349	319	342	314	F 326	360
29	330	F 335	F 330	F 320	F 297	F 318	F 366	381	362	325	374	369	368	380	368	348	361	364	387	344	384	337	F 311	F 325
30	F 326	F 317	F 327	348	F 322	F 313	340	382	370	376	329	347	375	332	365	353	R 379	348	337	346	358	F 282	F 268	F 322
31	F 364	F 317	F 329	F 326	F 357	F 283	F 290	366	384	349	327	351	377	H 346	354	369	366	375	365	333	358	327	F 294	F 302
	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	30	31	31	30	30	29	30	30	30	30	30	26	29	28	29	27	29	31
MED	315	311	313	324	F 319	319	334	369	364	355	357	357	360	366	360	358	376	351	346	343	342	327	317	310
U Q	F 326	317	325	335	348	343	352	377	371	370	367	368	368	375	370	367	383	365	357	354	358	337	324	322
L Q	F 307	301	F 305	F 317	F 309	F 307	321	363	356	347	343	346	349	353	350	345	369	328	330	336	334	313	298	F 304

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DEC. 1996 M(3000)F1 (0.01) 135°E MEAN TIME (G.M.T. + 9 H)

LAT. 35°42.4'N LON. 139°29.3'E SWEEP 1.0MHz TO 25.0MHz IN 24.0SEC IN MANUAL SCALING

D \ H	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 524	U L 380	L 367	L 382	U L 366	U L 377	U L 388	L 373								
2									U L 406	L	A	U L 390	A	L		L								
3											L 365	A	A	L 372	U L 374	L								
4										L 404	L 351	L 371	U L 377	L 372	L 404	U L 416								
5										L	U L 381	A	A	L 389	L	L								
6									L		U L 375	L 366	L 384	L	L									
7										C	C	C	C	C	C	C	C	C						
8											U L 384	A	U L 384	A 379	L 382	L								
9										434	L	U L 380	L	L 411	U L 376	L								
10									L 392	L 378	U L 372	L	L 365		L	L 396								
11									U L 385	L 415	L	U L 368	L 367	L 361	L 370									
12								L		426	U L 367	L 391	L	A	L									
13									430	L	H 363	L 374	397	U L 367	A									
14								422			L	U L 374	U L 372	L	L	L								
15									L 422	L	U L 358	L	L 363	L 375	409	L								
16									L 414	L	L	L 379	L 420	419	A									
17									L	L	L 354	U L 349	U L 363	U L 367	L 389									
18									L	L	L 369	393	L 369	L 376	L 388	L								
19									L	L	U L 384	L 378	A	L	U L 381	L								
20									L 407	L	L	L 397	U L 390	A 354		L								
21									L	L	U L 381	L 388	U L 381	L 383	L 424	L								
22									L	L	L 363	L 364	U L 381	A	L	L								
23										L	L	A	L 373	L	L	L								
24									L	L	L	L 388	L 396	L	L 379	L								
25											L	L 357	A 368	U L 377	L	L								
26									L	H 373	L 364	L 383	U L 391	L 384	L	396								
27									L 406	L	U L 368	L 378	U L 386	L 381	L 400									
28									475	H 360	L 362	L 385	L 381	L	L									
29									454		H 365	L 379	L 367	L 377	L	L								
30									U L 432	L	H 375	353	381	L 361	U L 385	L								
31										L	L 363	U L 403	L	U L 395		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	12	8	21	24	23	20	14	4								
MED								422	L 418	392	L 367	L 379	L 381	L 377	L 386	L 396								
U Q									443	420	U L 375	L 388	L 386	L 384	L 400	L 406								
L Q									L 406	H 376	L 363	L 370	L 367	L 370	L 379	384								

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DEC. 1996 h'F2 (KM) 135°E MEAN TIME (G.M.T. + 9 H)

LAT. 35°42.4'N LON. 139°29.3'E SWEEP 1.0MHz TO 25.0MHz IN 24.0SEC IN MANUAL SCALING

D \ H	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									222	236	248	236	252	268	236	266								
2									220	222	236	226	258	232		240								
3											278	238	258	246	232	218								
4										238	242	240	258	226	232	220								
5										250	236	218	238	246	260	218								
6									222		262	246	238	H 266	236									
7										C	C	C	C	C	C	C	C	C						
8											244	A	270	250	228	220								
9										220	244	244	244	232	256	232								
10									228	220	240	278	236		222	252								
11									230	238	240	262	274	266	238									
12								214		228	266	246	266	230	240									
13									216	256	246	230	242	266	A 246									
14								218			248	230	256	240	258	232								
15									218	250	284	262	238	236	226	222								
16									218	242	232	232	230	236	246									
17									226	238	262	250	228	254	234									
18									220	238	260	252	250	230	242	244								
19									238	246	234	254	262	228	236	236								
20									236	234	240	242	242	244		232								
21									218	232	234	248	242	226	240	264								
22									230	236	258	264	240	234	246	234								
23										246	260	246	248	236	234	234								
24									236	L 238	240	240	222	242	242	238								
25											234	272	260	242	226	228								
26									220	286	232	230	240	244	230	242								
27									230	242	254	238	254	224	234									
28									222	250	252	242	242	256	242									
29									226		238	246	234	230	226	240								
30									216	222	258	268	246	272	232	226								
31										244	266	228	236	250		232								
	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	20	24	30	29	30	29	27	22								
MED								216	222	238	245	244	243	242	236	233								
U Q									230	246	260	253	258	252	242	240								
L Q									219	233	238	234	238	231	232	226								

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DEC. 1996 h'F (KM) 135°E MEAN TIME (G.M.T. + 9 H)

LAT. 35°42.4'N LON. 139°29.3'E SWEEP 1.0MHz TO 25.0MHz IN 24.0SEC IN MANUAL SCALING

D \ H	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	306	288	288	242	228	204	230	210	222	196	228	228	196	H 194	A 244	226	220	A	A 268	250	256	A	282	306
2	294	308	298	296	272	248	252	218	200	212	A	A 232	A	224	230	240	212	A	A 312	226	222	A 266	A	342
3	332	318	278	236	302	288	210	206	216	242	A 248	A	A	232	224	220	212	216	222	222	222	246	262	250
4	296	310	296	250	212	288	242	222	224	202	230	220	236	220	202	206	212	210	218	246	236	250	270	288
5	274	282	278	320	290	240	238	230	228	230	242	A	A	200	250	226	206	228	254	228	212	268	280	288
6	298	272	264	252	252	212	398	222	222	220	248	230	212	206	236	228	222	254	A 258	C	C	256	292	304
7	304	294	284	276	226	232	280	216	216	C	C	C	C	C	C	C	C	C	A 294	248	228	222	258	290
8	308	288	258	236	248	B 284	224	226	218	232	236	A	236	E A 252	214	212	224	A	A	238	254	290	268	296
9	280	276	286	280	244	250	224	208	210	196	A 238	220	A 228	198	242	234	206	230	238	212	246	276	276	292
10	258	276	294	262	230	308	B 344	246	224	218	220	246	228	214	224	212	206	214	220	280	248	248	230	252
11	272	282	284	248	292	266	264	218	228	218	228	228	A 254	234	212	218	206	226	258	226	214	226	264	260
12	280	300	298	284	272	220	230	186	228	212	248	A 240	E A 258	A	214	242	220	A	A 240	248	256	248	302	274
13	290	276	284	262	240	E A 310	230	A 232	198	228	H 194	216	A 232	H 176	A	238	224	210	216	218	232	258	268	306
14	310	304	296	288	290	216	294	184	234	240	A 240	236	202	226	214	A 234	210	214	220	A 276	278	276	296	304
15	292	300	258	244	224	256	246	222	204	240	228	H 198	230	212	190	228	212	208	242	214	258	A	348	324
16	236	286	306	284	258	284	252	222	186	246	238	H 188	202	204	A	228	A 218	A 258	212	252	236	208	280	A 302
17	318	288	284	266	300	274	260	230	226	216	218	210	204	194	194	A 238	A 240	246	234	A	A	286	322	308
18	292	280	266	242	290	286	262	214	218	204	204	204	H 198	206	210	H 194	208	218	266	242	246	256	310	302
19	268	A 334	A 320	272	248	A 308	A	226	H 206	H 190	H 196	202	A	218	196	240	206	240	A	A	252	230	242	A 362
20	322	S 310	270	260	246	252	256	228	198	H 182	H 192	206	214	A 246	232	230	212	206	290	278	A 300	246	A 326	232
21	244	272	272	278	274	248	B 282	230	224	H 188	222	208	222	216	186	236	218	224	276	246	240	266	258	272
22	304	312	274	240	296	272	250	212	210	210	232	H 202	226	A	A 226	H 210	206	H 200	H 226	238	230	264	A 312	308
23	320	308	298	306	272	260	224	212	230	242	A 242	A	234	222	A 226	220	232	H 208	234	260	242	264	242	278
24	254	276	250	252	286	332	246	230	H 194	206	218	212	210	A 222	210	224	212	A	240	A	264	290	270	292
25	286	296	260	250	228	306	266	216	220	224	212	228	A 248	A 242	214	222	208	294	242	242	A	A	A	282
26	270	284	230	232	298	298	256	218	206	H 174	A 240	228	214	204	216	230	224	212	250	234	220	A	290	270
27	276	284	286	262	282	280	242	228	200	H 174	224	226	212	H 200	198	238	218	214	208	222	262	E A 372	334	324
28	292	292	260	280	336	302	242	208	174	H 182	244	238	A 238	A 238	A 232	222	A 218	232	244	A 262	260	296	268	216
29	248	252	240	294	302	292	232	200	184	232	H 194	224	198	212	204	200	230	220	202	234	216	248	284	290
30	246	266	256	228	292	322	230	204	198	188	186	224	210	186	244	218	218	214	244	242	234	324	320	232
31	206	274	228	228	256	382	392	228	222	208	212	H 190	238	224	226	240	230	220	208	266	210	238	306	280
	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	30	31	31	30	29	26	26	28	28	30	30	25	29	27	28	27	29	31
MED	290	288	278	262	272	277	248	218	216	212	228	222	221	214	215	227	215	218	240	242	241	257	280	290
U Q	304	304	294	280	292	302	264	228	224	230	240	228	A 236	225	231	236	222	231	258	252	256	276	308	306
L Q	268	276	260	242	244	248	230	210	200	H 196	212	H 206	210	202	207	218	208	211	220	226	225	246	266	272

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DEC. 1996 h'E (KM) 135°E MEAN TIME (G.M.T. + 9 H)

LAT. 35°42.4'N LON. 139°29.3'E SWEEP 1.0MHz TO 25.0MHz IN 24.0SEC IN MANUAL SCALING

D \ H	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								138	122	118	118	A	A	A	A	A	A							
2								E B 186	122	116	118	A	A	A	A	A	A							
3								140	118	118	A	112	116	A	A	A	A							
4								A	E A 138	A 132	124	118	A 136	A	126	118	E A 170							
5								A	A	126	122	114	114	A 122	A 132	A	A							
6								B	A	A	128	126	A	116	114	114	A							
7								164	126	C	C	C	C	C	C	C	C	C						
8								150	122	A	A	112	A	A	A 120	A	A							
9								B	126	A 128	A 130	A	A 134	A 130	114	A	A							
10								A	A 144	A 136	114	110	124	132	134	132	122							
11								144	A 140	A 132	118	116	A	A 132	126	130	A							
12								B	134	124	130	116	116	114	114	A	A							
13								B	124	A 128	A 132	A	120	A	114	A	A							
14								A	A 144	A 142	A	116	116	116	124	A 126	A							
15								A	A	A 142	144	A	122	120	118	124	156							
16								B 198	A 144	A 132	A 132	A	A	A 132	A	A	A							
17								B	132	A 140	118	A	116	A	A	A	A							
18								B 140	A	A	130	A 134	A 134	A 124	A	A 122	A							
19								B	A	A 136	A 134	A 134	A	A 130	124	116	B							
20								E B 162	120	A 150	A 136	120	118	A 132	A 130	124	A 140							
21								156	122	A	A	116	A	A 130	A	A 126	134							
22								A	116	A	A 126	A	114	A	A	118	E A 162							
23								E B 178	128	A 140	A 122	122	A 130	A 124	A 126	108	A							
24								A	A	126	122	A 138	A 128	A	124	128	A							
25								B	A	A	A	126	120	120	116	A	A							
26								B	122	122	A 126	A 126	A	A	A 124	A	E B 150							
27								B	A	A	A	120	128	122	116	126	A							
28								B	A 148	A 134	134	122	A	A 132	120	118	A							
29								B	112	A 124	124	126	120	116	116	114	E B 156							
30								B	A	126	112	114	120	118	118	118	148							
31								B	A	124	E A 144	A 120	A	124	120	124	128							
	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								11	21	23	24	22	19	20	22	18	10							
MED								148	125	A 128	126	120	120	124	120	123	U 137							
U Q								E B 178	A 139	A 136	A 132	A 126	A 128	A 131	126	126	E A 156							
L Q								140	122	124	120	116	116	119	116	118	134							

DEC. 1996 h'E (KM) COMMUNICATIONS RESEARCH LABORATORY, JAPAN

IONOSPHERIC DATA STATION Kokubunji

DEC. 1996 h'Es (KM) 135°E MEAN TIME (G.M.T. + 9 H)

