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IONOSPHERIC DATA IN JAPAN

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CONTENTS

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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. 1993

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	42	43	25	44	42	37	91	52	64	61	76	78	75	74	60	60	63	42	36	39	38	A	A	A
2	A	34	34	35	36	37	A	A	86				81	83	85	60	50	32	34	34	29	A	A	30
3	40	40	C	C	37	35	A	34		58	64	77	72	89	71	71	61	64	51	53	49	50	26	A
4	37	32	30	30	30	26	84	64	78	88	90	90	84	77	88	76	66	44	31	29	A		30	30
5	A	A	A	32	32	34	A	53	64	88	81	77	80	74	78	66	62	52	34	36	19	29	34	38
6	42	43	A	43	44	32	91	52	66	82	90	88	89	88	75	66	53			34	34	32	34	34
7	34	31	35	34	35	34	91	61	78	78	86	84	73	72	68	72	60	36	34	37	34	30	32	35
8	31	34	36	35	35	35	64	61	88	N	108	107	105	90	88	82	64	67	53	53	A	34	30	38
9	37	32	30	36	40	41	62	66	A	104	107	90	80	87	79	82	54	66	32	34	40	35	34	35
10	37	34	34	34	34	34	71	53	69	59	73	84	80	82	66	77	53	42	36	34	37	32	35	42
11	38	43	A	35	32	29		113	64	80	76	83	86	86	64	61	53	71	37	37	32	29	37	34
12	37	42	42	40	42	44	32	52	73	88	87	84	67	88	77	61	46	41	34	40	30	35	40	36
13	49	43	48	38	42	40	91	71	65	78	87	75	71	77	70	66	54	A	26	31	A	A	30	36
14	34	37	36	36	37	37	A	40	59	66	64	84	68	86	72	57	53		30	38	40	34	42	30
15	A	37	34	30	32	30	A	A	61	59	68	89	77	66	74	67	52	53	31	34	A	30	36	37
16	34	36	36	35				35	52	64	84	76	67	64	63	63	52	42	37	35	N	28	30	32
17	31	34	35	31	32	34	86	55	69	79	63	86	77	78	72	65	53	32	N	N	28	34	34	35
18	34	40	A	30	28	30			64	66	78	77	72	93	84	67	53	34	66	34	C	41	C	C
19	C	C	C	C	C	C	C	C	95	101	C	96	88	C	64	51	52	30	C	C	C	C	C	C
20	C	C	C	C	C	C	C	C	N	C	87	78	74	81	78	64	52	64	35	31		34	43	32
21	34	A	53	51	44	37	71	54	58	66	71	68	78	78	71	58	53	A	37	36	26	25	30	26
22	34	35	34	30	30	28	91	43	50	78	75	86	84	73	80	66	32	71	37	33	32	37	37	24
23	35	38	38	37	37	35	A	58	73	86	72	89	68	88	72	71	46	29	38	34	28	31	34	34
24	34	34	32	35	37	35	86	50	63			80	82	86	75	73	50	A	A	30	31	34	34	35
25	34	34	34	34	35	38		64	66	74	80	90	76	74	70	65	54	30	40	34	25	34	37	36
26	42	38	35	38	38	29	34	50	54	87	76	84	72	66	78	62	58	71	A	A	30	34	36	36
27	36	40	40	40	37	30	85	31	64	83	85	78	A	74	71	62	54	62	A	31	30	31	34	35
28	34	34	37	40	A	34	91	53	65	83	88	88	86	79	86	54	A	52	A	24	28	32	34	32
29	38	40	38	40	40	38	52	50	66	77	80	74	78	82	74	67	A	53	A	A	A	30	34	34
30	34	A	A	30	35	30	90	91	80	87	88	75	76	87	82	63	52	49	37	30	30	34	A	36
31	36	35	36	40	37	34	91	76	64	74	87	88	78	77	75	63	58	46	34	34	32	A	35	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	26	26	23	28	27	28	19	26	28	27	28	30	30	30	31	31	29	26	23	27	22	25	26	27
MED	36	36	35	35	37	34	86	53	65	78	80	84	78	80	74	65	53	48	36	34	30	34	34	35
U Q	38	40	38	40	40	37	91	64	73	87	87	88	82	87	79	71	58	64	37	37	34	34	36	36
L Q	34	34	34	33	32	30	64	50	63	66	74	77	72	74	70	61	52	36	34	31	28	30	32	32

HOURLY VALUES OF FES AT WAKKANAI

DEC. 1993

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	32	33	27	29	G	G	G	G	G	66	G	G	G	G	G	32	64	59	38	43	51	68
2	37	30	30	24	33	60	57	66	G	G	G	G	G	G	G	G	33	G	G	G	G	35	40	32
3	G	G	C	C	G	G	30	38	G	G	G	G	G	G	G	G	33	G	25	40	32	35	32	28
4	G	G	G	G	G	G	G	24	G	55	54	57	G	G	G	G	27	G	G	27	70	25	32	29
5	42	34	58	37	32	32	27	G	G	G	46	G	G	48	32	G	G	G	G	G	24	30	23	33
6	31	30	35	28	G	G	G	G	G	54	G	G	G	G	G	G	G	G		G	G	G	G	G
7	G	G	G	G	G	G	G	G	G	34	G	G	G	G	G	38	34	25	G	25	G	G	G	G
8	G	G	G	G	G	G	G	G	31	33	G	G	G	G	G	G	G	27	25	G	28	29	G	G
9	G	G	G	G	G	G	G	76	95	94	143	49	G	G	G	G	G	G	G	G	G	G	G	G
10	G	G	G	G	G	G	G	G	G	G	51	36	G	G	G	G	34	32	G	G	25	35	G	35
11	33	29	32	26	G	G		68	32	G	45	G	G	G	G	G	G	G	31	G	G	G	27	G
12	G	30	29	G	G	G	G	32	30	G	G	G	G	G	G	G	G	G	G	28	G	G	G	G
13	G	G	G	G	G	G	G	G	36	G	G	G	G	G	G	G	33	50	56	36	55	59	33	34
14	32	28	G	G	28	G	36	31	G	G	G	G	G	G	G	G	G		32	G	G	G	G	G
15	32	30	G	G	G	24	36	45	G	G	G	G	G	G	38	37	32	G	30	28	33	G	30	G
16	G	G	G	G	G			27	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	25
17	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G
18	G	32	36	24	G	G		G	36	G	G	G	G	G	G	G	G	G	G	G	C	G	C	C
19	C	C	C	C	C	C	C	C	G	G	C	G	G	C	G	G	G	G	G	232	244	C	C	244
20	C	C	G	G	G	G	G	C	237	C	G	G	G	G	G	G	27	29	G	G	G	G	G	G
21	G	30	29	G	G	G	G	25	35	G	G	G	G	G	35	38	38	32	26	G	G	G	G	G
22	G	G	G	G	G	G	G	G	37	G	G	G	G	G	G	G	G	G	G	27	G	23	G	32
23	G	G	G	G	28	G	26	G	G	G	G	G	G	G	36	61	G	G	G	G	32	G	G	G
24	G	G	G	G	G	G	G	G	G			G	G	54	34	32	G	36	36	26	G	G	32	G
25	G	32	G	26	G	G		G	G	G	G	G	G	G	G	G	G	G	24	G	G	G	G	30
26	31	38	G	27	G	32	33	G	59	G	G	G	G	G	G	G	G	G	55	60	25	G	G	G
27	G	G	33	26	33	32	G	G	G	33	G	46	66	40	G	50	36	38	37	26	G	29	G	G
28	G	G	G	G	65	32	G	70	38	G	G	G	G	G	G	40	51	33	29	33	G	G	G	G
29	G	G	G	G	G	G	G	G	G	32	G	G	G	G	G	G	38	39	105	141	40	32	23	G
30	G	33	30	27	G	G	G	G	G	G	G	G	G	G	56	G	40	50	G	26	G	25	41	29
31	26	26	26	34	59	126	G	30	36	35	G	G	G	G	G	58	G	23	G	33	32	32	28	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	29	29	29	29	30	29	26	29	31	29	29	31	31	30	31	31	31	30	30	31	30	30	29	30
MED	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	25	G	G	G	G
U Q	28	30	30	26	27	26	26	31	36	32	G	G	G	G	G	32	33	32	31	33	32	30	31	30
L Q	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G