LAT. 35°42.4'N LON. 139°29.3'E SWEEP 1.0MHz TO 25.0MHz IN 24.0SEC IN MANUAL SCALING

D \ H	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
1	B	B	B	124	118	112	106	140	106	120	140	124	112	150	118	158	116	108	108	106	108	108	106	106
2	114	B	106	B	B	124	B	G	G	130	114	112	108	112	110	108	106	102	106	108	106	106	102	106
3	106	104	106	108	112	B	B	G	130	122	120	114	112	110	112	108	106	112	106	102	B	B	B	B
4	102	104	B	114	112	114	112	108	102	110	186	182	172	166	112	122	100	96	B	128	128	B	B	B
5	B	114	116	108	108	108	162	146	128	142	118	116	112	114	112	108	106	102	104	B	140	114	108	108
6	104	104	106	108	108	122	116	136	150	104	106	192	120	142	138	114	108	112	112	C	C	110	98	110
7	B	108	104	B	104	112	120	180	156	C	C	C	C	C	C	C	C	C	106	104	B	110	B	B
8	B	B	B	124	B	116	162	160	138	138	126	112	116	108	106	112	108	100	98	102	102	B	B	B
9	B	B	B	B	B	B	134	B	150	140	138	152	130	146	126	140	110	106	112	B	120	B	B	108
10	116	116	138	B	B	B	B	144	118	140	126	192	190	172	156	106	G	B	B	B	B	B	B	B
11	B	B	B	110	118	B	178	166	158	154	124	122	110	114	110	102	98	B	B	B	B	108	B	B
12	B	B	B	B	B	B	B	B	182	166	152	134	124	118	124	112	110	108	106	104	100	104	106	106
13	B	112	116	108	106	106	112	102	142	104	100	126	118	114	118	102	112	108	108	102	100	B	B	104
14	B	114	112	B	B	B	110	108	182	182	106	184	G	172	154	120	126	116	116	110	118	116	112	B
15	B	B	B	126	B	116	134	124	124	162	116	114	G	112	G	G	108	114	B	120	104	108	108	B
16	118	150	162	128	116	B	114	120	118	186	176	110	118	146	114	116	120	116	114	116	118	114	120	108
17	110	108	104	104	B	120	B	126	150	166	120	124	120	118	110	108	106	108	110	110	106	104	106	114
18	104	112	B	B	B	B	122	110	114	114	120	108	108	104	98	104	100	94	104	100	106	112	102	108
19	106	106	108	114	116	116	110	112	112	114	112	112	106	108	112	166	156	98	96	98	102	B	108	100
20	108	102	106	104	106	B	108	108	106	114	178	G	188	166	150	162	112	100	108	110	106	B	104	110
21	124	112	108	106	112	B	B	G	G	118	114	122	108	110	108	162	104	100	104	108	110	104	104	104
22	100	112	B	112	110	108	112	104	G	118	182	116	G	110	106	G	110	B	124	B	B	102	104	104
23	112	B	120	120	108	116	B	G	166	156	142	126	128	104	122	G	100	102	106	B	106	104	110	118
24	128	112	110	112	106	106	110	102	100	G	194	152	140	120	G	G	108	102	102	102	100	102	106	124
25	112	B	118	110	B	B	112	B	128	120	132	128	122	120	118	118	106	108	108	102	100	100	98	106
26	108	116	B	110	106	B	114	102	112	102	178	100	102	100	124	102	164	104	112	110	112	106	106	102
27	104	B	104	104	104	126	114	102	102	98	104	106	122	G	100	172	150	112	120	108	108	106	108	106
28	B	B	B	B	B	B	114	108	106	110	162	172	144	130	128	108	104	114	102	104	102	102	122	106
29	B	B	B	B	110	B	118	114	166	158	162	174	104	104	G	154	162	114	B	114	112	110	106	106
30	112	112	110	104	110	B	B	116	112	114	G	G	G	G	G	G	154	B	116	114	106	106	118	136
31	B	116	B	B	108	124	B	134	114	128	106	104	156	106	154	162	130	108	102	100	B	108	106	108
	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	18	19	18	21	20	16	22	24	28	29	29	28	26	28	26	25	29	26	26	24	24	23	23	23
MED	109	112	109	110	109	116	114	115	126	122	126	123	119	114	116	114	108	108	107	107	106	106	106	106
U Q	114	114	116	117	112	121	122	138	150	155	162	152	130	144	126	156	123	112	112	110	112	110	108	110
L Q	104	106	106	107	106	110	112	108	112	114	114	112	110	109	110	108	106	102	104	102	102	104	104	106

IONOSPHERIC DATA STATION Kokubunji

DEC.1996 TYPES OF Es 135°E MEAN TIME (G.M.T. + 9 H)

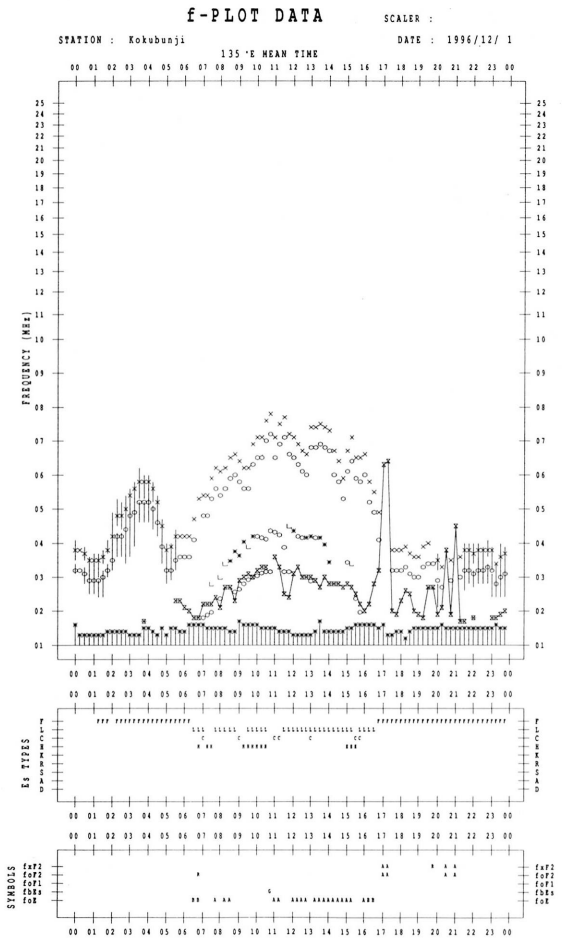
LAT.35°42.4'N LON.139°29.3'E SWEEP 1.0MHz TO 25.0MHz IN 24.0SEC IN MANUAL SCALING

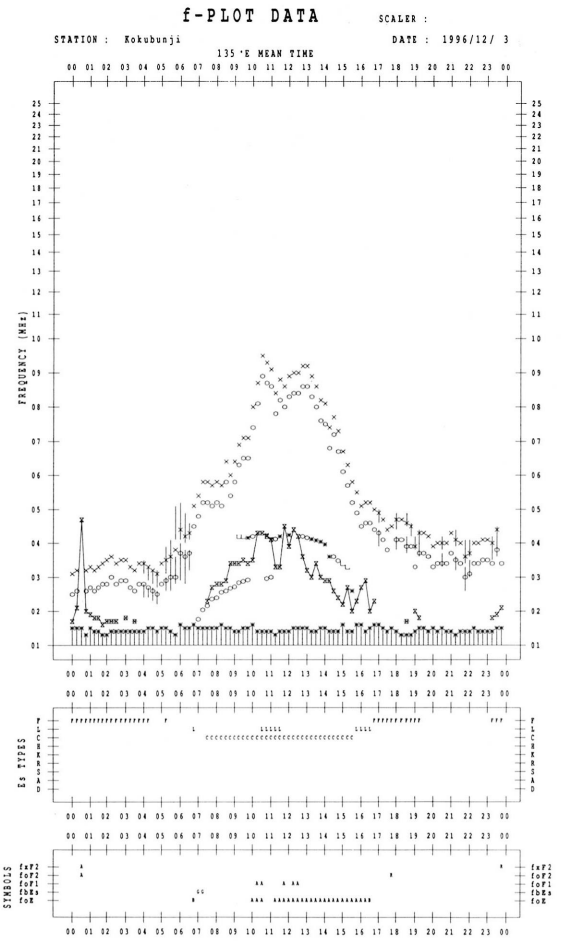
D \ H	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
1				FF 11	F 1	F 1	F 2	CL 11	L 1	C 1	HL 11	C 1	L 1	CL 11	L 2	HL 12	L 2	F 5	F 3	F 3	F 4	F 5	F 2	F 2
2	F 2		F 1			F 1				C 2	C 3	C 2	L 2	L 2	C 2	L 2	L 3	F 5	F 3	F 2	F 1	F 2	F 6	F 1
3	F 2	F 3	F 2	F 2	F 1				C 2	C 2	C 2	CL 21	C 2	C 2	C 3	C 2	L 3	F 1	F 1	F 2				
4	F 3	F 1		F 1	F 1	F 2	F 2	L 1	LC 31	L 2	HC 11	H 1	HC 11	HL 11	L 1	CL 12	L 1	F 1		F 1	F 1			
5		F 2	F 2	F 2	F 2	F 2	F 1	C 1	L 2	CL 11	C 2	C 2	C 3	L 2	L 2	L 2	L 3	F 3	F 1		F 1	F 1	F 1	F 2
6	F 2	F 1	F 1	F 2	F 2	F 1	F 2	CL 22	HL 12	L 3	L 1	HL 11	C 1	H 1	H 1	C 3	C 3	FF 41	F 2			F 1	F 2	F 1
7		F 1	F 1		F 1	FF 11	FF 11	C 1	HC 11										F 1	F 1		FF 11		
8				FF 11		F 2	F 1	C 1	C 1	CL 11	CL 11	C 2	C 1	L 2	L 1	L 2	L 2	F 4	F 2	F 1	F 1			
9							F 1	H 1	HL 11	CL 12	CL 12	HL 11	CL 11	HL 11	CL 11	CL 11	L 3	F 3	F 1		F 1			F 2
10	F 1	F 1	FF 11					C 1	L 1	CL 22	C 1	H 1	HL 11	HL 11	HL 11	L 2								
11				F 1	F 1		F 1	H 1	CL 11	HL 11	C 2	C 1	C 2	LH 21	L 2	LC 21	L 2					F 1		
12									H 1	H 1	HL 11	C 1	C 2	C 3	C 2	L 2	L 3	F 3	F 3	F 2	F 4	F 2	F 2	F 2
13		F 2	F 2	F 3	F 4	F 2	F 2	L 5	H 1	LC 31	LC 21	CL 12	CL 21	C 1	C 2	L 3	CL 11	F 1	F 1	F 1	F 1			F 1
14		F 1	F 2				F 2	L 1	HL 11	HL 12	L 3	H 1		HL 11	HL 11	CL 22	CL 22	FF 32	FF 11	F 2	F 1	F 1	F 2	
15				F 2		F 1	F 1	L 1	C 2	HL 21	LH 11	L 2		L 1			L 1	F 1		F 1	F 3	F 3	F 3	
16	F 2	F 3	F 1	F 2	F 2		F 3	L 1	L 1	HL 11	HL 11	L 1	CL 11	HL 11	CL 21	L 2	C 4	F 4	F 1	F 1	F 1	F 1	F 1	F 2
17	FF 21	FF 21	F 3	F 2		F 1		LC 11	CL 11	HL 11	C 2	C 1	C 1	L 1	L 2	L 2	L 3	F 3	F 2	F 4	F 3	F 3	F 2	F 1
18	F 2	F 1					F 1	LC 11	L 1	L 1	CL 11	L 1	L 2	L 2	L 2	L 1	L 2	F 2	F 1	F 1	F 1	F 1	F 1	F 1
19	F 2	F 3	F 2	F 2	F 1	F 2	F 2	L 3	L 2	L 1	L 1	L 1	L 2	L 1	L 1	H 1	HL 11	F 3	F 2	F 2	F 1		F 1	F 2
20	F 2	F 1	F 2	F 2	F 2		F 1	L 2	L 1	L 2	HL 11		H 1	HL 12	HL 11	HL 11	L 2	F 1	F 3	F 2	F 3		F 2	F 2
21	FF 11	F 1	F 1	F 1	F 1					L 2	L 1	C 1	L 2	L 1	L 2	HL 11	L 2	F 5	F 2	F 1	F 1	F 2	F 1	F 1
22	F 1	F 1		F 4	F 2	F 2	F 1	L 2		C 1	HL 11	L 1		L 1	L 2		L 1		FF 11			F 1	F 2	F 2
23	F 1		F 1	F 1	F 2	F 1			H 1	HL 11	HL 11	C 4	CL 11	LC 21	CL 22		L 3	FF 11	F 2		F 2	F 2	F 1	F 1
24	FF 12	F 2	F 1	F 1	F 2	F 2	F 1	L 2	LC 21		H 1	HL 11	HL 11	L 1			L 1	F 3	F 2	F 3	F 2	F 2	F 1	F 1
25	F 2		F 2	F 1			F 1		C 1	CL 11	C 1	C 1	C 1	C 1	C 1	C 1	L 3	FF 21	F 2	F 2	F 2	F 2	F 2	F 1
26	F 1	F 1		F 2	F 2		F 1	L 2	L 1	L 1	HL 11	L 1	L 1	L 1	CL 11	L 1	HL 11	F 1	F 1	F 1	F 1	F 1	F 2	F 1
27	F 1		F 1	F 2	F 2	F 1	F 2	L 3	L 2	L 3	L 1	L 1	L 1		L 1	HL 12	HL 12	F 1	F 1	F 2	F 2	F 2	F 1	F 1
28							F 1	L 1	L 2	L 2	HL 12	HL 12	CL 12	CL 21	C 2	C 3	L 4	FF 31	F 2	F 3	F 2	F 2	F 1	F 1
29					F 1		F 1	L 1	H 1	HL 11	HL 11	H 1	L 1	L 1		H 1	H 1	F 1		F 1	F 1	F 2	F 2	F 1
30	F 1	F 1	F 1	F 2	F 1			L 1	L 2	L 1							C 1		F 1	F 1	F 3	F 2	FF 11	F 1
31		F 1			F 1	F 1		C 1	LC 21	C 1	L 1	L 1	HL 11	L 1	HL 11	HL 11	L 1	F 1	F 1	F 2		F 1	F 2	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																								
U Q																								
L Q																								