COMMUNICATIONS RESEARCH LABORATORY, JAPAN

HOURLY VALUES OF FMIN AT WAKKANAI

DEC. 1993

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

HD	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	14	15	15	15	16	16	18	47	46	45	50	46	46	46	30	18	17	15	16	16	15	15	15
2	15	15	15	15	14	15	15	15	22	30	42	45	44	29	26	18	16	15	15	15	15	15	15	15
3	15	15	C	C	15	15		16		18	20	20	47	27	26	24	18	17	15	15	15	15	15	16
4	15	15	15	15	15	15	20	20	24	16	18	18	18	17	28	28	27	18	15	15	15	16	15	15
5	16	15	15	15	14	16	20	18	26	18	18	18	20	18	18	18	18	18	15	15	16	15	15	15
6	15	15	15	16	17	20	17	17	17	18	20	41	20	30	27	23	18	22		15	15	16	16	15
7	15	15	15	15	15	15	18	17	24	16	18	18	18	28	24	16	16	16	15	15	15	15	15	15
8	15	16	15	15	15	15	16	17	17	20	21	18	20	18	26	23	16	16	16	15	15	17	15	15
9	15	15	15	15	15	15	16	16	16	20	21	17	17	16	27	22	20		15	16	16	15	15	15
10	15	14	15	14	15	18		18	26	18	20	21	44	29	27	23	16	17	15	15	15	16	15	15
11	15	15	15	15	15	14		16	17	18	20	18	34	27	20	26	16	17	16	14	15	15	15	15
12	14	15	15	15	15	14	16	16	16	17	18	18	18	30	29	23	17	17	15	14	15	15	15	16
13	16	15	15	14	15	15	18	22	17	42	29	32	29	44	29	22	16	16	15	16	16	15	16	15
14	15	16	16	15	15	18	17	16	26	28	32	43	31	45	44	21	16		15	15	15	15	15	15
15	16	15	15	15	15	15	16	16	24	33	46	42	42	28	21	18	17	17	15	15	16	15	14	15
16	16	15	14	16	17			17	26	23	33	39	18	45	27	21	18	16	15	15	17	17	15	15
17	15	15	15	15	15	15	16	17	22	33	20	45	35	29	33	26	16	24	18	17	15	15	15	14
18	20	15	15	15	15	15		20	17	18	35	28	29	40	26	23	17	18	14	15	C	26	C	C
19	C	C	C	C	C	C	C	C	34	28	C	49	38	C	27	27	18	15	C	C	C	C	C	C
20	C	C	C	C	C	C	C	C	C	C	34	33	28	30	26	24	16	17	15	15	15	16	15	16
21	15	15	15	15	14	15	18	20	18	22	20	29	30	44	21	17	16	17	17	15	17	15	15	15
22	15	15	15	15	15	16		16	17	18	20	20	34	45	30	26	18	20	16	16	15	15	15	15
23	15	15	16	15	14	14	20	15	22	22	34	30	29	28	24	20	18	17	15	15	15	15	15	16
24	15	15	15	15	14	14	16	18	26			42	46	26	23	18	23	16	15	16	15	15	14	15
25	15	15	14	15	15	15		16	20	22	22	29	46	29	29	24	18	16	15	15	15	16	15	15
26	17	15	15	15	15	15	17	17	17	18	20	23	33	21	26	27	17	22	15	15	15	15	15	14
27	15	14	15	15	14	15	15	26	26	17	20	20	21	21	17	18	16	18	15	15	16	16	16	17
28	21	16	15	14	15	15	21	16	23	27	34	17	38	32	20	18	16	16	14	15	15	17	15	15
29	15	15	14	15	15	15	16	17	26	22	20	45	40	33	27	24	16	16	15	15	15	16	15	15
30	15	16	15	17	15	15	18	18	26	29	20	24	46	21	20	29	15	18	15	15	15	15	16	16
31	15	15	15	14	14	15	16	16	17	20	28	20	32	32	28	26	17	16	15	15	15	15	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	29	29	28	28	29	28	22	29	29	29	29	31	31	30	31	31	31	29	29	30	29	30	29	29
MED	15	15	15	15	15	15	16	17	22	20	20	28	32	29	26	23	17	17	15	15	15	15	15	15
U Q	16	15	15	15	15	15	18	18	26	28	33	42	42	33	28	26	18	18	15	15	16	16	15	15
L Q	15	15	15	15	14	15	16	16	17	18	20	18	20	26	23	18	16	16	15	15	15	15	15	15

HOURLY VALUES OF FOF2 AT KOKUBUNJI

DEC. 1993

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				42	40	37	42	51	62	70	49	82	70	68	76	66	59	44	59	59		79		A
2				59		76	60	89	86			116	92	88	72	94	67	60	32	27	A	69	37	64
3	A	37	44	46	47	42	A	90	92	84	98	105	80	87	88		80	94	64	52	60	A	35	A
4	A	A	27	56	34	38	32	67	90	98	101	125	125	114	91	77	89	53	38	32	39	C	A	A
5	36	C	27	C	51	A	A	81	92	94	97	119	91	A	98	78	61	65	33	38	32	36		A
6	A	A	31	53	66	76	59	82	93	88	88	79	86	77	100	60	67	68	59	A		65	38	32
7	38	40	38	42	34	A		58	88	93	83	94	85	74	74	69	84	47	A	71	43	32	38	26
8	49	25	44	46	44	43	37	53	84	113	97	96	93	92	115	93	89	88	58	59	76	66		52
9	37	49	49	34	31	71	50	85	93	117	124	116	95	112	87		84	103	A	52	71	26	65	65
10	69	38	A	43	27	36	49	75	92	76	84	94	82	78	83	87	70	48	32	37	44	A		A
11	A	46	35	37	35	38	44	79	65	82	80	91		95	73	76	59	66	70	40	51	51		49
12	42	66	54	40	46		27	56	92	68	84	86	92	79	80	76	61	50	76	38	48	38	A	46
13	36	41	40	47	41	76	44	51	92	88	92	93	78	68	60	76			70	49	50	A	A	65
14	33	A	37	35	38	36	65	66	79	58	78	90	75	78	71	59	68	64	54	38			38	34
15	38	38	35	51	48	36	44	54	75	72	65	93	71		77	59	57	55	31	76	N	42	43	32
16	65	35	48	42			A	63	N	68	80	87	81	83	76	69	82	62	62	37		A	A	31
17	42	49	32	43	50		37	58	71	94	79	70	88	83	85	85	85	49	86	75	37	28	35	76
18	51	41	48	42	48	25	58	62	82	82	96	79	77	83	76	64	72	38	86	47	36	47	A	
19		N	N	48	41	42	59	51	84	86	83	92	91	87	61	65	74	37	53	A	56	38	28	49
20	55	48	35	29	38	37	38	60	69	70	82	92	76	84	74	88	84	61	65	76	71	40	31	38
21	34	50	25	48	36	N	A	60	55	80	84	83	86	67	68	84	58	42	39	53		A	A	A
22	38	37	34	30	31	32	43	58	67	83		85	66	86		77	80	86	59	43	A			54
23	28	A	35	51	26	42	43	56	68	84	92	80	76	76	86	61	55	76	42	A	28	35	31	37
24	34	51	50	25	30	38	38	62	59	79	96	114	78	75	78	70	68	48	A	51	48			34
25		35	32	34	30	30	51	57	82	85	92	96	72	83	83	87	92	68	64	49	76	41	32	26
26	N	49	38	37	31	A	53	57	86	79	77	82	66	61	75	76	67	34	54	38	56	20	36	35
27	35	50	31	43	36	34	30	67	86	87	100	93	76	72	76	77	64	53	57	59	38	A	35	56
28	35	37	A	A	A	51	53	64	88	93	110	98	76	80	76	A	63	54	67	33	38	N	A	A
29	36	54	37	49	66	56	29	63	73	81	92	90	70	76	74	80	68	55	40	59	35	35		A
30	32	46	38	43		78	76	66	95	95	94	87	77	70	76	90	67	53	58	44	61	32	30	34
31	35	42	48	34	32	37	34	59	72	83	92	88	78	72	77	74	73	66			54	A	A	37
	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	22	23	26	29	27	24	26	31	30	30	29	31	30	29	30	28	30	30	27	27	23	19	15	22
MED	36	42	37	43	38	38	44	62	84	84	92	92	78	79	76	76	68	55	58	49	48	38	35	38
U Q	42	49	44	48	47	53	53	67	92	93	96	96	88	86	85	84	82	66	65	59	60	51	38	54
L Q	35	37	32	36	31	36	37	57	71	79	81	85	76	73	74	67	63	48	40	38	38	32	31	34

COMMUNICATIONS RESEARCH LABORATORY, JAPAN

HOURLY VALUES OF FES AT KOKUBUNJI

DEC. 1993

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	G	G	G	G	G	G	G	G	40	33	55	G	40	G	G	G	48
2	G	G		G	G	G	G	31	47	68	94	76	93	60	58	61	29	34	58	34	40	51	G	29
3	69	30	31	G	G	G	58	32	41	72	69	58	68	G	50	G	35	G	48	33	47	38	38	70
4	92	44	24	G	G	G	G	G	37	70	43	G	41	44	40	34	48	40	47	36	44	24	49	54
5	29	C	G	C	22	43	41	35	32	44	72	62	61	95	61	34	G	G	28	G	24	38	G	39
6	41	46	28	G	G	21	G	G	34	50	60	60	G	G	G	44	36	27	48	44	G	25	G	G
7	G	G	G	G	G	29	G	48	48	38	43	44	54	44	51	58	30	31	33	31	38	G	G	G
8	G	G	G	G	G	G	G	48	34	36	117	G	49	74	55	52	40	44	44	G	G	G	G	30
9	26	25	G	G	G	G	G	33	41	71	75	135	109	128	110		50	40	36	33	26	30	G	G
10	G	G	34	45	G	G	G	G	34	G	45	G	43	40	G	34	34	G	G	G	G	26		29
11	29	G	G	G	G	56	G	G	32	59	62	45	G	G	G	G	G	G	G	G	G	G	G	G
12	59	G	26	26	26		30	G	G	48	G	G	51	47	36	G	34	G	G	G	G	G	44	26
13	G	G	G	G	G	G	G	29	34	G	G	G	40	G	59	47			G	G	G	43	37	40
14	28	32	28	25	28	28	30	G	G	47	40	G	G	G	G	G	G	21	G	G	G		G	G
15	G	G	G	G	G	G	G	34	44	46	G	G	G		G	47	G	G	G	G	G	G	G	G
16	G	G	G	G			25	34	G	G	41	42	G	G	G	G	G	G	29	G	G	26	32	G
17	G	G	G	G	G		32	38	40	35	G	G	G	G	G	G	G	32	G	G	28	G	G	G
18	G	G	G	G	G	G	G	G	G	G	59	44	39	65	40	44	29	G	47	23	24	40	42	24
19		G	G	G	G	G	G	G	33	44	41	G	G	G	G	G	48	25	G	32	G	26	26	G
20	25	G	G	G	G	G	29	G	34	36	54	G	G	G	37	42	35	59	32	G	G	G	G	G
21	G	G	G	45	G	G	28	G	G	G	49	60	52	78	105	53	60	49	26	G	G	37	59	53
22	34	G	30	G	G	G	G	G	G	56	G	G	G	G	36	G	46	24	G	45	36			G
23	G	34	58	27	G	G	G	G	32	40	41	51	62	42	G	56	G	G	G	54	33	45	59	G
24	G	G	31	G	G	G	G	G	G	G	G	G	G	G	G	48	G	43	48	24	G			G
25	G	G	G	G	G	37	G	G	G	G	G	40	G	G	G	G	G	G	G	G	G	G	G	24
26	G	G	G	42	G	28	32	30	G	G	G	40	68	64	54	G	G	G	40	G	G	24	G	49
27	G	G	G	24	G	G	G	G	G	G	42	49	48	48	G	41	34	60	60	32	25	57	37	G
28	30	23	34	42	32	36	G	G	G	G	G	G	G	G	69	83	58	30	39	28	88	31	39	26
29	25	G	G	26	G	G	30	G	G	G	51	45	G	G	G	G	G	G	46	G	G	G		32
30	25	G	G	27		21	G	G	33	62	102	47	43	45	54	68	64	57	34	G	G	G	G	G
31	38	G	G	G	G	G	G	G	50	44	G	G	G	G	G	47	30	44	127	69	71	32	34	29
	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
CNT	29	30	30	30	29	28	31	31	31	31	31	31	31	30	31	30	30	30	31	31	31	28	27	31
MED	G	G	G	G	G	G	G	G	32	38	42	40	39	G	36	40	32	26	32	G	G	26	G	24
U Q	29	G	28	26	G	24	29	32	37	50	60	49	52	48	54	48	40	43	47	33	33	37	38	32
L Q	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G