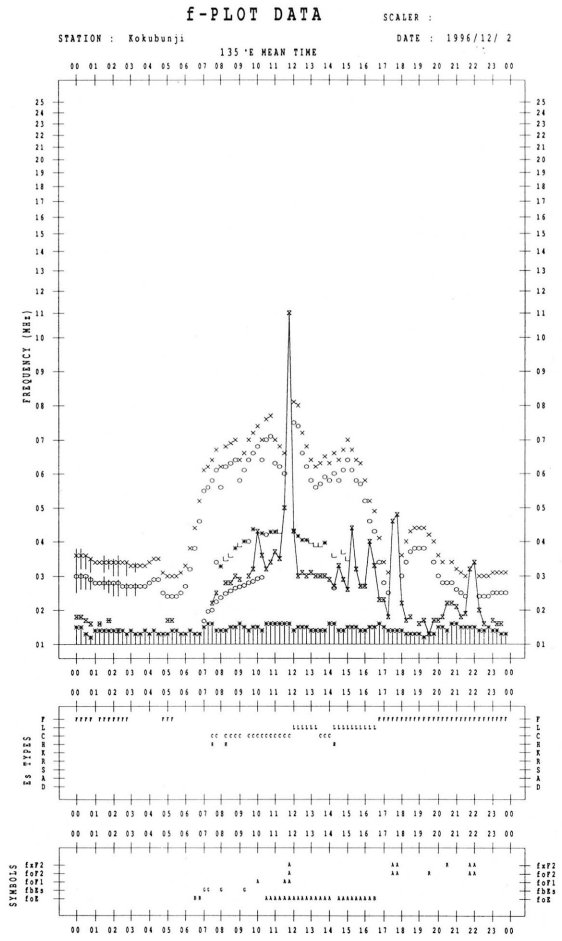
DEC.1996 TYPES OF Es COMMUNICATIONS RESEARCH LABORATORY, JAPAN

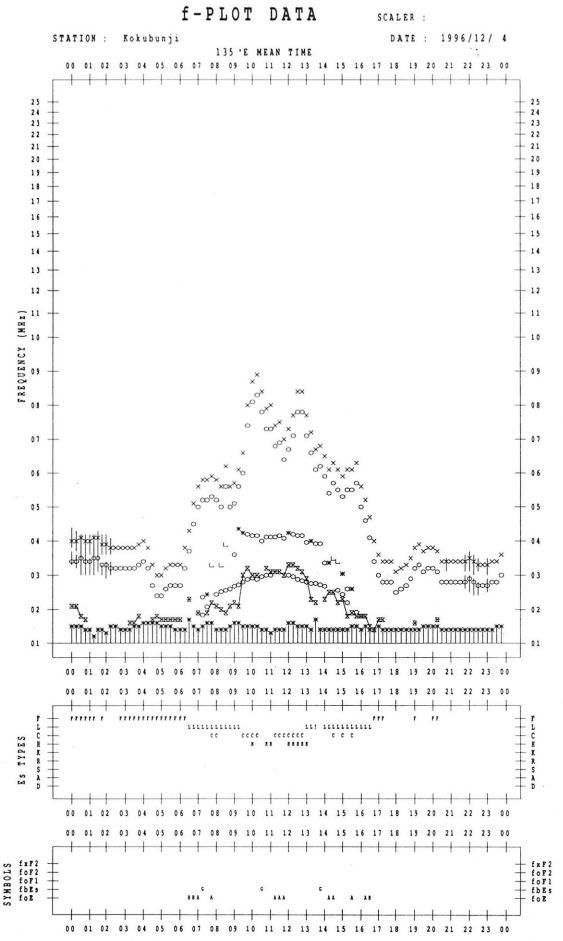
f-PLOTS OF IONOSPHERIC DATA

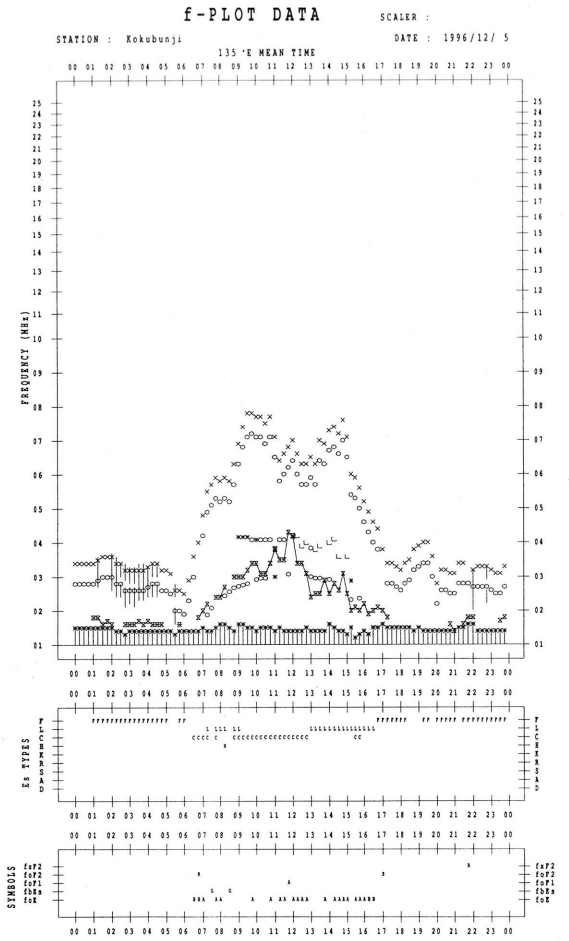
KEY OF f-PLOT	
	SPREAD
	foF2, foF1, foE
	fxF2
	DOUBTFUL foF2, foF1, foE
	fbEs
	ESTIMATED foF1
	fmin
	GREATER THAN
	LESS THAN


f-PLOT DATA
SCALER :
STATION : Kokubunji
DATE : 1996/12/ 1
135 °E MEAN TIME
FREQUENCY (MHz)
Es TYPES
SYMBOLS
fxF2
foF2
foF1
fbEs
foE


f-PLOT DATA
SCALER :
STATION : Kokubunji
DATE : 1996/12/ 3
135 °E MEAN TIME
FREQUENCY (MHz)
Es TYPES
SYMBOLS
fxF2
foF2
foF1
fbEs
foE


f-PLOT DATA
SCALER :
STATION : Kokubunji
DATE : 1996/12/ 2
135 °E MEAN TIME
FREQUENCY (MHz)
Es TYPES
SYMBOLS
fxF2
foF2
foF1
fbEs
foE


f-PLOT DATA
SCALER :
STATION : Kokubunji
DATE : 1996/12/ 4
135 °E MEAN TIME
FREQUENCY (MHz)
Es TYPES
SYMBOLS
fxF2
foF2
foF1
fbEs
foE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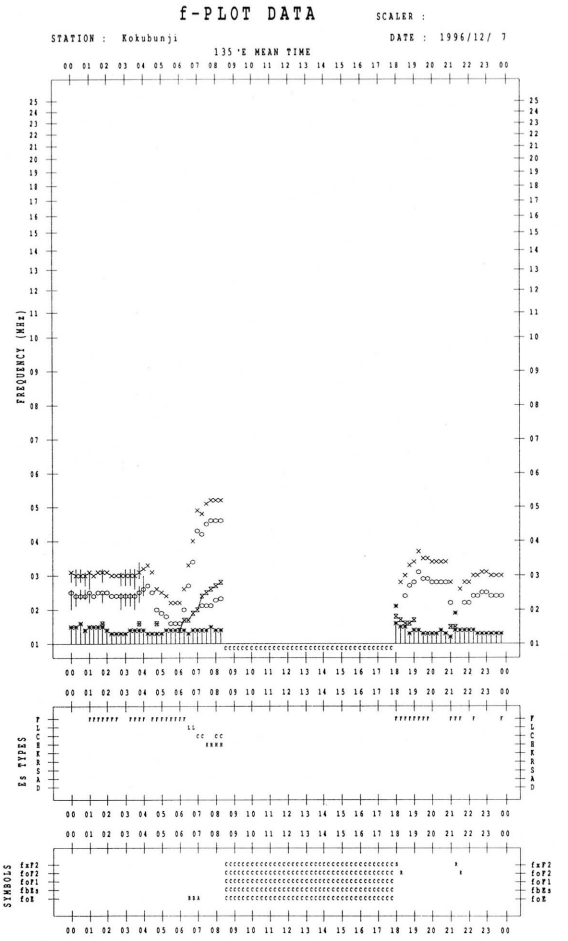
STATION : Kokubunji
DATE : 1996/12/ 5
135 °E MEAN TIME
FREQUENCY (MHz)
Es TYPES
SYMBOLS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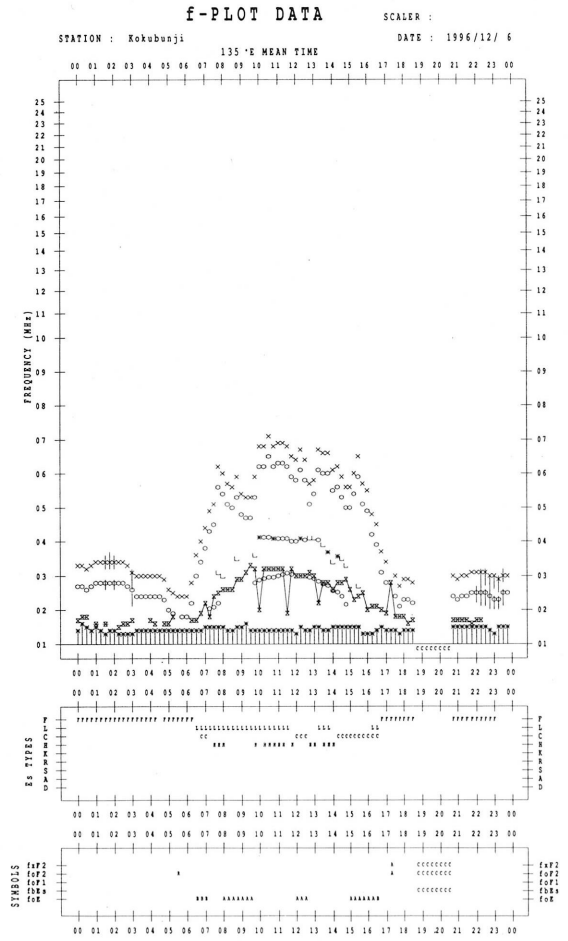
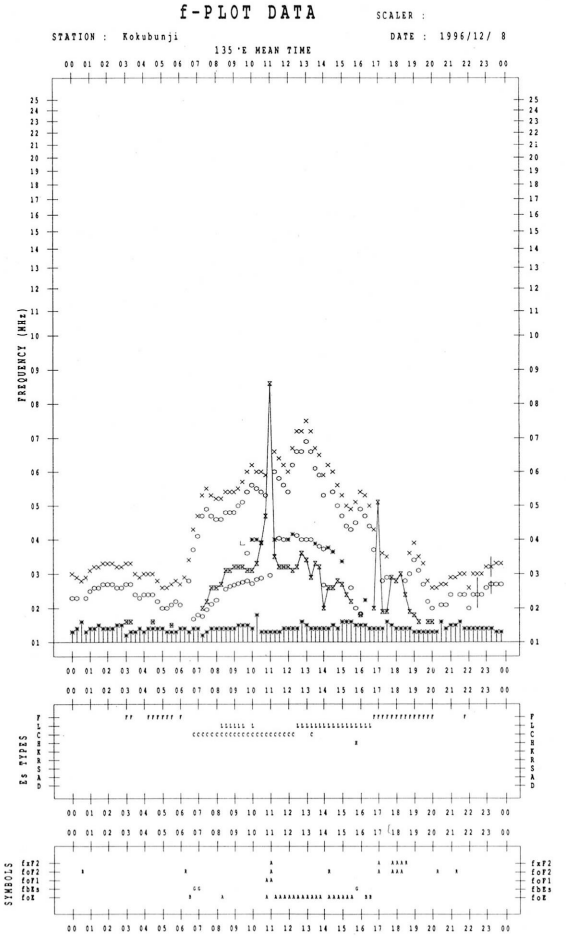
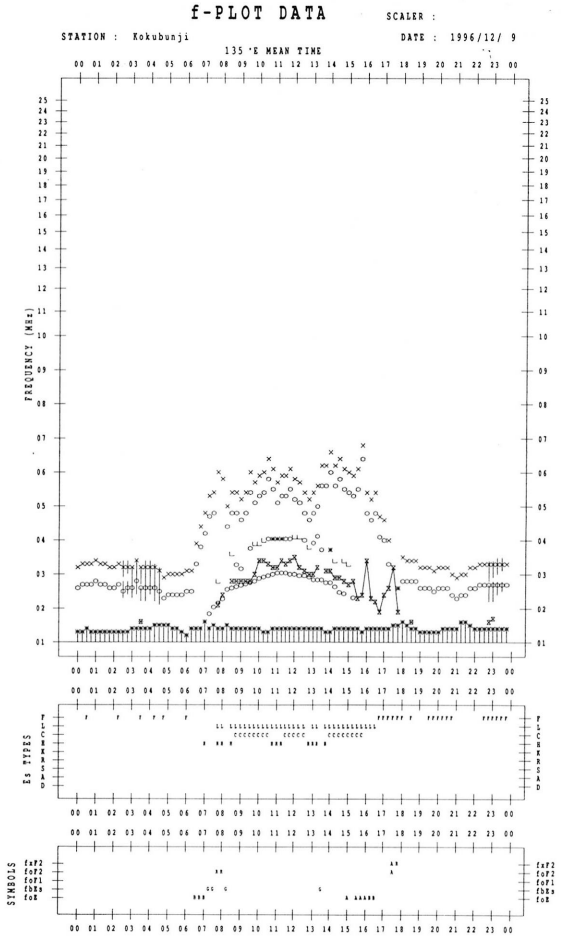
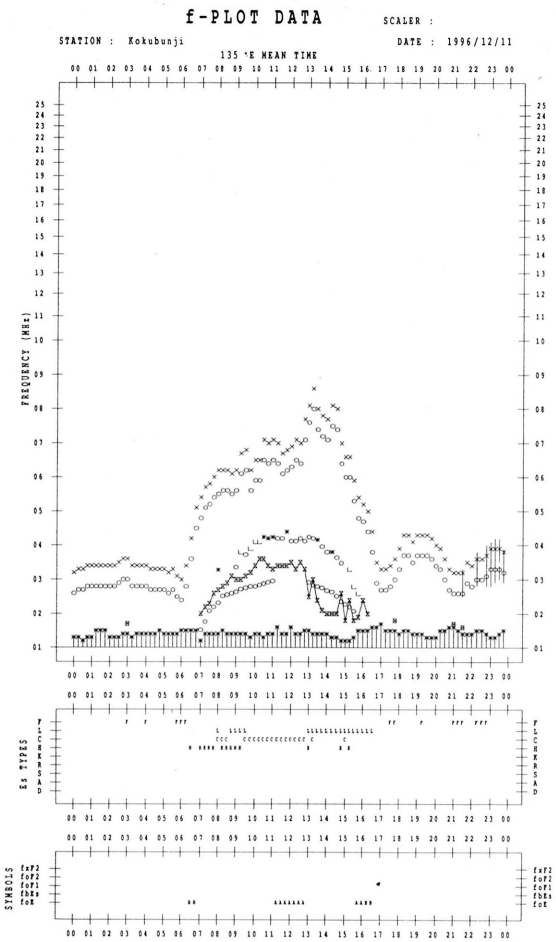
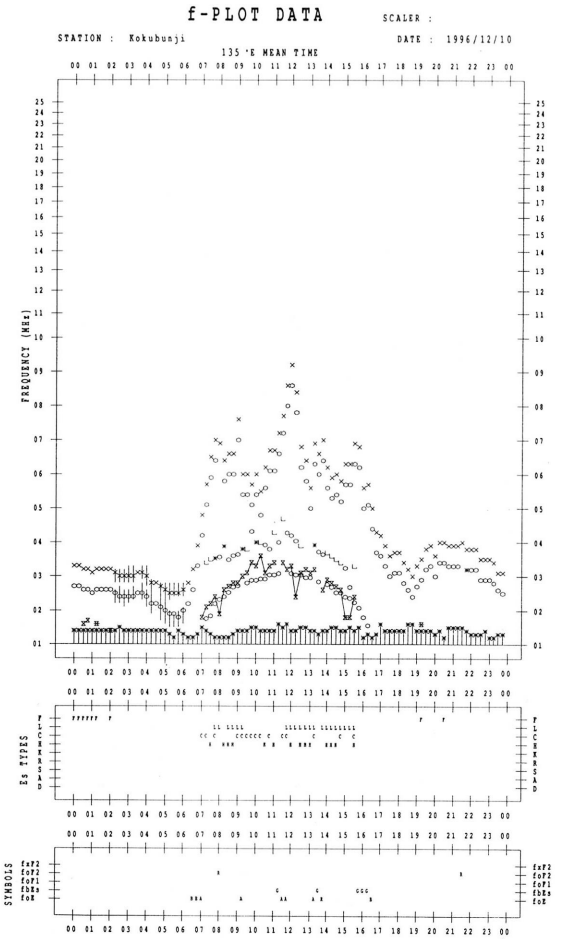
SCALER :
STATION : Kokubunji
DATE : 1996/12/ 7
135 °E MEAN TIME
FREQUENCY (MHz)
Es TYPES
SYMBOLS