HOURLY VALUES OF FMIN AT KOKUBUNJI

DEC. 1993

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		22		16	15	15	16	27	34	38	39	42	39	39	38	30	20	15	15	15	18	15	15	15
2	18	15		15	16	15	15	14	15	14	17	18	16	15	14	14	14	14	14	14	14	15	15	15
3	15	15	14	14	15	15	14	14	15	14	14	14	15	15	14		17	15	15	14	14	15	15	14
4	14	14	14	16	14	15	15	17	14	14	14	16	20	15	15	14	17	15	15	14	15	15	14	14
5	15	C	15	C	15	15	15	14	14	14	14	15	16	14	14	15	20	15	15	15	15	15	15	14
6	15	15	14	15	14	15	15	16	14	14	14	14	14	14	14	14	17	15	14	14		14	16	15
7	15	15	15	14	14	14	15	15	14	15	18	15	16	15	14	15	14	15	15	15	15	14	14	15
8	15	14	15	15	14	14	15	16	15	14	15	16	15	15	15	15	15	14	15	15	14	18	18	14
9	15	14	15	16	15	14	15	15	14	15	14	15	16	15	14		14	14	15	14	14	15	14	14
10	16	15	15	14	15	15	16	17	14	15	17	24	15	17	16	15	14	15	15	15	16	15		16
11	14	15	15	15	15	15	15	17	14	14	14	16	18	15	18	15	22	15	14	15	15	15	16	15
12	16	15	15	14	14		15	16	15	15	16	17	17	15	15	15	15	15	15	15	14	15	14	15
13	16	14	15	15	14	15	16	15	17	14	17	16	16	18	14	14			15	15	16	15	15	15
14	14	14	14	15	15	14	15	16	14	15	15	15	16	15	14	14	21	15	15	15	18		15	15
15	14	15	15	15	14	15	16	14	14	14	15	17	32		14	16	22	14	14	14	15	15	15	15
16	15	15	14	15			15	15	14	14	14	15	18	14	20	15	16	15	15	14	15	15	14	15
17	14	14	14	15	14		15	15	14	15	14	15	18	16	15	14	18	15	15	15	14	14	15	15
18	16	15	15	15	15	15	15	17	15	15	17	16	20	16	16	15	15	15	14	15	15	15	15	15
19		15	16	14	15	15	15	17	15	14	16	15	17	16	16	15	18	15	15	15	15	15	14	15
20	15	16	14	15	15	15	15	17	15	15	15	14	15	14	14	14	14	14	15	15	14	16	15	14
21	15	15	15	14	14	15	15	17	15	15	23	18	17	17	15	14	14	15	16	15	18	14	15	15
22	14	15	15	15	15	15	15	17	15	16	18	16	16	15	17	15	14	14	15	15	14			17
23	17	14	15	15	15	15	15	16	16	17	17	20	21	17	18	18	21	16	15	14	15	14	14	15
24	14	15	14	14	14	15	15	18	18	18	26	24	30	20	17	15	16	14	15	15	15			15
25	15	14	14	14	14	14	15	17	22	18	18	22	22	18	34	17	23	14	15	15	16	15	16	15
26	15	15	15	14	15	15	15	16	15	17	18	20	20	17	15	15	21	15	15	14	15	15	17	14
27	15	14	15	14	14	15	15	16	14	15	16	20	20	27	20	15	14	16	15	16	15	15	15	15
28	15	15	14	14	14	14	15	14	16	18	17	17	35	15	14	15	14	15	14	14	15	14	14	15
29	16	16	15	16	16	15	15	17	17	15	17	21	20	18	16	16	14	16	15	15	17	15		14
30	14	15	15	15		15	15	16	15	15	18	24	27	23	15	20	15	15	15	15	15	15	15	15
31	15	14	15	15	15	16	15	17	15	15	20	21	38	21	17	16	15	15	15	16	15	15	14	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	29	30	29	30	29	28	31	31	31	31	31	31	31	30	31	29	30	30	31	31	30	28	27	31
MED	15	15	15	15	15	15	15	16	15	15	17	16	18	16	15	15	16	15	15	15	15	15	15	15
U Q	15	15	15	15	15	15	15	17	15	15	18	20	21	18	17	15	20	15	15	15	15	15	15	15
L Q	14	14	14	14	14	15	15	15	14	14	14	15	16	15	14	14	14	14	15	14	14	15	14	14

COMMUNICATIONS RESEARCH LABORATORY, JAPAN

HOURLY VALUES OF FOF2 AT YAMAGAWA

DEC. 1993

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																								
2																								
3																								
4																								
5																								
6																								
7			39		39										82	87	75	65	57			41		
8				40	66		91		85	83	84	86	97	97	97	78	90	96	77		43			
9								89	66	107		108	98	112	87	80	83	74	54					
10				34				43	72	72	84	91	86	90	84	89	86	66	78	48				
11					37				63	66	76	85	96	105	108	98	73	74	55					
12					65				78	88	78	90	97	86	71	83	74	59	52		44			
13				86	36				76	80	76	86	72	68	74	72	70	52	47		69			A
14	A				A	91			77	84	71	77	82	78	66	66	63	76	53					
15									77	72	77	81	78	80	80	70	66	62						
16				46				96	84	73	72	79	77	84	78	61	75	66			A			
17			91	65	39				66	78	76	72	85	92	100	85	79	52			39	39	43	
18							39		61	67	77	83	87	84	77	65	64	48	39		A		39	
19		43						54	64	60	66	88	91	75	66	76	73	63						
20						39	39		61	76	76	75	81	90	87	74	73	53						
21						39		39	59	61	77	82	84	82	66	71	83	84		40	39			39
22					39		39	39	61	78		83	77	78	74	78	81	56		39				
23	41			39	65	39	43		84	76	82	80	98	76	64	60	82	81			39			
24	39			39			39		57	81	81	102		87	72	83	85	70	42	30				
25		29			34		29	44	66	62	84	96	102	74	75	85	90	67	60			42	25	26
26		51	59	40	31	30	59	43	66	65	86	93	86	77	81	81	74	58	43	A	42	A	25	
27			59	35	42		51	36	66	81	86	100	77	78	87	87	84	66		53	43		A	31
28				A	A	35	30	42	66	77	99	111	87	78	82	78	87	64	47	66	A	A		A
29		49	N		35	49	39	42	70	70	90	82	92	95	84	87	90	67	44	66	62			69
30		39	A	31			49	42	66	64	75	94	82	89	73	78	87	62	60	64	52			
31						31	34	42	66	84	77	95	80	82	72	73	71	63	52	53		A	A	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				10	12		13	13	24	24	22	24	23	24	25	25	25	25	16		10			
MED				40	39		39	42	66	76	77	86	86	83	78	78	79	65	52		43			
U Q				46	53		50	49	76	81	84	94	96	90	85	85	85	72	58		52			
L Q				35	35		36	40	63	66	76	81	80	78	72	71	73	58	45		39			

HOURLY VALUES OF FES AT YAMAGAWA

DEC. 1993

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																								
2																								
3																								
4																								
5																								
6																						G	G	G
7		G	G	G	G										43	39	37	29	G	G	G	G	G	G
8	G	G	G	G	G	G	G	G	G	G	40	60	59	50	56	60	44	G	32	G	G	G	G	G
9	G	G	G	G		G	G	G	G	G	42	44	43	59	G	G	42	40	30	G	G	G	G	G
10		G	G	G	G		G	G	G	G	G	46	50	53	50	80	42	G	G	G	G	G	G	G
11	G	G			G	G	G	G	G	G	42	44	45	66	G	G	G	G	G	G	G	G	G	G
12	G	G	G	G	G	G	G	G	G	G	G	40	G	G	57	49	39	G	G	G	G	G	G	
13	G	G		G	G	G		G	G	38	G	G	G	G	G	G	G	G	G	G	G	G	G	34
14	34				32	G			G	40	46	50	49	59	G	G	G	29	G	G	G	G	G	G
15	G	G	G	G		G	G		G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G
16	G	G	G	G	G			G	G	G	G	G	44	G	54	51	G	G	G	G	78	G	G	G
17	G	G	G	G	G	G		G	33	36	61	G	G	G	G	G	G	G	G	G	G	G	G	G
18	G	G	G	G	G	G	G	G	G	G	50	39	G	G	G	G	G	G	G	G	40	G	G	G
19	G	G	G	G	G	G	G	G	G	39	G	44	50	G	G	G	40	38	G	G	G	G	G	G
20	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G		G
21	G		G		G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G
22	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G
23	G	G	G	G	G	G	G	G	G	G	G	54	62	63	57	49	G	G	G	G	G	G	G	G
24	G	G	G	G	G	G	G	G	G	G	41	51		G	G	G	G	G	G	G	G	G		
25	G	G			G	G	G	G	G	G	G	G	G	47	G	40	40	G	G	G	30	G	G	G
26	G	G	G	G	G	G	24	G	G	G	G	G	56	40	39	45	61	48	60	57	43	38	G	24
27	G		28	37	31		23	G	G	G	G	G	G	48	44	44	G	G		67	37	G	32	G
28	G	G	31	58	58	25	G	32	33	G	G	46	G	G	44	G	G	44	29	G	32	78	G	33
29	G	G	G	G	G	24	G	G	G	G	44	51	43	41	G	G	G	30	G	G	G	G	G	G
30	G	G	69	24		G	G	G	G	G	44	52	53	G	44	48	54	G	G	G	26	25	G	
31	G	G		G	G	25	G	32	G	G	G	51	54	43	40	G	44	G	33	31	G	79	32	39
	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
CNT	23	22	20	21	22	21	20	22	24	24	24	24	23	24	25	25	25	25	24	25	25	26	24	23
MED	G	G	G	G	G	G	G	G	G	G	G	42	43	G	G	G	G	G	G	G	G	G	G	G
U Q	G	G	G	G	G	G	G	G	G	G	42	50	50	49	44	46	41	29	G	G	28	G	G	G
L Q	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G