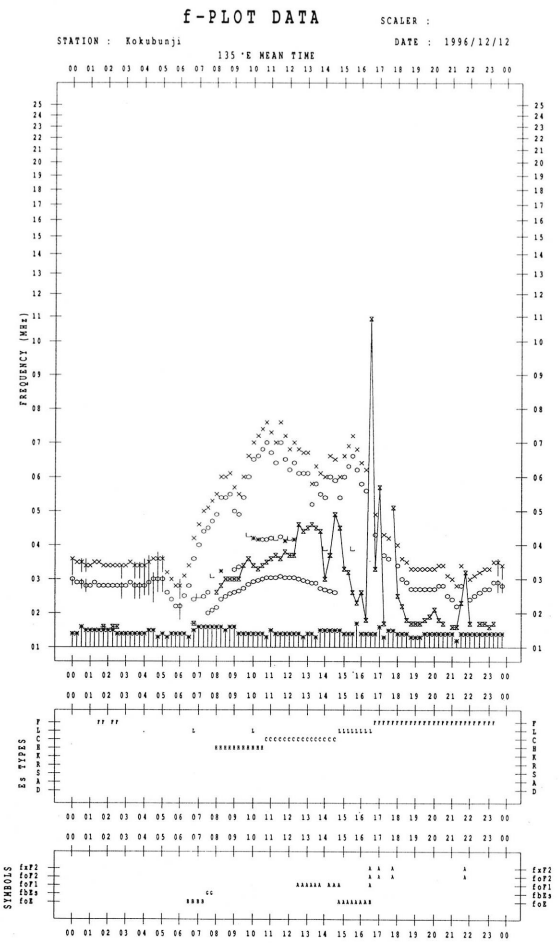

f-PLOT DATA
SCALER :
STATION : Kokubunji
DATE : 1996/12/ 6
135 °E MEAN TIME
FREQUENCY (MHz)
Es TYPES
SYMBOLS

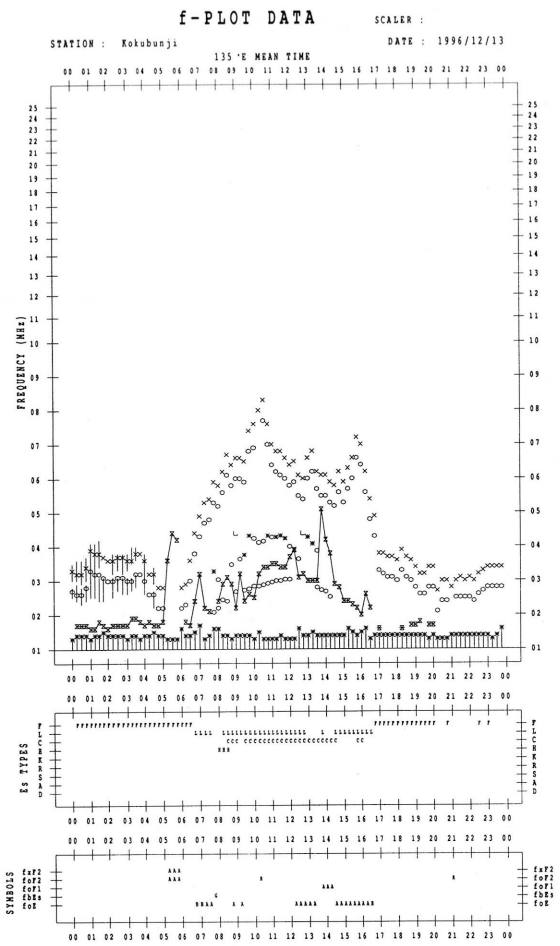

f-PLOT DATA
SCALER :
STATION : Kokubunji
DATE : 1996/12/ 8
135 °E MEAN TIME
FREQUENCY (MHz)
Es TYPES
SYMBOLS


f-PLOT DATA
SCALER :
STATION : Kokubunji
DATE : 1996/12/ 9
135 °E MEAN TIME
FREQUENCY (MHz)
Es TYPES
SYMBOLS
fxF2
foF2
foF1
fbEs
foE


f-PLOT DATA
SCALER :
STATION : Kokubunji
DATE : 1996/12/11
135 °E MEAN TIME
FREQUENCY (MHz)
Es TYPES
SYMBOLS
fxF2
foF2
foF1
fbEs
foE


f-PLOT DATA
SCALER :
STATION : Kokubunji
DATE : 1996/12/10
135 °E MEAN TIME
FREQUENCY (MHz)
Es TYPES
SYMBOLS
fxF2
foF2
foF1
fbEs
foE


f-PLOT DATA
SCALER :
STATION : Kokubunji
DATE : 1996/12/12
135 °E MEAN TIME
FREQUENCY (MHz)
Es TYPES
SYMBOLS
fxF2
foF2
foF1
fbEs
foE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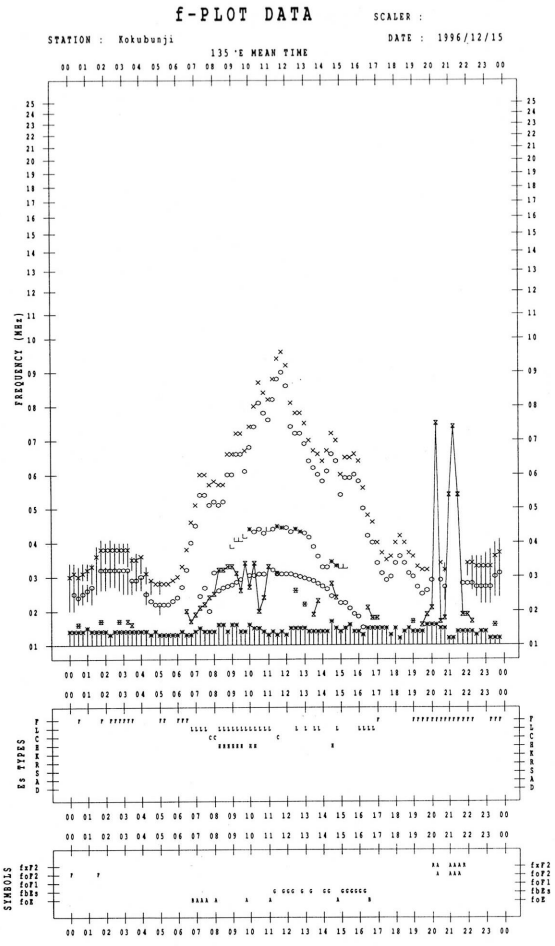
SCALER :
STATION : Kokubunji
DATE : 1996/12/13
135 °E MEAN TIME
FREQUENCY (MHz)
Es TYPES
SYMBOLS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SCALER :
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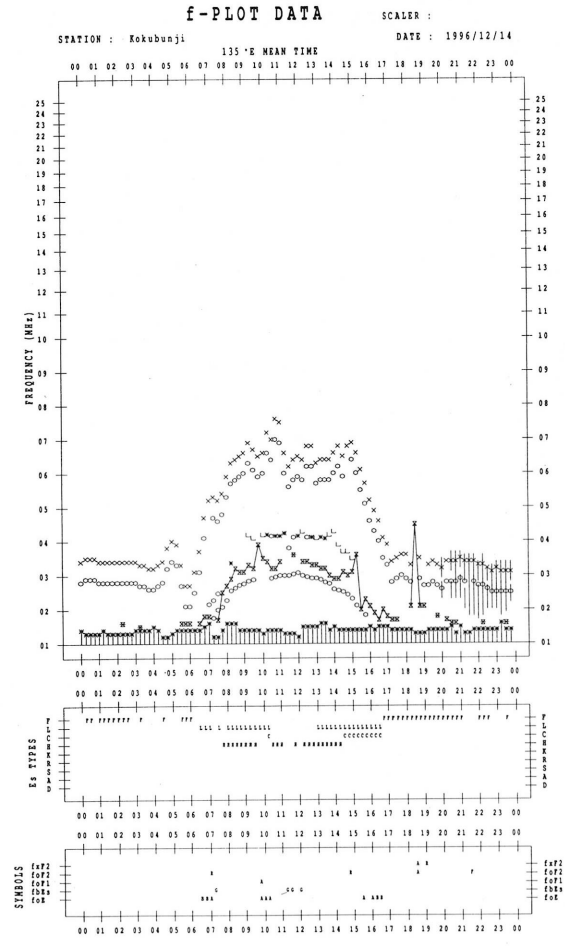
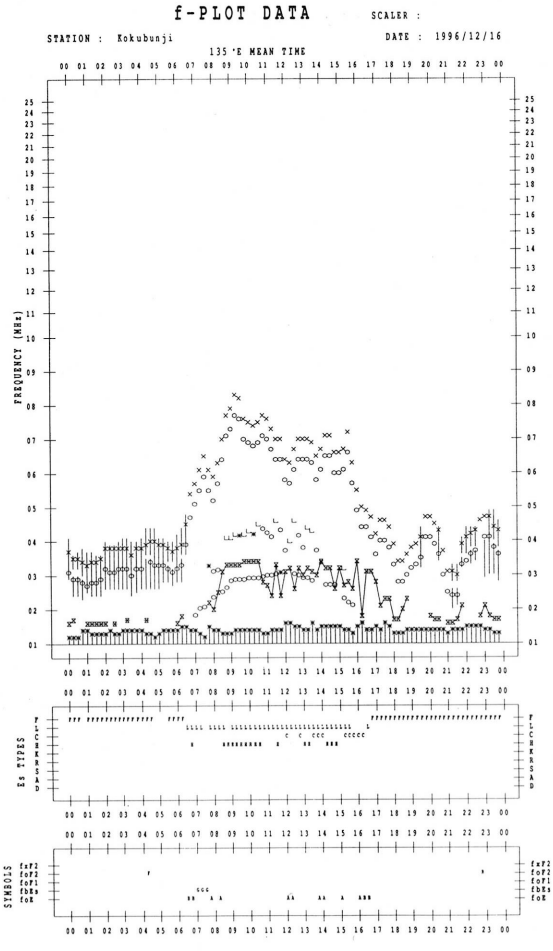
DATE : 1996/12/15
135 °E MEAN TIME
FREQUENCY (MHz)
Es TYPES
SYMBOLS


f-PLOT DATA
SCALER :
STATION : Kokubunji
DATE : 1996/12/14
135 °E MEAN TIME
FREQUENCY (MHz)
Es TYPES
SYMBOLS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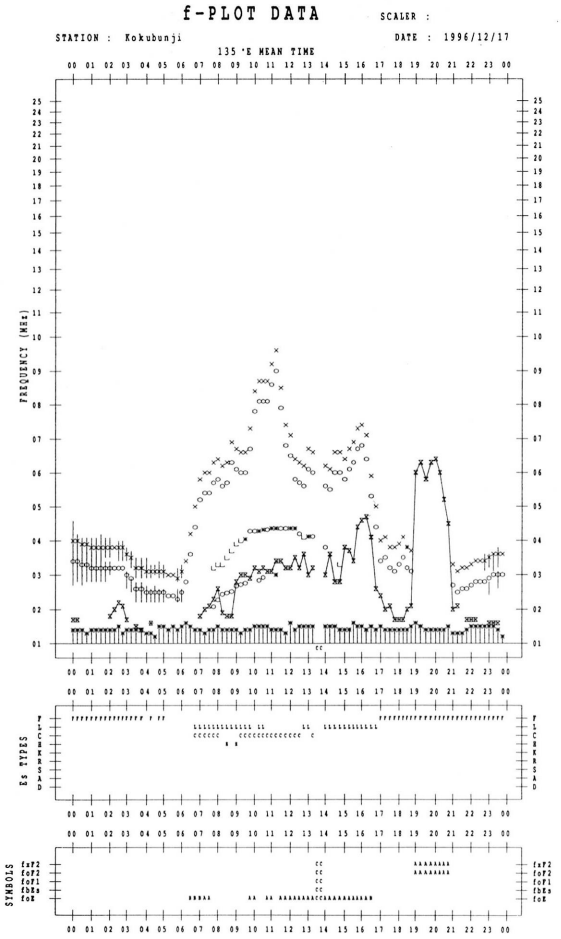
SCALER :
STATION : Kokubunji
DATE : 1996/12/16
135 °E MEAN TIME
FREQUENCY (MHz)
Es TYPES
SYMBOLS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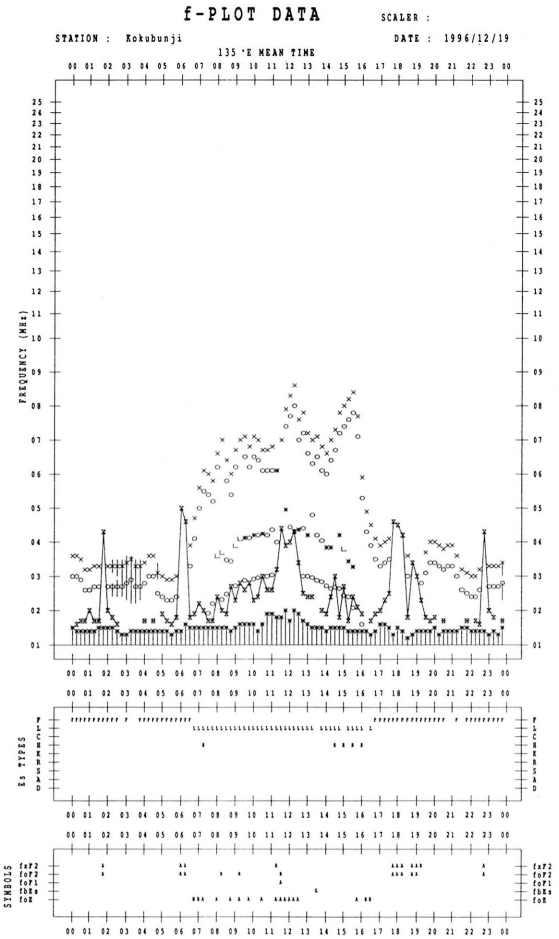
STATION : Kokubunji
DATE : 1996/12/17
135 °E MEAN TIME
FREQUENCY (MHz)
Es TYPES
SYMBOLS
foF2
foF1
foEs
foE