COMMUNICATIONS RESEARCH LABORATORY, JAPAN

HOURLY VALUES OF FMIN AT YAMAGAWA

DEC. 1993

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																								
2																								
3																								
4																								
5																								
6																						24	21	
7															24	18	20	20	30	24		22		
8				23	18	21	21	26	26	40	22	26	26	26	22	22	16	20	20		28	26		
9			18				22	18	24	30	27	22	23	23	18	20	18	17	17	24				
10				20	21			20	24	17	33	27	30	24	24	44	22	23	24	21	27	23		
11					24	24	91	27	40	17	21	22	26	26	24	20	23	20	22			22		
12		20		21	20				38	30	22	22	26	35	20	23	17	22	17		20			
13	24			20	17			17	24	18	22	23	26	26	36	30	24	20	28					21
14	23				21	24			21	17	20	23	23	23	22	17	26	23	18	26	24	22		
15				18					23	28	35	35	43	40	39	32	17	40	24	26	24			
16				22				22	24	33	36	23	40	43	23	17	23	22	22	24	22			
17	27		18		21				20	20	18	20	24	44	17	21	27	27	32					
18								24	26	14	27	28	40	40	33	44	38	42			22		14	
19					27			22	45	22	39	33	17	44	33	43	23	20						
20									14	42	40	37	42	14	40	35	44	50						
21									28	14	42	41	39	42	38	14	32	32						14
22									49	32	43	40	39	41	39	44	44	24		14				
23						14			29	14	44	40	14	38	43	26	38	42			14			
24	14			14			14		46	34	36	14		23	17	43	28	21	15	18	15	15		
25		16			24		15	15	24	18	40	38	36	22	45	15	16	23	15	15	15	15	16	16
26		16	18	15	16	15	15	16	23	45	42	42	24	23	17	16	21	15	15	23	15	15	16	15
27			15	15	15		15	15	49	17	46	20	21	22	18	17	43	45		15	15		16	15
28	15	16	15	15	15	15	15	15	15	16	45	23	42	17	36	16	42	15	15	44	15			15
29	15	16	16		15	16		16	36	16	16	16	17	21	17	16	15	15	15	15	15	15		15
30			15	16		16	15	15	17	16	15	27	23	43	17	35	15	17	15	16	16	16		
31	15					16	16	16	16	16	45	24	26	26	26	43	16	16	15	15	15	15	16	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				11	13		10	15	24	24	24	24	23	24	25	25	25	25	18	15	16	12		
MED				18	20		15	17	24	18	36	25	26	26	24	22	23	22	18	21	16	19		
U Q				21	22		21	22	37	31	42	36	39	40	37	39	35	29	24	24	23	22		
L Q				15	15		15	15	22	16	22	22	23	23	18	17	17	18	15	15	15	15		

COMMUNICATIONS RESEARCH LABORATORY, JAPAN

HOURLY VALUES OF FOF2 AT OKINAWA

DEC. 1993

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		28	31	31	29	30	28	36	63	76	86	87	78	85	76	94	75	71	53	35	33	60	62	31
2	62	48	42	37		34	35	A	72	104		90	91	90	114	90	90	82	78	54	52	53	A	A
3	38	A	A	A	36	26	26	43	82	71	91	121		110	92	80	93	90	78	A	A	66	28	32
4	28		A	A	A			43	88	96	90	88	105			115	94	93	88	34	41	37	47	40
5	40	42	34	A	A	36	35	41	73	85	77	84	109	110			120	110	91	A	77	59	54	36
6	35	36	44	A	44	28	26	42	81	86	82	88	91	91	112	86	81	71	62	42	53	41	41	31
7			31	32		30	30	42	66	90	94	87	91	109	93	117	94	90	83	63	38	58	54	31
8		30	36	41	37		26		76	81	80	77	90	111	92	90	94	90	100	64	61	60		32
9	31	N	34	35	34	36	53	77	88	111		117	92	121		91	97	91	90	49	43	44	38	N
10			32	32	31		28	38	65	77	78	72	92	86	91	78		97	91	82	62	53	40	A
11		B		34	34	29	N	38	66	77	85	82	91	110	120	130	143	125	91	74	58	58	63	41
12	53	53	61	58	54			32	66	94	76	91	93	90	90	90	91	76	54	A	54	42	34	A
13	A	A	A	35	44			36	76	78	80	77	82	70	81	76	78	76	61	43	44	42	42	
14	34	37	41	42	42			28	66	90	84	88	91	90	83	76	72	69	60	37	35	40	34	35
15	35	34	36	40	31	34	N	34	66	90	92	91	81	82	87	91	82	65	51	41	46	35	31	34
16	28	30	46	35				35	66	78	77	72	75	92	82	74	77	73	48	54	51	32	28	35
17	37	35	38	47	32			32	65	N	81	67	89	106	111	84	91	90	72	54	54	35	40	
18				30	35			32	62	75	76	75	90	93	76	90	72	68	56	48	46	42	38	
19	28	A	A	32	38	N	N	42	55	62	78	94	92	91	90	87	70	78	73	54	53	42	32	
20			30		29	30		34	58	72	81	76	78	91	94	92	90				35	34	26	N
21		28	N	31	35		26	32	64	66	77	74	71	112	86	76	94	108	76	41	53	26	29	A
22	31	C	A	A	36	36		42	63	85	112	75	85	91	108	100	100	87	74	54	52	60	43	32
23								41	64	87	101	75	100	118	88	A	87	88	34	20	53	55	35	31
24	32	31	22	A	29	31	86	26	62	85	106	96	104	100	94	103	114	120	86	53	47	52	34	28
25		30	28	24	32	30	23	45	64	75	80	96	90	111		103	112	116	85	64	51	54	32	35
26	N																							
27												84	97	95	127	111	94	90	78	68	73	60	37	30
28		37	42	40	35	A	A	30	74	84	98	106	111	106	94	88	94	109	86	66	76	37	34	A
29	A	29	35	32	40		26	34	77	77	78	90	112	126	121	130	137	130	87	66	81	66	42	
30		29	22	28	A	A	A	37													78	61	54	35
31	34	34	42	31	30	A		31	78	104	88	96	98	85	81	84	82	82	66	63	80	42	49	A
	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
CNT	15	17	20	21	22	13	13	27	28	27	26	29	28	28	25	27	28	28	28	25	29	30	28	17
MED	34	34	36	34	35	30	28	36	66	84	82	87	91	94	92	90	92	90	77	54	53	48	38	32
U Q	38	37	42	40	38	35	35	42	76	90	91	92	97	110	109	103	95	102	86	64	61	59	45	35
L Q	31	29	31	31	31	29	26	32	64	76	78	75	87	90	84	84	81	76	60	41	45	40	33	31

COMMUNICATIONS RESEARCH LABORATORY, JAPAN

HOURLY VALUES OF FES AT OKINAWA

DEC. 1993

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		G	G	G	G	G	G	G	G	G	G	G	G	41	41	50	48	36	G	G	G	G	G	G
2	G	G	23	G		G	G	37	G	59	G	G	G	G	G	G	G	40	70	40	39	G	39	44
3	31	38	32	39	G	G	G	G	G	G	G	G	41	G	G	46	36	39	60	67	41	33	G	65
4	G	G	80	45	36			G	G	G	46	76	51	60	82	58	43	46	47	40	25	34	G	33
5	G	23	29	58	39	27	G	G	32	38	46	48	57	48	58	42	G	G	40	78	48	33	G	G
6	G	G	30	37	32	G	G	G	G	40	44	50	G	G	40	40	G	38	G	G	G	G	G	G
7			G	G		G	G	G	31	36	42	84	G	53	42	61	66	35	28	28	G	G	G	G
8		G	G	G	G		G	G	G	G	45	G	G	47	43	64	44	33	72	G	G	G		G
9	G	G	G	G	G	G	G	G	31	G	45	54	53	46	40	68	57	38	40	G	G	G	G	G
10			G	G	G		G	G	G	G	G	43	62	66	86	86	86	40	G	11	G	G	G	28
11	G	B	G	G	G	G	G	G	G	G	42	44	48	G	G	40	G	G	31	40	G	G	G	G
12	G	28	G	G	G			G	G	G	G	45	G	G	G	40	38	40	35	38	26	G	27	32
13	57	38	33	G	G	G	G	23	33	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G
14	G	G	G	G	G	G		G	G	G	G	G	51	51	45	40	38	34	34	33	G	G	G	G
15	G	G	G	G	G	G	G	G	G	G	G	43	G	G	G	G	G	32	24	G	G	G	G	G
16	G	G	G	G	G			G	G	G	G	G	G	G	G	44	G	40	33	24	G	G	G	G
17	32	G	G	G	G			G	32	35	38	40	G	G	G	38	44	29	30	G	G	G	G	
18			G	G	G			G	34	37	41	G	G	41	G	G	G	32	40	32	G	G	G	
19	G	28	32	G	G	G	G	G	G	G	48	45	G	G	G	G	G	G	G	G	G	25	G	
20			G		G	G		G	G	G	G	G	G	G	G	G	39				G	G	G	G
21		G	24	G	G	G	G	G	G	G	G	42	44	84	G	G	36	34	G	G	25	G	G	66
22	28	C	41	37	26	G	86	G	G	41	55	62	150	50	48	44	50	56	34	34	G	G	G	G
23								G	G	35	65	43	48	66	56	38	61	83	81	30	G	G	G	G
24	G	G	23	28	24	58	G	23	37	49	46	81	51	59	G	G	69	G	G	G	G	G	G	G
25		G	58	G	G	G	G	G	G	G	G	G	44	44		80	41	G	G	26	G	21	G	G
26	G																							
27												62	40	50	66	44	37	33	44	30	G	24	G	G
28	G	G	G	G	39	40	34	34	G	44	G	46	47	58	62	79	38	31	G	G	G	23	66	48
29	68	24	G	G	G		G	G	29	35	G	49	56	45	43	41	36	33	44	32	34	29	32	
30		G	G	26	32	32	28	G													24	28	28	25
31	G	G	G	G	G	24		24	36	40	66	70	147	67	148	51	60	46	G	G	30	30	25	39
	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
CNT	20	22	28	27	26	20	20	29	28	28	28	29	29	29	28	29	29	28	28	28	30	30	29	26
MED	G	G	G	G	G	G	G	G	G	G	20	43	41	45	40	41	38	34	32	25	G	G	G	G
U Q	14	23	29	26	24	12	G	G	31	37	45	52	51	55	52	54	49	40	42	33	25	24	G	32
L Q	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	30	G	G	G	G	G	G