f-PLOT DATA
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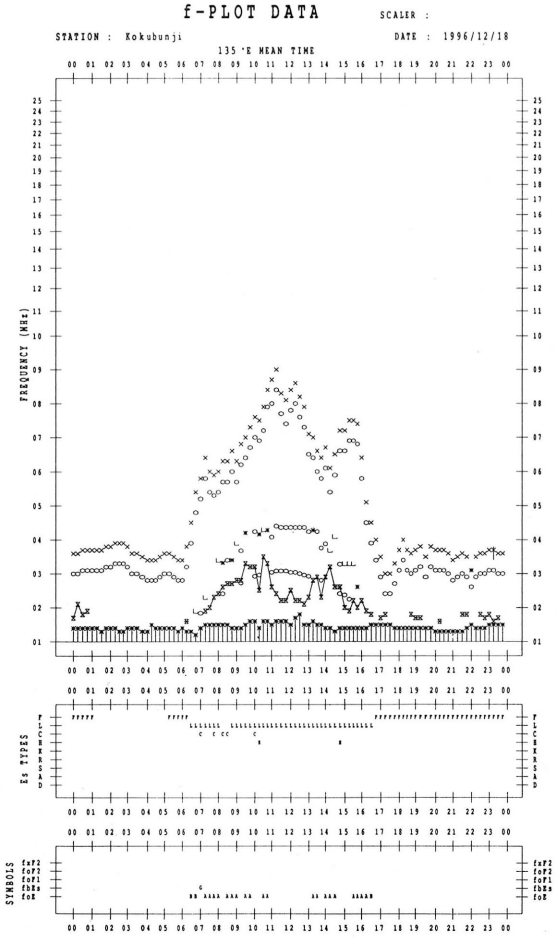
STATION : Kokubunji
DATE : 1996/12/19
135 °E MEAN TIME
FREQUENCY (MHz)
Es TYPES
SYMBOLS
foF2
foF1
foEs
foE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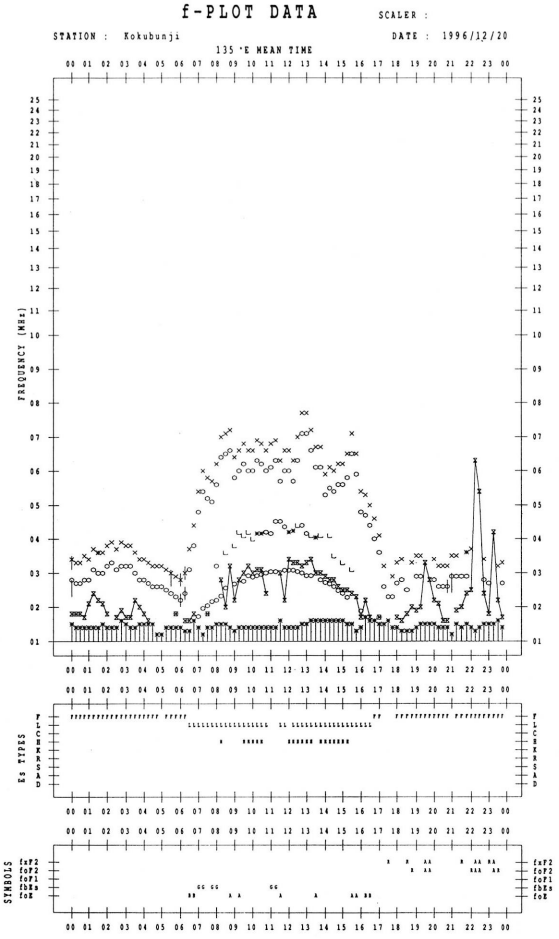
SCALER :
STATION : Kokubunji
DATE : 1996/12/18
135 °E MEAN TIME
FREQUENCY (MHz)
Es TYPES
SYMBOLS
foF2
foF1
foEs
foE


f-PLOT DATA
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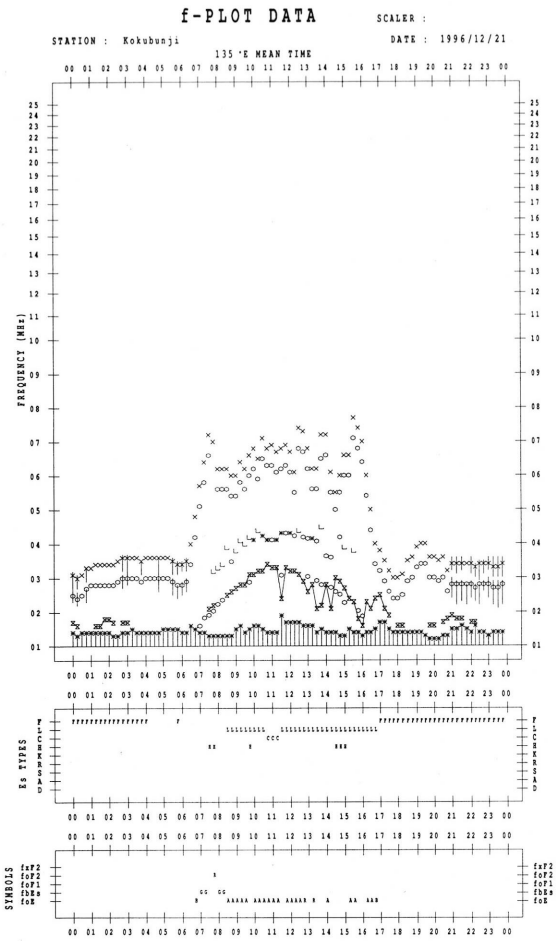
STATION : Kokubunji
DATE : 1996/12/20
135 °E MEAN TIME
FREQUENCY (MHz)
Es TYPES
SYMBOLS
foF2
foF1
foEs
foE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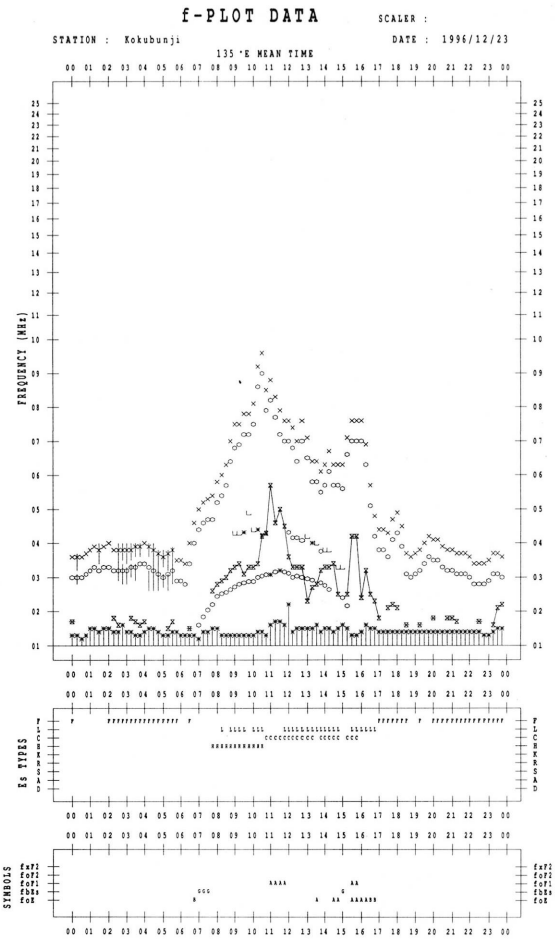
SCALER :
STATION : Kokubunji
DATE : 1996/12/21
135 °E MEAN TIME
FREQUENCY (MHz)
Es TYPES
SYMBOLS
fxF2
foF2
foF1
fbEs
foE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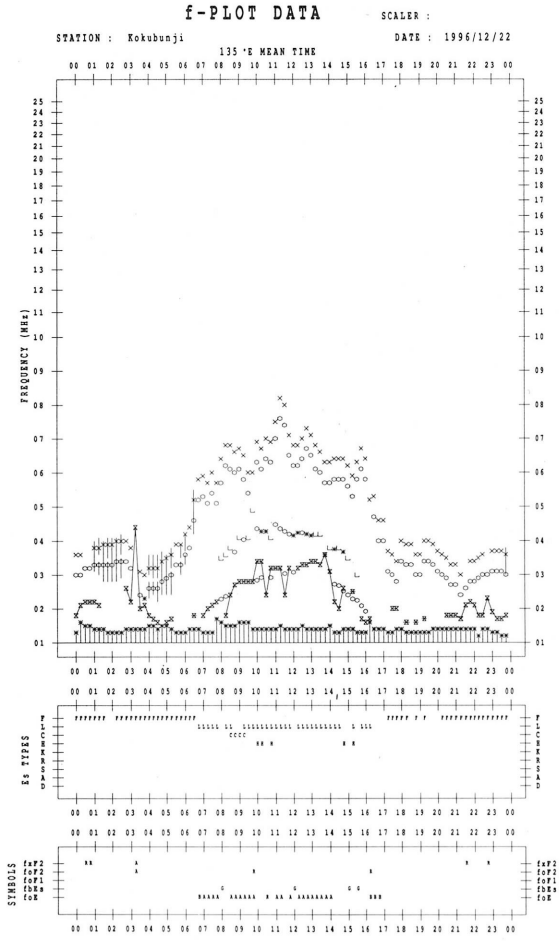
DATE : 1996/12/23
135 °E MEAN TIME
FREQUENCY (MHz)
Es TYPES
SYMBOLS
fxF2
foF2
foF1
fbEs
foE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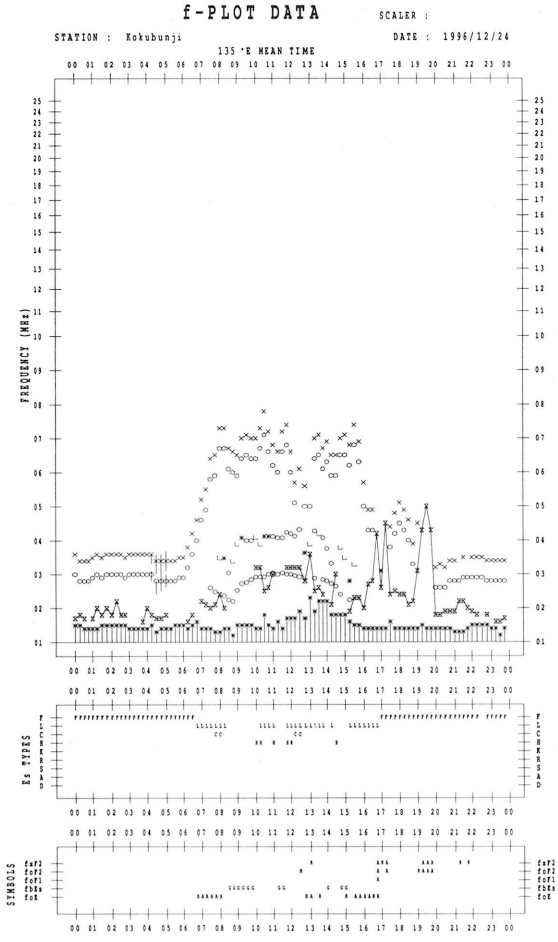
STATION : Kokubunji
DATE : 1996/12/22
135 °E MEAN TIME
FREQUENCY (MHz)
Es TYPES
SYMBOLS
fxF2
foF2
foF1
fbEs
foE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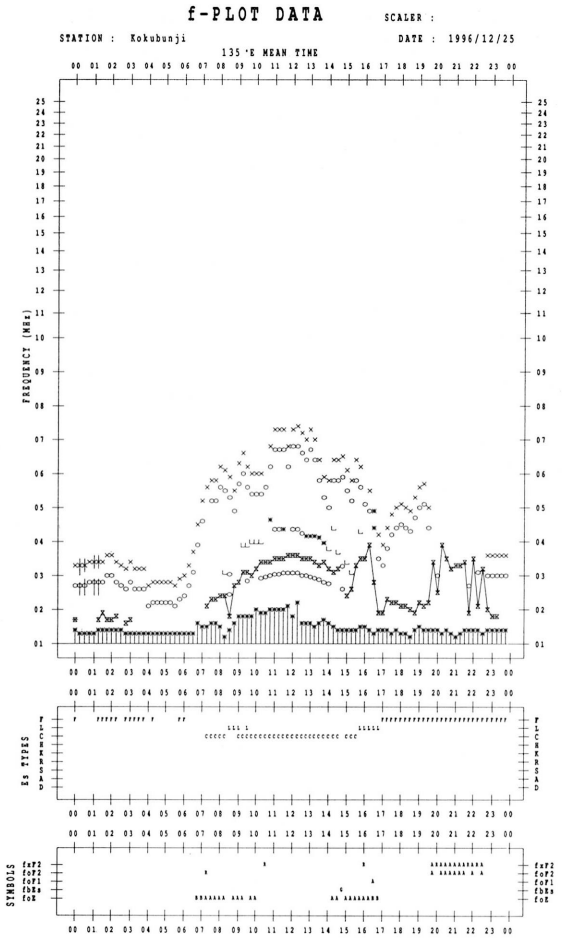
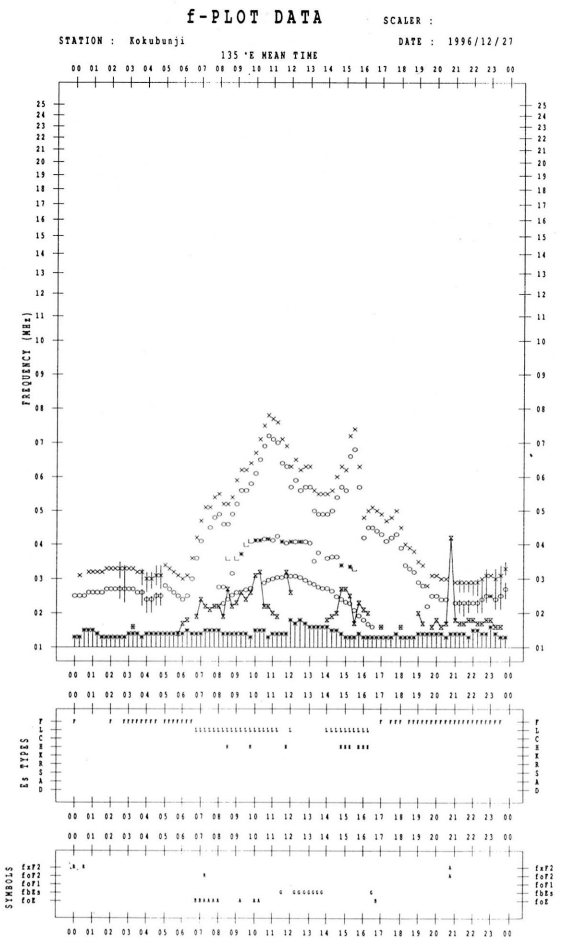
SCALER :
STATION : Kokubunji
DATE : 1996/12/24
135 °E MEAN TIME
FREQUENCY (MHz)
Es TYPES
SYMBOLS
fxF2
foF2
foF1
fbEs
foE


f-PLOT DATA
SCALER :
STATION : Kokubunji
DATE : 1996/12/25
135 °E MEAN TIME
FREQUENCY (MHz)
Es TYPES
SYMBOLS
foE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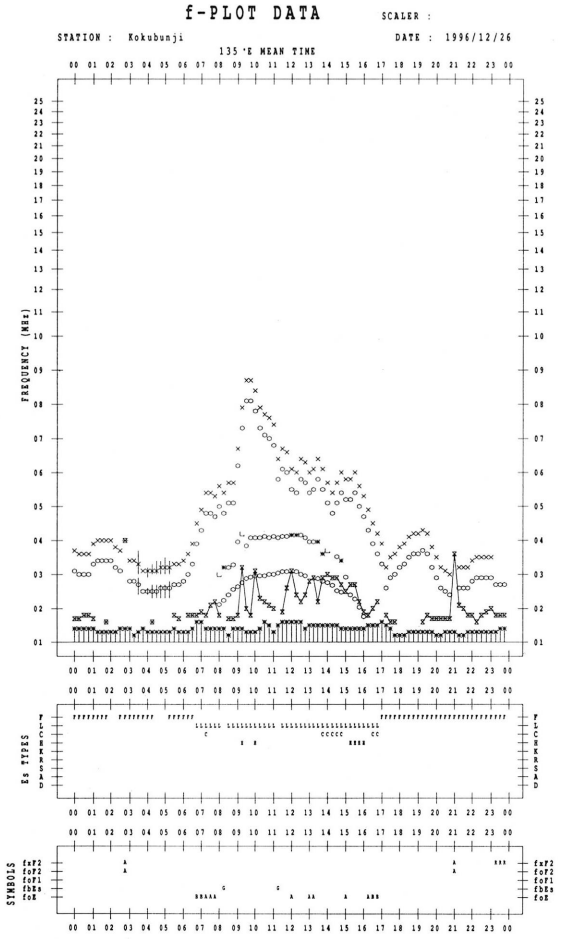
SCALER :
STATION : Kokubunji
DATE : 1996/12/27
135 °E MEAN TIME
FREQUENCY (MHz)
Es TYPES
SYMBOLS
foE


f-PLOT DATA
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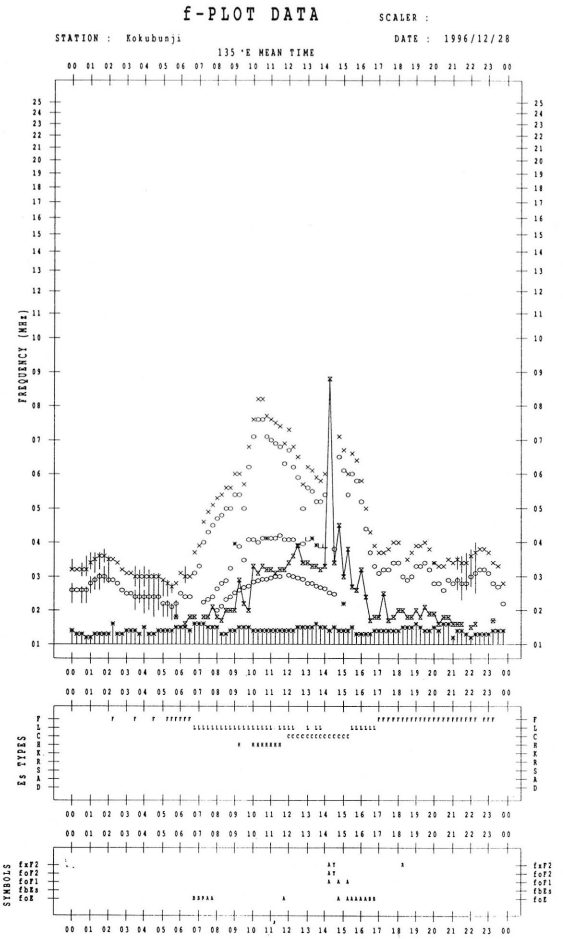
STATION : Kokubunji
DATE : 1996/12/26
135 °E MEAN TIME
FREQUENCY (MHz)
Es TYPES
SYMBOLS
foE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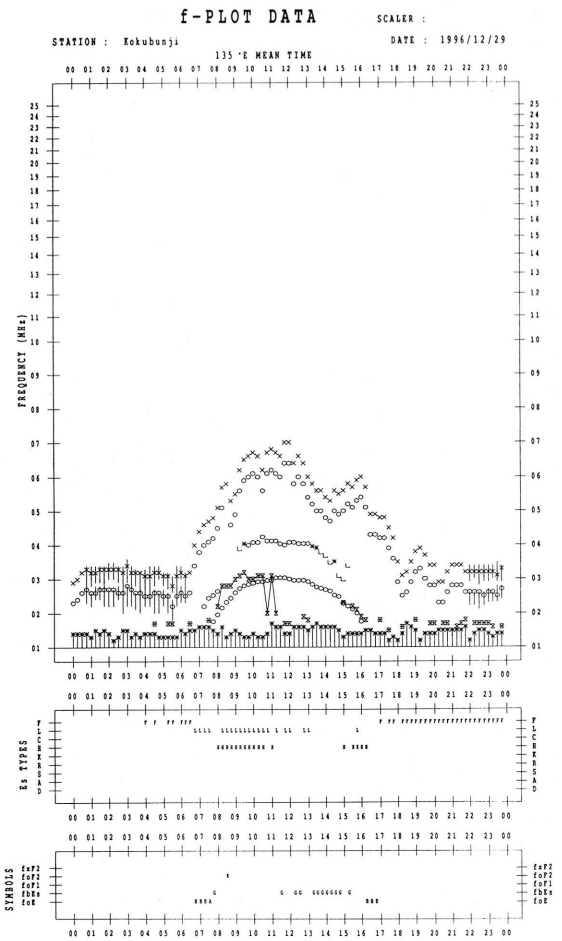
SCALER :
STATION : Kokubunji
DATE : 1996/12/28
135 °E MEAN TIME
FREQUENCY (MHz)
Es TYPES
SYMBOLS
foE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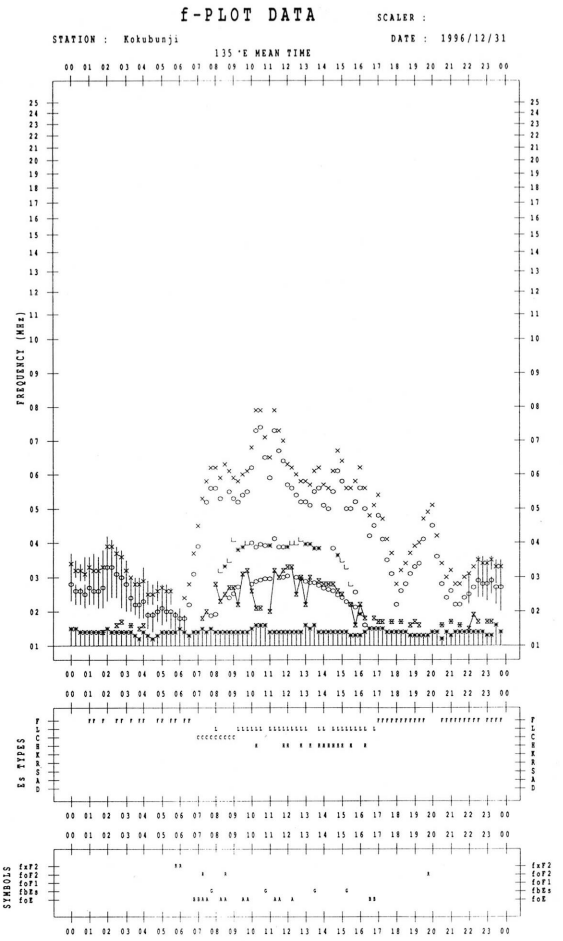
SCALER :
STATION : Kokubunji
DATE : 1996/12/29
135 °E MEAN TIME
FREQUENCY (MHz)
Es TYPES
SYMBOLS
foE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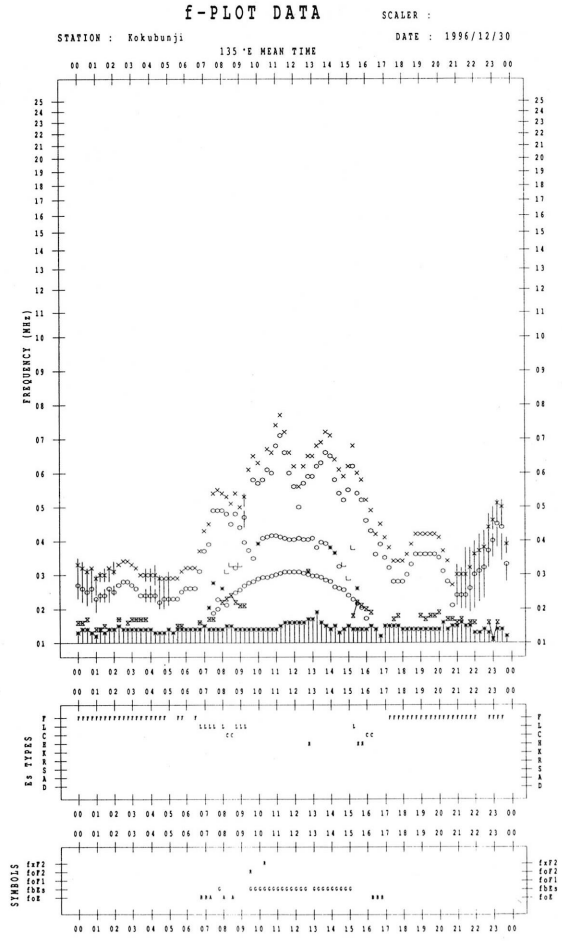
STATION : Kokubunji
DATE : 1996/12/31
135 °E MEAN TIME
FREQUENCY (MHz)
Es TYPES
SYMBOLS
foE


f-PLOT DATA
SCALER :
STATION : Kokubunji
DATE : 1996/12/30
135 °E MEAN TIME
FREQUENCY (MHz)
Es TYPES
SYMBOLS
foE

B. Solar Radio Emission

B1. Daily Data at Hiraiso

200 MHz

Hiraiso December 1996

Not available until system improvement is completed.

B. Solar Radio Emission

B1. Daily Data at Hiraiso

500 MHz

Hiraiso December 1996

Single-frequency total flux observations at 500 MHz					
Flux density: 10^{-22} $Wm^{-2}Hz^{-1}$					
UT	00-03	03-06	06-09	21-24	Day
Date					
1	-	-	-	-	-
2	27	26	(26)	28	27
3	27	25	(25)	27	26
4	26	25	(24)	-	25
5	-	-	-	24	24
6	25	25	(26)	26	25
7	26	24	(23)	27	25
8	26	25	(24)	27	26
9	26	25	(26)	28	26
10	28	26	(26)	28	27
11	28	26	(26)	28	27
12	28	27	(27)	27	27
13	28	28	(28)	30	28
14	30	28	(27)	30	29
15	30	29	(29)	31	30
16	31	30	(29)	32	31
17	32	30	(30)	30	31
18	31	31	(32)	31	31
19	32	31	(30)	32	31
20	32	31	(30)	33	31
21	31	30	(29)	32	31
22	31	29	(29)	30	30
23	30	30	(30)	31	30
24	30	28	(28)	30	29
25	30	28	(27)	29	29
26	28	27	(27)	28	28
27	27	26	(25)	29	27
28	28	26	(25)	29	27
29	28	26	(26)	29	27
30	28	25	(24)	28	26
31	27	25	(25)	28	26

Note: No observations during the following periods.
01st 0000 - 02nd 0050 04th 2230 - 05th 0630