HOURLY VALUES OF FMIN AT OKINAWA

DEC. 1993

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
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2	18	18	15	16		17	15	15	24	16	22	35	54	48	35	30	18	17	16	17	16	23	17	17
3	16	17	16	16	18	20	17	16	23	16	21	23	27	24	24	18	16	15	14	15	17	18	20	24
4	20		17	16	16			17	24	29	29	26	26	26	23	22	22	15	17	15	18	17	18	16
5	20	17	16	15	15	16	15	15	16	16	18	21	26	26	27	23	20	22	17	17	16	16	18	18
6	20	17	16	15	15	15	17	16	15	16	28	27	28	29	24	21	18	21	16	18	21	22	24	21
7			15	15		16	16	16	16	17	26	26	27	27	28	24	22	18	18	20	16	18	17	17
8		16	17	16	16		15	15	14	16	21	24	24	22	27	21	21	17	17	18	16	16		18
9	18		18	16	16	21	15	15	18	28	29	33	24	26	24	22	20	24	18	18	18	18	24	20
10			20	17	17		15	14	26	21	24	27	27	26	24	23	22	17	26	17	24	16	16	20
11		B		28	17	18	16	15	23	30	28	29	28	48	53	26	29	24	14	18	18	20	17	18
12	17	17	17	16	15			18	26	20	22	27	30	32	48	24	23	23	14	18	18	23	16	18
13	21	17	17	17	16		17	15	26	29	34	38	35	43	34	32	29	23	15	24	16	15	17	16
14	27	16	24	16	15	15		23	27	27	38	26	27	29	26	22	14	15	15	14	26	22	21	23
15	20	20	17	17	16	16	16	15	18	16	33	32	45	27	27	32	28	17	16	16	14	15	16	15
16	16	17	15	15	15			15	26	18	33	47	48	36	36	23	18	15	14	17	15	15	16	15
17	16	16	15	16	15			16	15	16	17	24	27	24	21	15	17	16	14	15	22	16	16	