B. Solar Radio Emission

B2. Outstanding Occurrences at Hiraiso

Hiraiso December 1996

Single-frequency observations

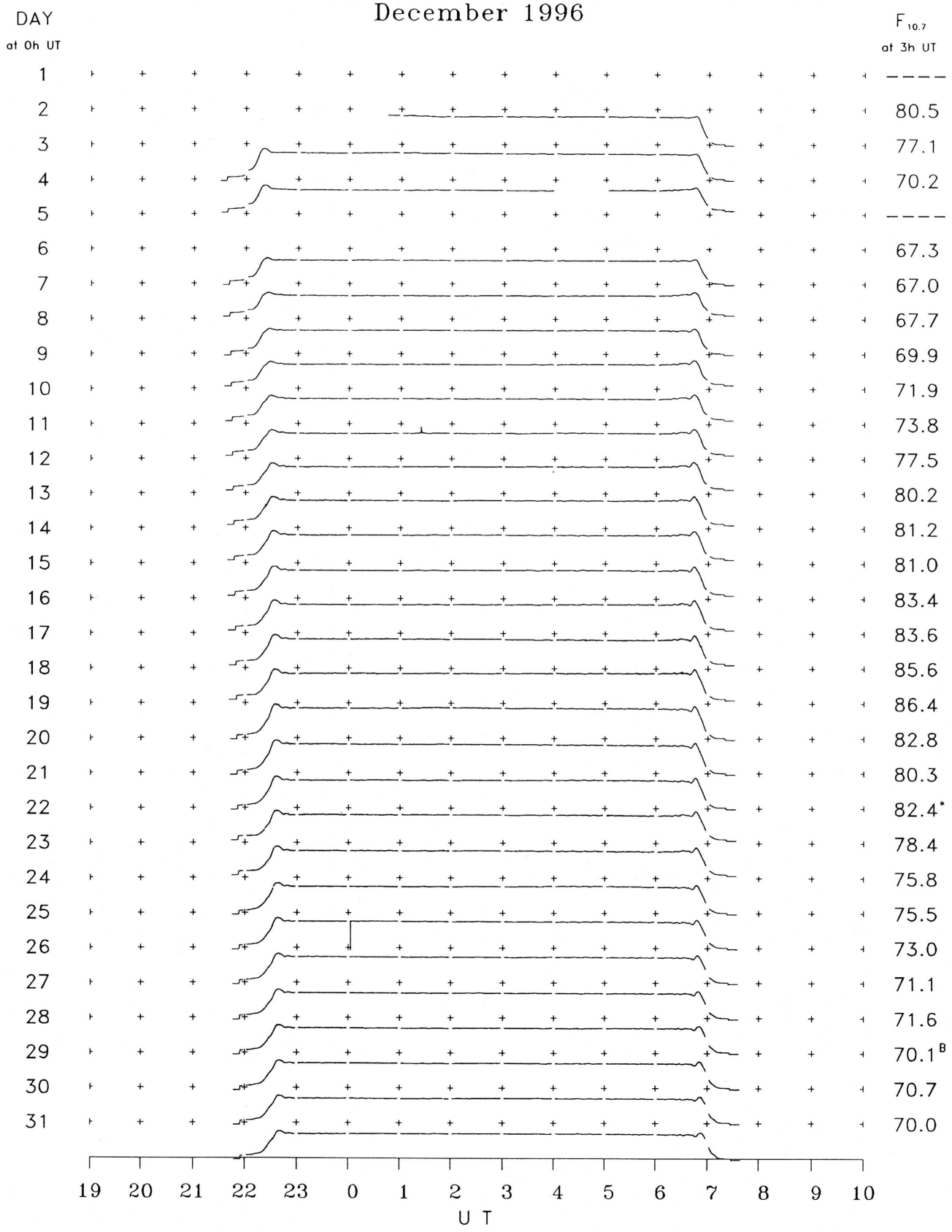
Normal observing period: 2140 - 0730 U.T. (sunrise to sunset)

DEC. 1996	FREQ. (MHz)	TYPE	START TIME (U.T.)	TIME OF MAXIMUM (U.T.)	DUR. (MIN.)	FLUX DENSITY (10^{-22} Wm^{-2}Hz^{-1}) PEAK	FLUX DENSITY (10^{-22} Wm^{-2}Hz^{-1}) MEAN	POLARIZATION REMARKS
10	200	42 SER	2238.6	2341.0	2.6	135	-	0
	500	42 SER	2238.8	2341.1	2.5	39	-	WL
11	500	1 S	0122.3	0122.7	1.0	4	1	0
	2800	1 S	0122.3	0122.7	1.6	17	4	0

B. Solar Radio Emission

B3. Summary Plots of $F_{10.7}$ at Hiraiso

December 1996



Note: A vertical grid space corresponds to a 100 sfu.
Elevation angle range ≧ 6°.

C. RADIO PROPAGATION

C1. H.F. FIELD STRENGTH (UPPER SIDE-BAND OF WWV)

DEC 1996 FREQUENCY 15 MHZ BANDWIDTH 80 HZ RECEIVING ANTENNA ROD 4.5 M

MEASURED AT HIRAISO

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

C. RADIO PROPAGATION

C1. H.F. FIELD STRENGTH (UPPER SIDE-BAND OF WWVH)

DEC 1996 FREQUENCY 15 MHZ BANDWIDTH 80 HZ RECEIVING ANTENNA ROD 4.5 M

MEASURED AT HIRAISO

UT DAY	00H 46M	01H 46M	02H 46M	03H 46M	04H 46M	05H 46M	06H 46M	07H 46M	08H 46M	09H 46M	10H 46M	11H 46M	12H 46M	13H 46M	14H 46M	15H 46M	16H 46M	17H 46M	18H 46M	19H 46M	20H 46M	21H 46M	22H 46M	23H 46M
						S	S	ES	ES	ES	ES	ES	ES	ES	ES	ES	ES	ES	ES	ES	ES			
1	5	12	13	17	20	.		-21	-21	-21	-21	-21	-21	-21	-21	-21	-21	-21	-21	-21	-21	10	14	8
		S	S	S	S	S	S	S	ES	ES	ES	ES	ES	ES	ES	ES	ES	ES	ES	ES				
2	12								-21	-21	-21	-21	-21	-21	-21	-21	-21	-21	-21	-21	4	15	12	16
						ES	ES	ES	ES	ES	ES	ES	ES	ES	ES	ES	ES	ES	ES	ES				
3	17	10	14	24	20	-21	-21	-21	-21	-21	-21	-21	-21	-21	-21	-21	-21	-21	-21	-21	7	22	17	15
					S	S	S	ES	ES	ES	ES	ES	ES	ES	ES	ES	ES	ES	ES	ES				
4	17	19	25	18				-21	-21	-21	-21	-21	-21	-21	-21	-21	-21	-21	-21	-21	13	14	21	18
						S	S	ES	ES	ES	ES	ES	ES	ES	ES	ES	ES	ES	ES	ES				
5	16	21	16	22	17			-21	-21	-21	-21	-21	-21	-21	-21	-21	-21	-21	-21	-21	7	17	15	14
						S	S	ES	ES	ES	ES	ES	ES	ES	ES	ES	ES	ES	ES	ES	ES			
6	12	22	15	20	10			-21	-21	-21	-21	-21	-21	-21	-21	-21	-21	-21	-21	-21	-21	17	13	17
						ES	ES	ES	ES	ES	ES	ES	ES	ES	ES	ES	ES	ES	ES	ES				
7	15	13	16	16	3	-21	-21	-21	-21	-21	-21	-21	-20	-20	-20	-20	-20	-20	-20	-20	8	10	15	12
								ES	ES	ES	ES	ES	ES	ES	ES	ES	ES	ES	ES	ES				
8	10	17	17	19	17	17	20	-21	-21	-21	-21	-21	-21	-21	-21	-21	-21	-21	-21	-21	8	13	10	10
								ES	ES	ES	ES	ES	ES	ES	ES	ES	ES	ES	ES	ES	ES			
9	15	15	15	22	15	15	15	-21	-21	-21	-21	-21	-21	-21	-21	-21	-21	-21	-21	-21	-21	8	10	12
						ES	ES	ES	ES	ES	ES	ES	ES	ES	ES	ES	ES	ES	ES	ES	ES			
10	7	10	20	17	5	-21	-21	-21	-21	-21	-21	-21	-21	-21	-21	-21	-21	-21	-21	-21	-21	17	13	17
						ES	ES	ES	ES	ES	ES	ES	ES	ES	ES	ES	ES	ES	ES	ES	ES			
11	12	17	12	18	17	-21	-21	-21	-21	-21	-21	-21	-21	-21	-21	-21	-21	-21	-21	-21	-21	10	17	15
						ES	ES	ES	ES	ES	ES	ES	ES	ES	ES	ES	ES	ES	ES	ES				
12	10	12	24	15	20	-21	-21	-21	-21	-21	-21	-21	-21	-21	-21	-21	-21	-21	-21	-21	13	17	16	16
								ES	ES	ES	ES	ES	ES	ES	ES	ES	ES	ES	ES	ES				
13	12	15	15	15	22	15	10	-21	-21	-21	-21	-21	-21	-21	-21	-21	-21	-21	-21	-21	13	17	17	17
						S	ES	ES	ES	ES	ES	ES	ES	ES	ES	ES	ES	ES	ES	ES	ES			
14	12	21	22	20	17		-21	-21	-21	-21	-21	-21	-21	-21	-21	-21	-21	-21	-21	-21	-21	17	16	16
		S				S	S	ES	ES	ES	ES	ES	ES	ES	ES	ES	ES	ES	ES	ES				
15	19		17	22	20			-21	-21	-21	-21	-21	-21	-21	-21	-21	-21	-21	-21	-21	16	17	20	14
						S	S		ES	ES	ES	ES	ES	ES	ES	ES	ES	ES	ES	ES				
16	15	17	20	15	17			10	-21	-21	-21	-21	-21	-21	-21	-21	-21	-21	-21	-21	11	11	15	16
											ES	ES	ES	ES	ES	ES	ES	ES	ES	ES	ES			
17	16	14	18	15	17	14	15	14	10	4	-21	-21	-21	-21	-21	-21	-21	-21	-21	-21	-21	10	9	10
		S					S	ES	ES	ES	ES	ES	ES	ES	ES	ES	ES	ES	ES	ES				
18	11		12	17	14	16		-21	-21	-21	-21	-21	-21	-21	-21	-21	-21	-21	-21	-21	10	7	15	11
							S	S	ES	ES	ES	ES	ES	ES	ES	ES	ES	ES	ES	ES	ES			
19	13	13	12	14	16	10			-21	-21	-21	-21	-21	-21	-21	-21	-21	-21	-21	-21	-21	12	10	7
							ES	ES	ES	ES	ES	ES	ES	ES	ES	ES	ES	ES	ES	ES				
20	12	12	10	15	12	7	-21	-21	-21	-21	-21	-21	-21	-21	-21	-21	-21	-21	-21	-21	3	2	7	14
					S	S	ES	ES	ES	ES	ES	ES	ES	ES	ES	ES	ES	ES	ES	ES				
21	11	20	17	13			-21	-21	-21	-21	-21	-21	-21	-21	-21	-21	-21	-21	-21	-21	13	17	13	13
							ES	ES	ES	ES	ES		ES		ES	ES	ES	ES	ES	ES				
22	10	18	13	20	10	10	-21	-21	-21	-21	-21	0	-21	-5	-21	-21	-21	-21	-21	-21	-5	10	8	2
		S	S					ES	ES	ES	ES	ES	ES	ES	ES	ES	ES	ES	ES	ES				
23	12			12	15	10	12	-21	-21	-21	-21	-21	-21	-21	-21	-21	-21	-21	-21	-21	11	10	12	13
		S	S			ES	ES	ES	ES	ES	ES	ES	ES	ES	ES	ES	ES	ES	ES	ES				
24	2			15	5	-21	-21	-21	-21	-21	-21	-21	-21	-21	-21	-21	-21	-21	-21	-21	5	10	5	2
						ES	ES	ES	ES	ES	ES	ES	ES	ES	ES	ES	ES	ES	ES	ES		ES		
25	2	2	10	17	0	-21	-21	-21	-21	-21	-21	-21	-21	-21	-21	-21	-21	-21	-21	-21	2	-21	7	5
						ES	ES	ES	ES	ES	ES	ES	ES	ES	ES	ES	ES	ES	ES	ES				
26	17	15	10	24	10	-21	-21	-21	-21	-21	-21	-21	-21	-21	-21	-21	-21	-21	-21	-21	4	12	12	12
								ES	ES	ES	ES	ES	ES	ES	ES	ES	ES	ES	ES	ES	ES			
27	13	14	14	17	15	10	17	-21	-21	-21	-21	-21	-21	-21	-21	-21	-21	-21	-21	-21	-21	3	13	13
						ES	ES	ES	ES	ES	ES	ES	ES	ES	ES	ES	ES	ES	ES	ES		ES		
28	10	10	13	13	16	-21	-21	-21	-21	-21	-21	-21	-21	-21	-21	-21	-21	-21	-21	-21	5	-21	10	-11
					ES	ES	ES	ES	ES	ES	ES	ES	ES	ES	ES	ES	ES	ES	ES	ES	ES			
29	15	10	13	10	-21	-21	-21	-21	-21	-21	-21	-21	-21	-21	-21	-21	-21	-21	-21	-21	-21	10	10	14
						ES	ES	ES	ES	ES	ES	ES	ES	ES	ES	ES	ES	ES	ES	ES	ES			
30	14	15	20	10	15	-21	-21	-21	-21	-21	-21	-21	-20	-20	-20	-20	-20	-20	-20	-20	-20	10	8	10
			ES				ES	ES	ES	ES	ES	ES	ES	ES	ES	ES	ES	ES	ES	ES	ES			
31	10	14	-21	14	16	13	-21	-21	-21	-21	-21	-21	-21	-21	-21	-21	-21	-21	-21	-21	-21	0	10	8
CNT	31	26	28	30	28	22	22	29	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31
						US	ES	ES	ES	ES	ES	ES	ES	ES	ES	ES	ES	ES	ES	ES	ES			
MED	12	14	15	17	16	-7	-21	-21	-21	-21	-21	-21	-21	-21	-21	-21	-21	-21	-21	-21	4	10	13	13
								ES	ES	ES	ES	ES	ES	ES	ES	ES	ES	ES	ES	ES				
UD	17	21	22	22	20	16	17	-21	-21	-21	-21	-21	-21	-20	-21	-21	-21	-21	-21	-21	13	17	17	17
						ES	ES	ES	ES	ES	ES	ES	ES	ES	ES	ES	ES	ES	ES	ES	ES			
LD	5	10	10	12	3	-21	-21	-21	-21	-21	-21	-21	-21	-21	-21	-21	-21	-21	-21	-21	-21	0	7	2

C. Radio Propagation

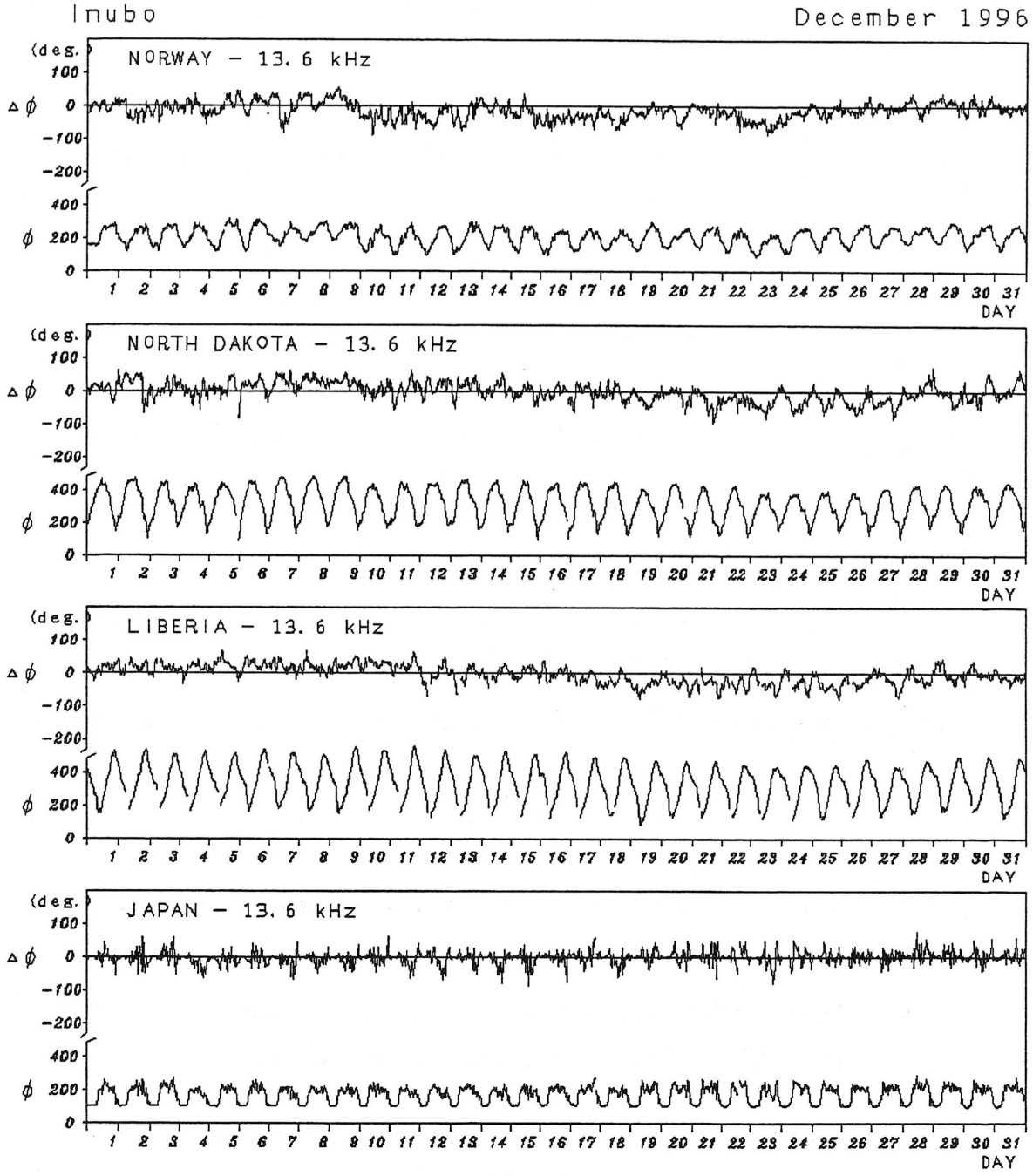
C2. Radio Propagation Quality Figures at Hiraiso

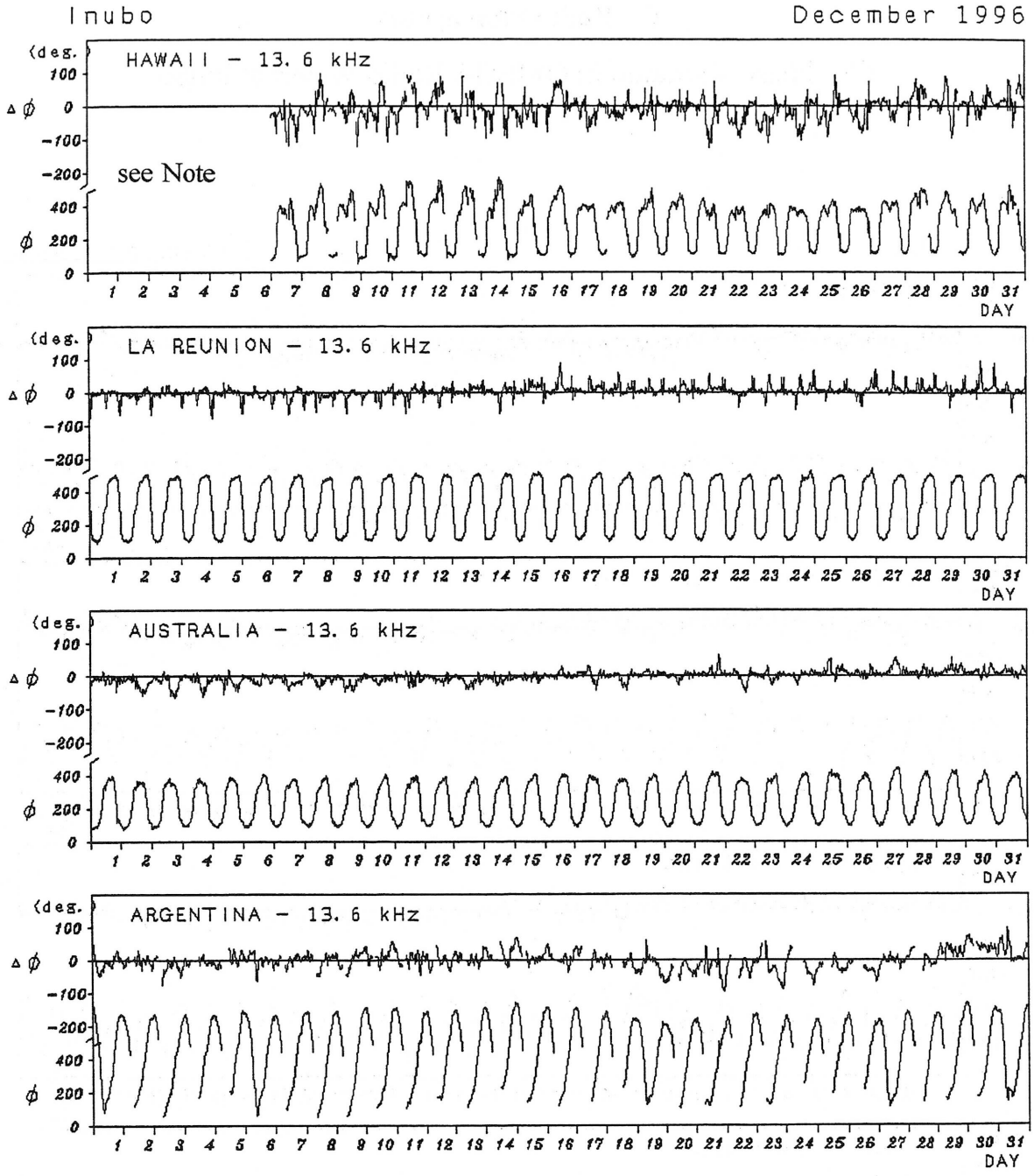
Hiraiso — Time in U.T.

Dec. 1996	Whole Day Figure	WWV 00 06 12 18 / 06 12 18 24	WWVH 00 06 12 18 / 06 12 18 24	Condition 00 06 12 18 / 06 12 18 24	Principal Geomagnetic Storms Start h m	End h	Range nT
1	4- U	- - - 4U	4 - - 3	N N N N	None		
2	4o U	S - - 4U	S - - 4	N N N N			
3	4+ U	- - - 5U	4 - - 4	N N N N			
4	4+ U	- - - 5U	4 - - 4	N N N N			
5	4o U	- - - 4U	4 - - 4	N N N N			
6	4- U	- - - 3U	4 - - 4	N N N N			
7	4o U	- - - 4U	4 - - 4	N N N N			
8	4o U	- - - 4U	4 - - 4	N N N N			
9	4- U	- - - 4U	4 - - 3	N N N N			
10	4o U	- - - 5U	3 - - 4	N N N N			
11	4- U	- - - 4U	4 - - 3	N N N N			
12	4o U	- - - 4U	4 - - 4	N N N N			
13	4o U	- - - 4U	4 - - 4	N N N N			
14	4+ U	- - - 5U	4 - - 4	N N N N			
15	5- U	- - - 5U	4 - - 5	N N N N			
16	4o U	- - - 4U	4 - - 4	N N N N			
17	4+ U	- - - 5U	4 5U - 3	N N N N			
18	4o U	- - - 4U	4 - - 4	N N N N			
19	4o U	- - - 5U	4 - - 3	N N N N			
20	4o U	- - - 4U	4 - - 4	N N N N			
21	4- U	- - - 3U	4 - - 4	N N N N			
22	3+ U	- - - 3U	4 - - 3	N N N N			
23	4- U	- - - 3U	4 - - 4	N N N N			
24	3o U	- - - 3U	3U - - 3	N N N N			
25	3- U	- - - 3U	3 - - 2	N N N N			
26	4- U	- - - 3U	4 - - 4	N N N N			
27	3+ U	- - - 3U	4 - - 3	N N N N			
28	3+ U	- - - 3U	4 - - 3	N N N N			
29	3o U	- - - 3U	3 - - 3	N N N N			
30	3+ U	- - - 3U	4 - - 3	N N N N			
31	3+ U	- - - 3U	4 - - 3U	N N N N			

C. Radio Propagation

C3. Phase Variation in OMEGA Radio Waves at Inubo





Note : As for HAWAII-13.6 kHz, no record during 14 November 1500 UT to 6 December 2320 UT, due to transmitter maintenance.

Polar Cap Phase Anomaly (PCPA) on Norway-Inubo Circuit

NONE

C. Radio Propagation

C4. Sudden Ionospheric Disturbance

(a) Short Wave Fade-out (SWF) at Hiraiso

Hiraiso Time in U.T.

DEC. 1996	S W F						Correspondence	
	Drop-out Intensities(dB)				Start	Dur.	Type	Imp.	Solar * Flare	Solar Burst
	CO	HA	AUS	MOS	BBC							
None												

NOTE CO:Colorade(WWV) HA:Hawaii(WWVH) AUS:Australia MOS:Moscow BBC:London
* Optical and X-ray Flares

(b) Sudden Phase Anomaly (SPA) at Inubo

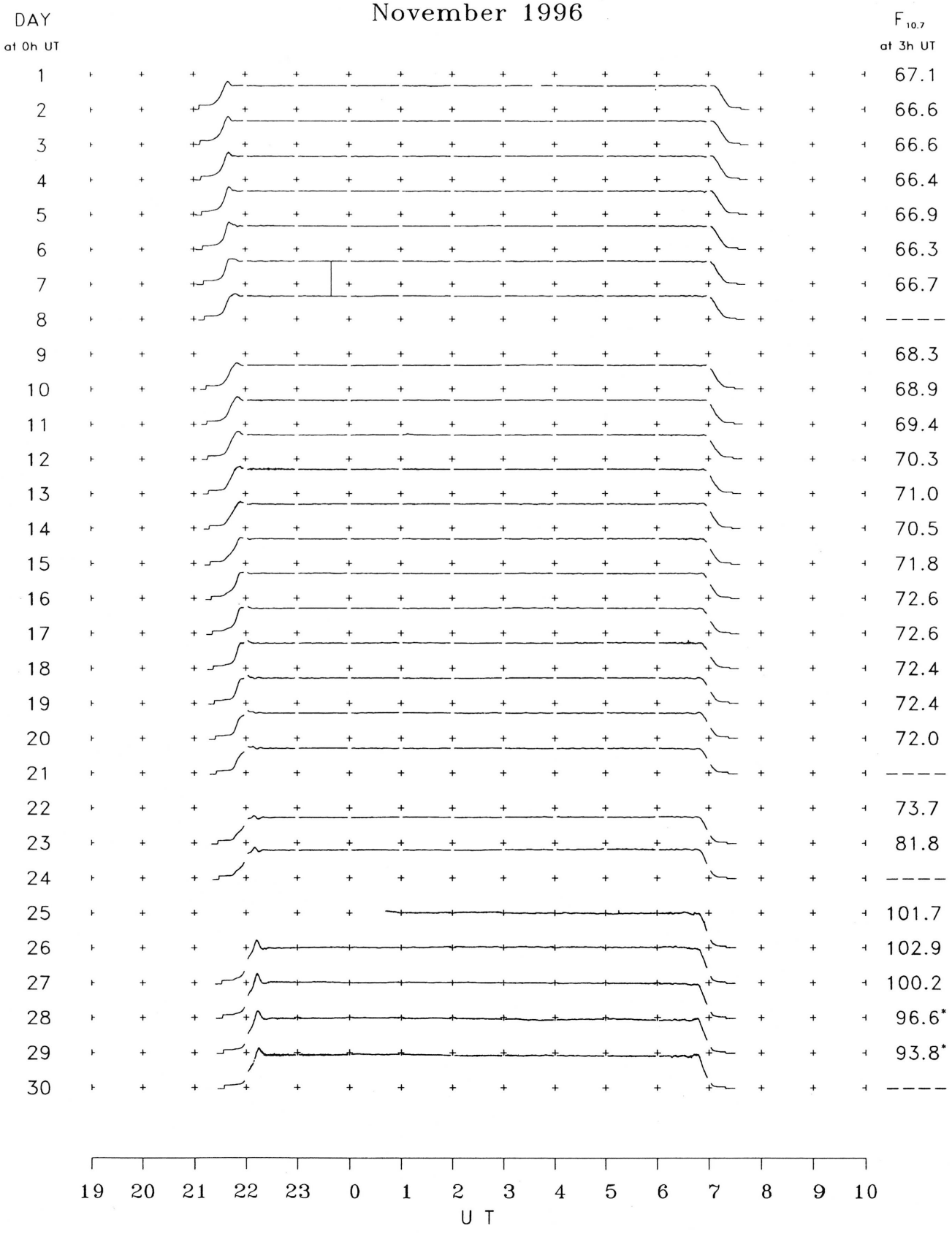
Inubo

Dec. 1996	S P A								
	Phase Advance (degrees)						Time (U.T.)		
Date	Ω/N	Ω/L	Ω/LR	Ω/AU	Ω/H	Ω/ND	Start	End	Maximum
2				7	–		0109	0130	0114
2	10		5	18	–	22	0134	0200	0140
2				16	–		2338	0032	2354
2		24			–		1430	1504	1440
11				14	7		0120	0210	0130
16		27					1225	1308	1233

B. Solar Radio Emission

B3. Summary Plots of $F_{10.7}$ at Hiraiso

November 1996



Note: A vertical grid space corresponds to a 100 sfu.
Elevation angle range ≧ 6°.

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