18				15	17			15	17	18	29	33	48	33	47	30	29	16	17	15	15	16	15	
19	16	15	14	15	16	14	16	14	26	20	21	28	50	38	23	30	20	23	15	16	15	15	15	
20			15		16	15		15	24	18	21	29	30	33	42	47	15				15	15	15	16
21		15	15	14	14	15	15	15	15	14	14	14	15	16	14	16	17	14	14	14	15	14	15	14
22	15	C	14	14	14	14	15	14	14	14	14	14	14	15	15	16	14	14	14	14	15	14	15	15
23								15	15	15	15	15	16	17	14	14	16	16	14	14	15	15	15	15
24	15	14	14	14	14	14	15	14	15	17	16	16	15	21	15	14	14	15	15	14	15	15	14	15
25		15	14	15	15	14	14	14	15	14		15	14	24		14	14	14	14	14	14	15	14	14
26	15																							
27												15	18	17	17	16	14	14	14	14	15	14	15	15
28	15	14	15	14	14	14	14	14	14	15	15	16	38	21	18	16	16	15	15	15	14	15	15	14
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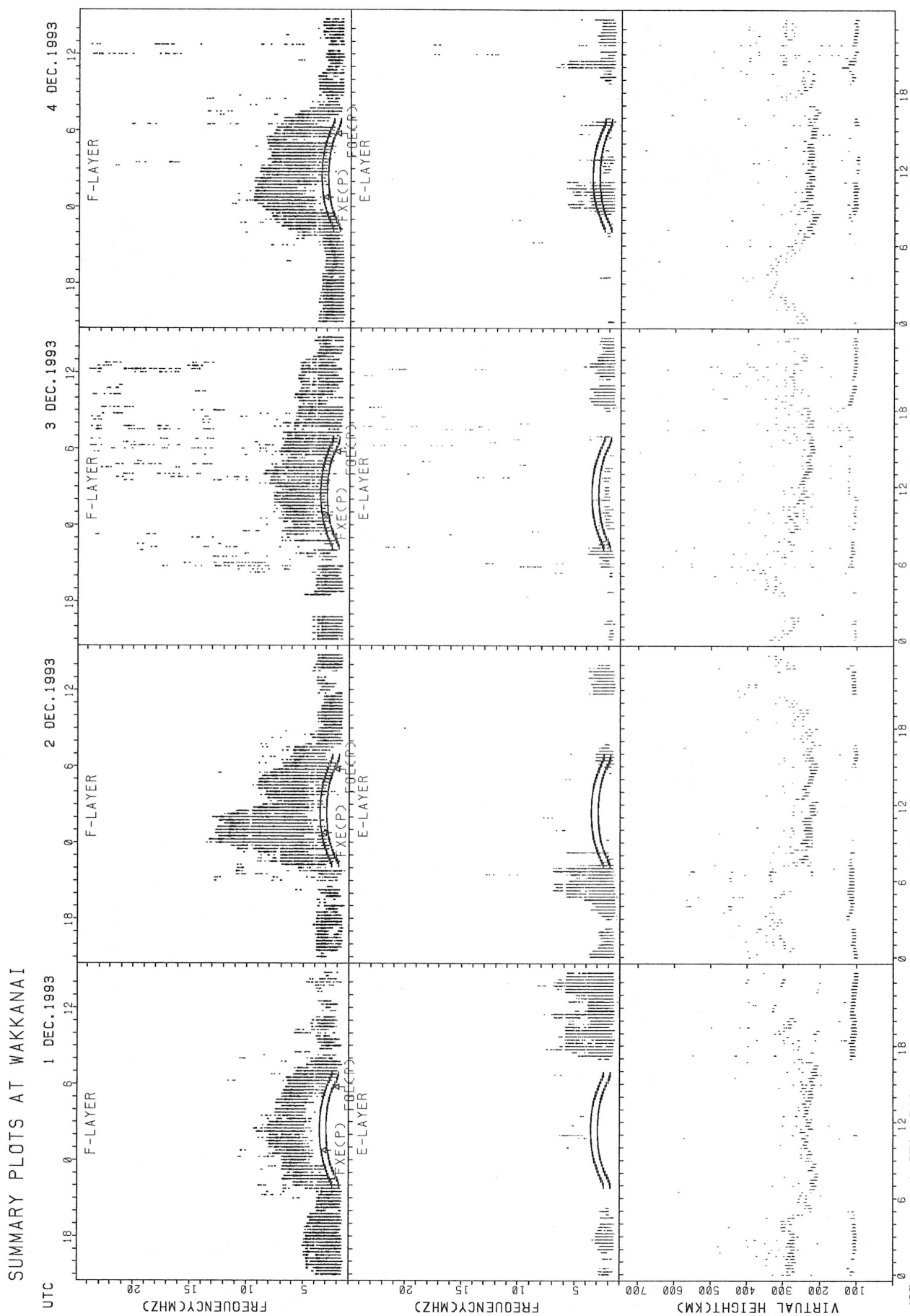
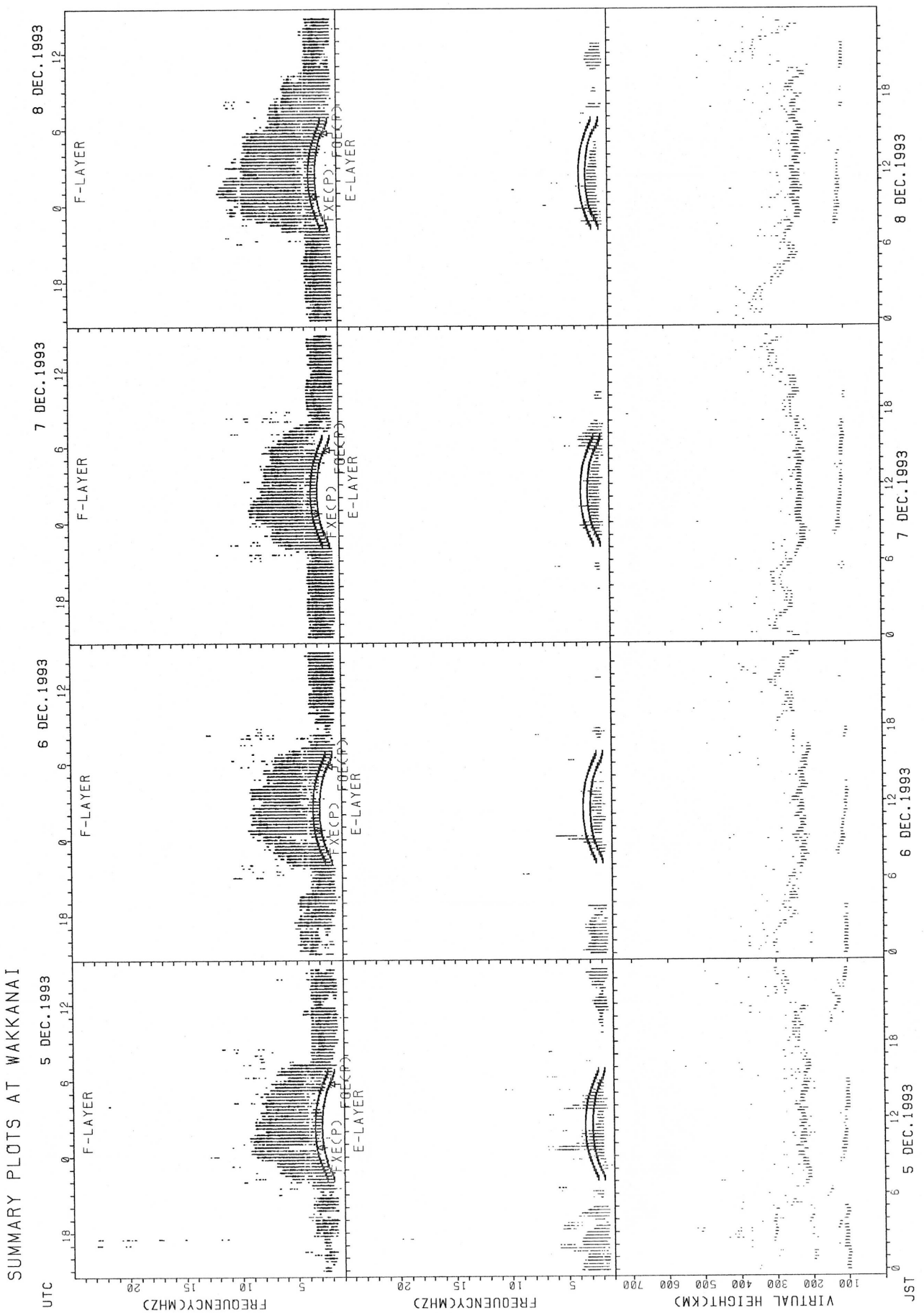
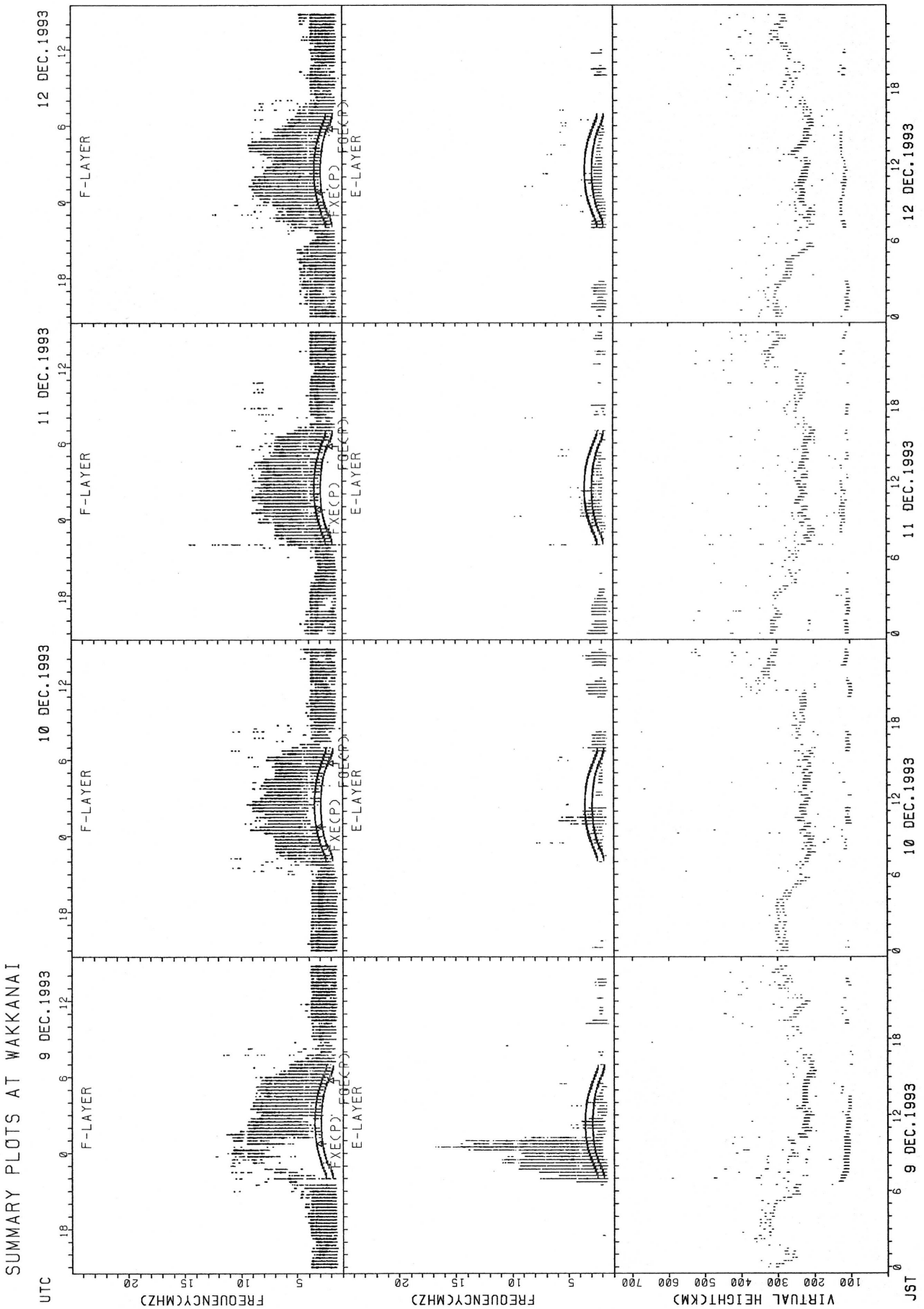
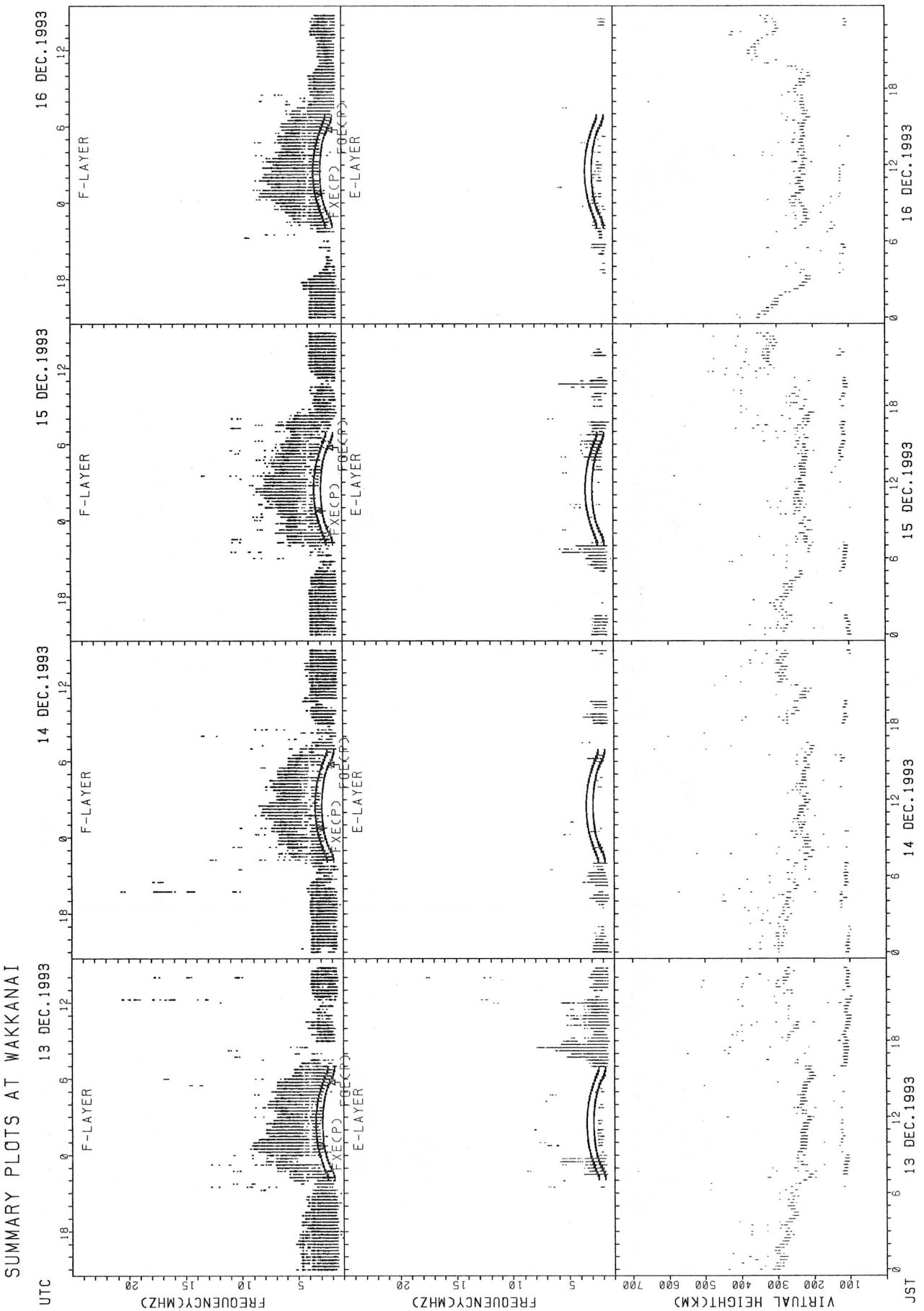
CNT	19	20	26	27	26	19	20	29	28	28	27	29	29	29	28	29	29	28	28	28	30	30	29	26
MED	16	16	15	15	15	15	15	15	16	16	22	26	27	26	24	22	18	16	15	16	16	16	16	16
U 0	20	17	17	16	16	16	16	16	24	20	29	30	36	33	34	28	22	19	16	17	18	18	17	18
L 0	15	15	14	15	15	14	15	15	15	15	16	16	19	21	17	16	15	15	14	14	15	15	15	15

COMMUNICATIONS RESEARCH LABORATORY, JAPAN

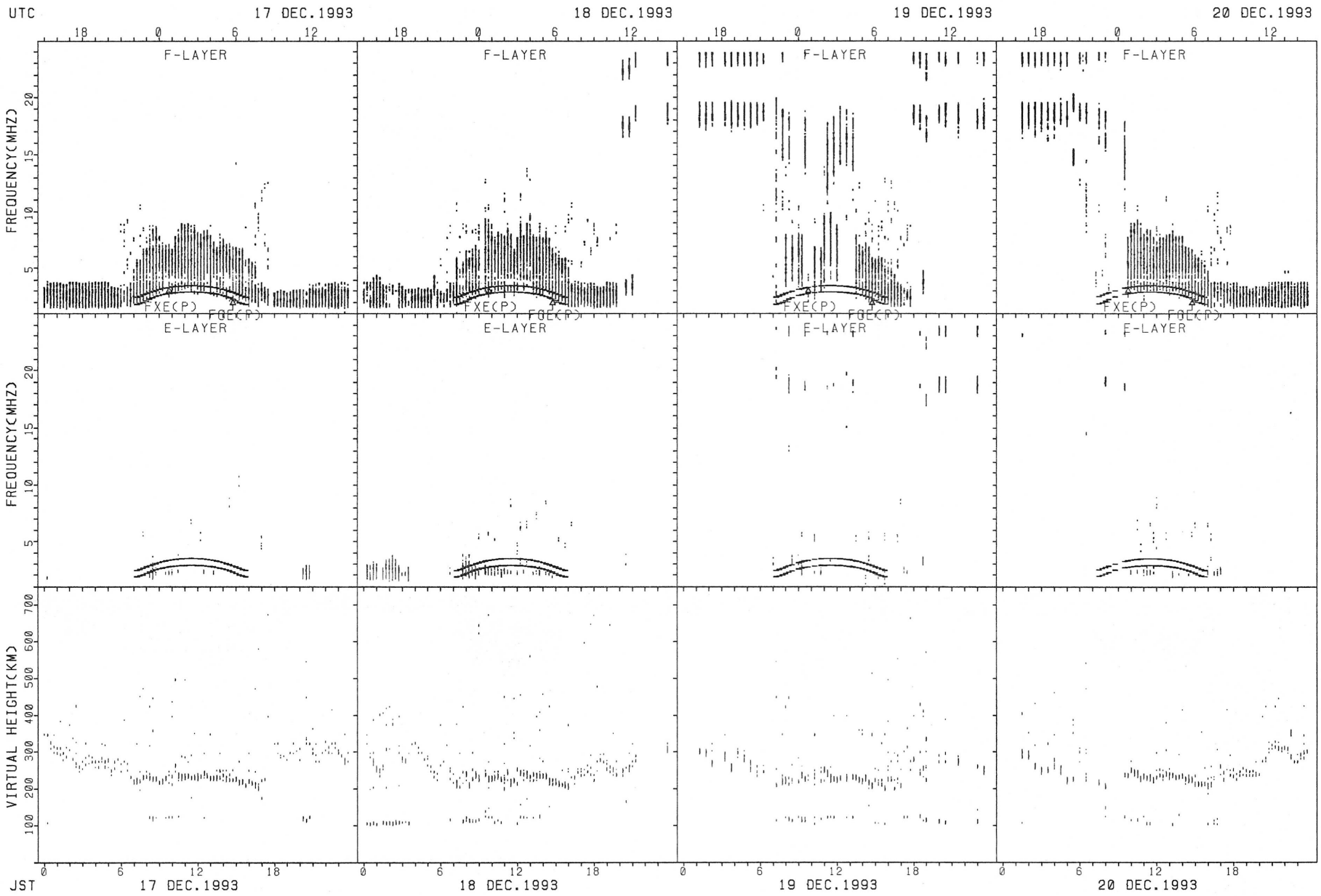

SUMMARY PLOTS AT WAKKANAI
UTC
1 DEC.1993
2 DEC.1993
3 DEC.1993
4 DEC.1993
F-LAYER
E-LAYER
FXE(P)
FOE(P)
FREQUENCY(MHZ)
VIRTUAL HEIGHT(KM)
JST
FXE(P): PREDICTED VALUE FOR FXE
FOE(P): PREDICTED VALUE FOR FOE


SUMMARY PLOTS AT WAKKANAI
UTC
5 DEC.1993
6 DEC.1993
7 DEC.1993
8 DEC.1993
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

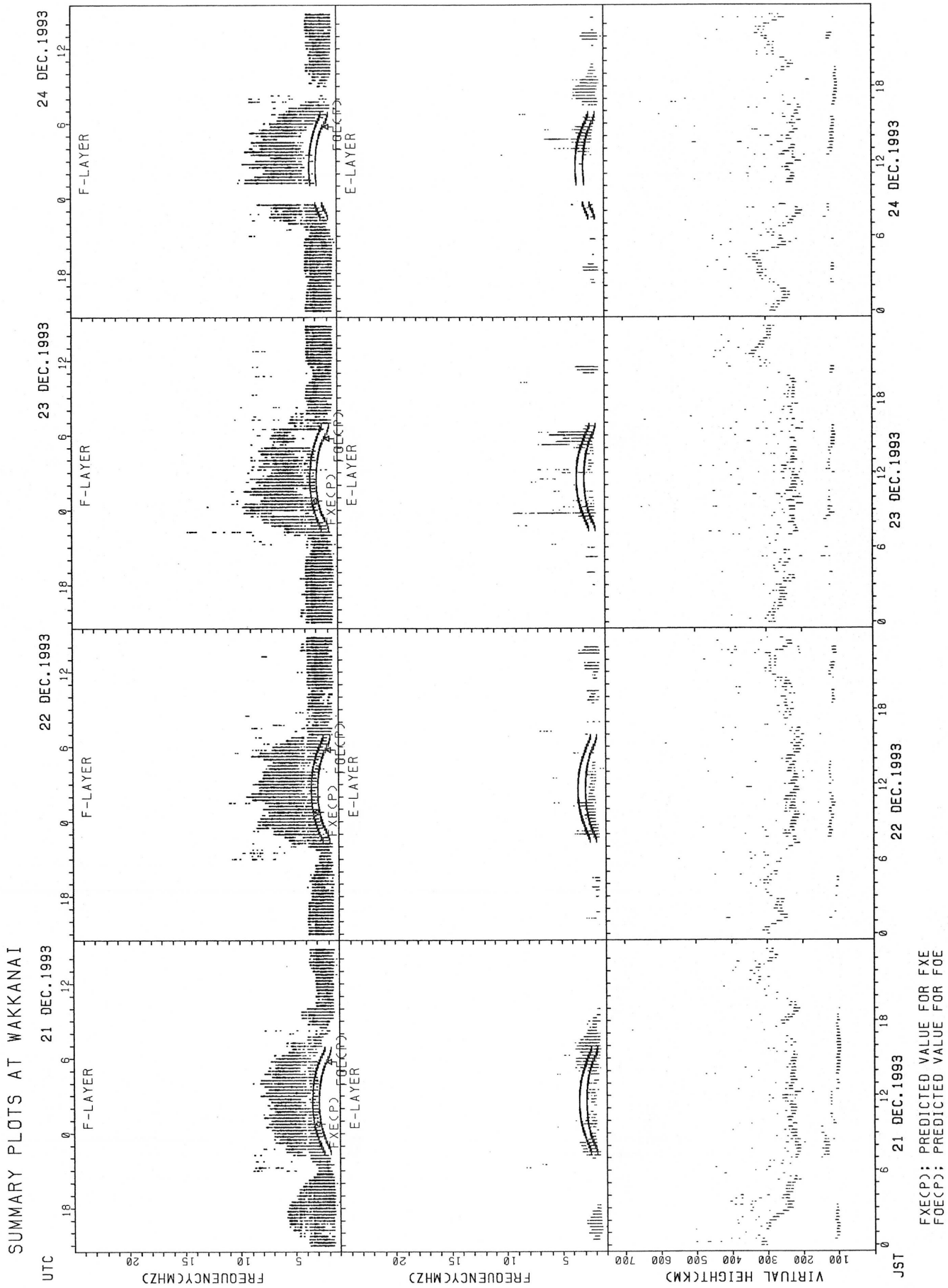

SUMMARY PLOTS AT WAKKANAI
UTC
9 DEC.1993
10 DEC.1993
11 DEC.1993
12 DEC.1993
F-LAYER
E-LAYER
FXE(P)
FOE(P)
FREQUENCY(MHZ)
VIRTUAL HEIGHT(KM)
JST
FXE(P); PREDICTED VALUE FOR FXE
FOE(P); PREDICTED VALUE FOR FOE


SUMMARY PLOTS AT WAKKANAI
UTC
13 DEC.1993
14 DEC.1993
15 DEC.1993
16 DEC.1993
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

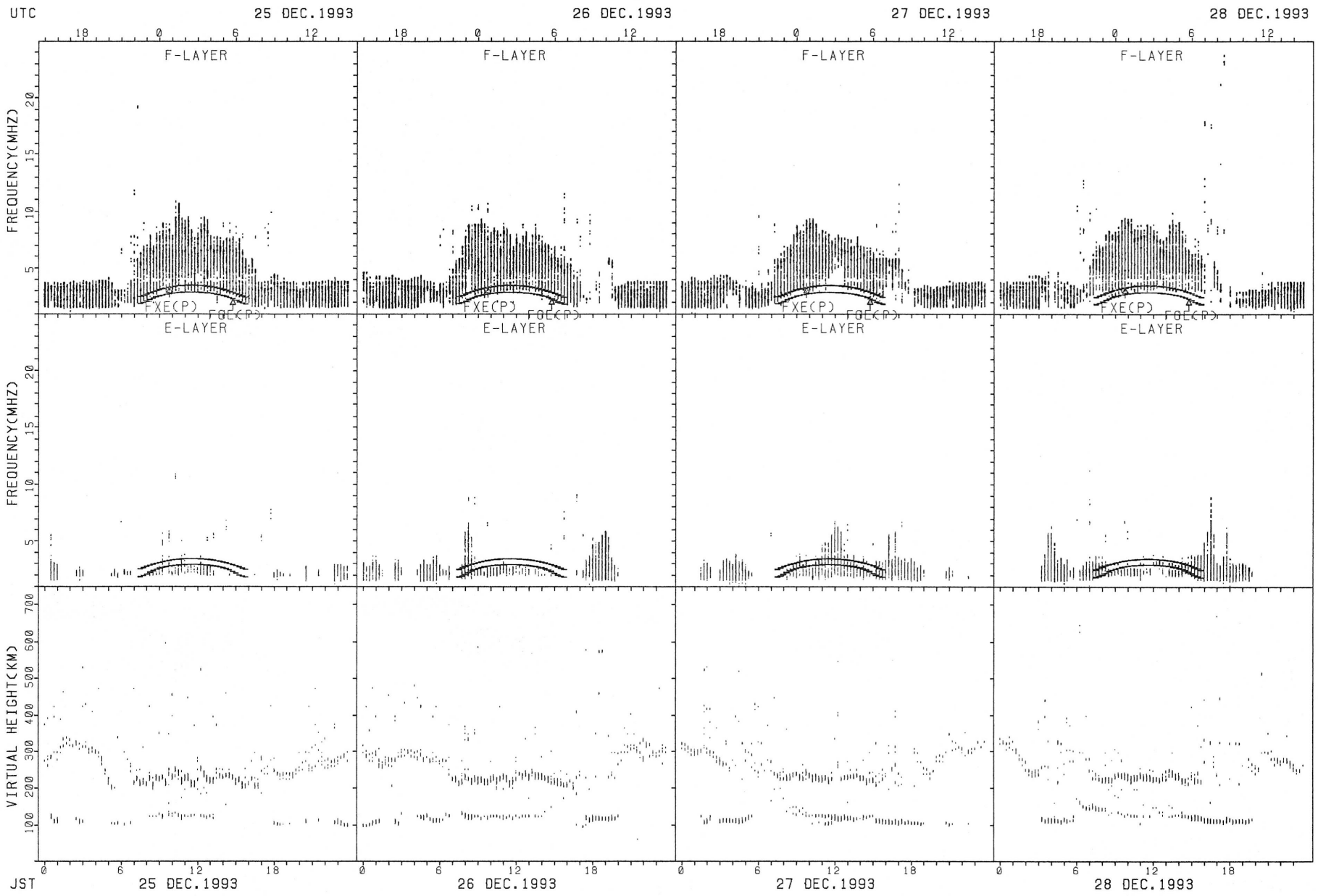
SUMMARY PLOTS AT WAKKANAI



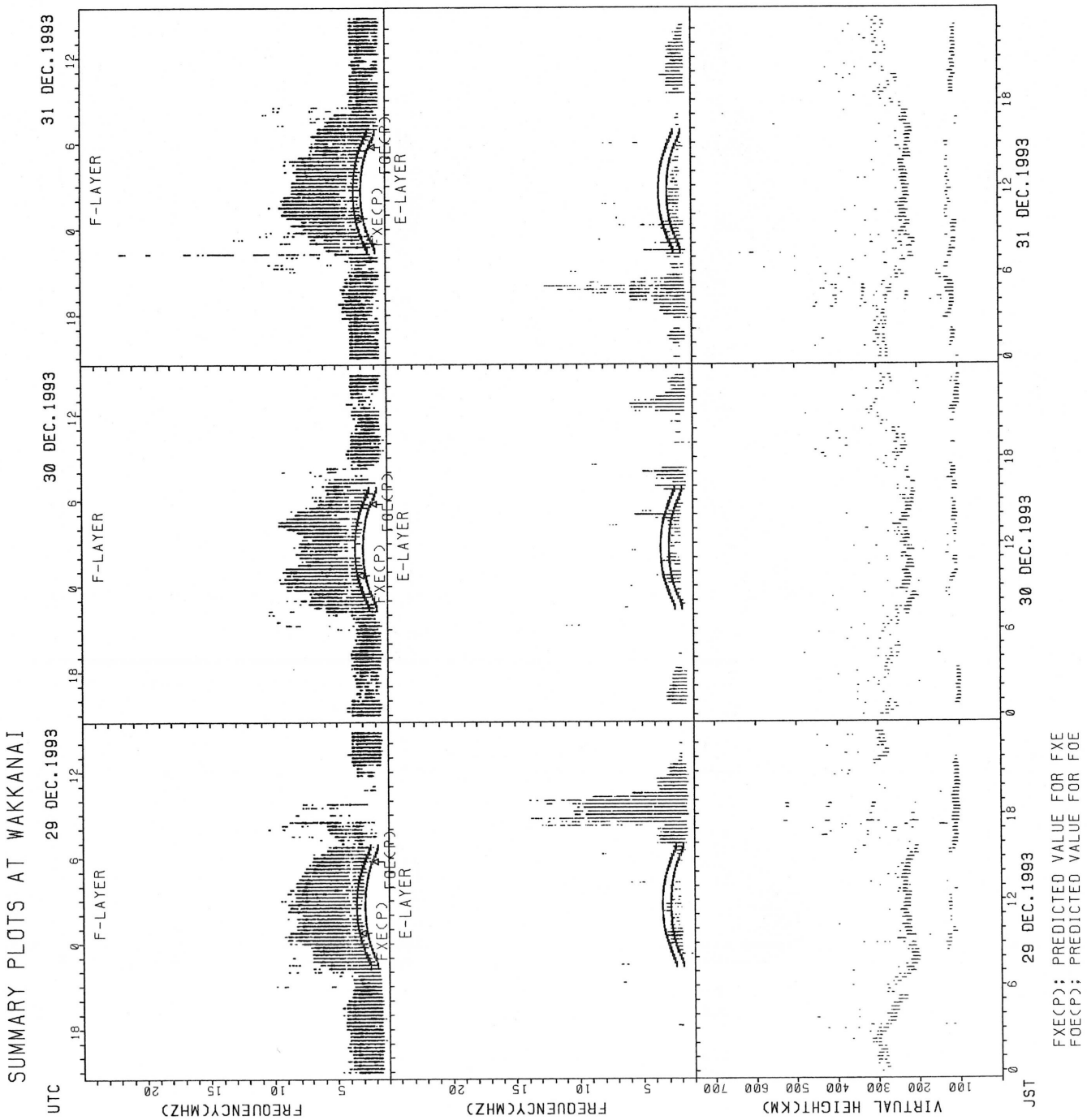
FXE(P): PREDICTED VALUE FOR FXE
FOE(P): PREDICTED VALUE FOR FOE

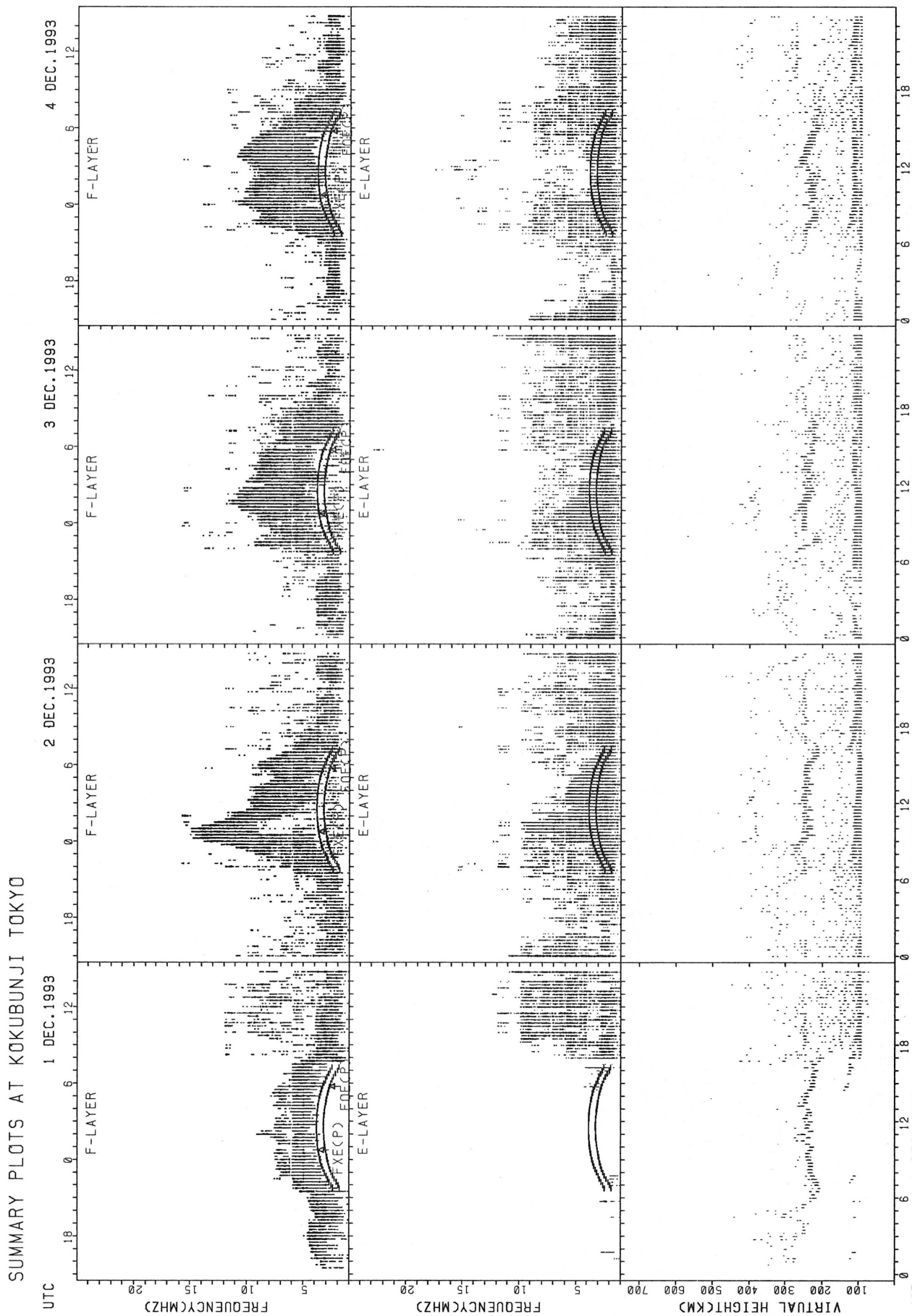

SUMMARY PLOTS AT WAKKANAI
UTC
21 DEC.1993
22 DEC.1993
23 DEC.1993
24 DEC.1993
F-LAYER
E-LAYER
FXE(P)
FOE(P)
FREQUENCY(MHZ)
VIRTUAL HEIGHT(KM)
JST
FXE(P): PREDICTED VALUE FOR FXE
FOE(P): PREDICTED VALUE FOR FOE

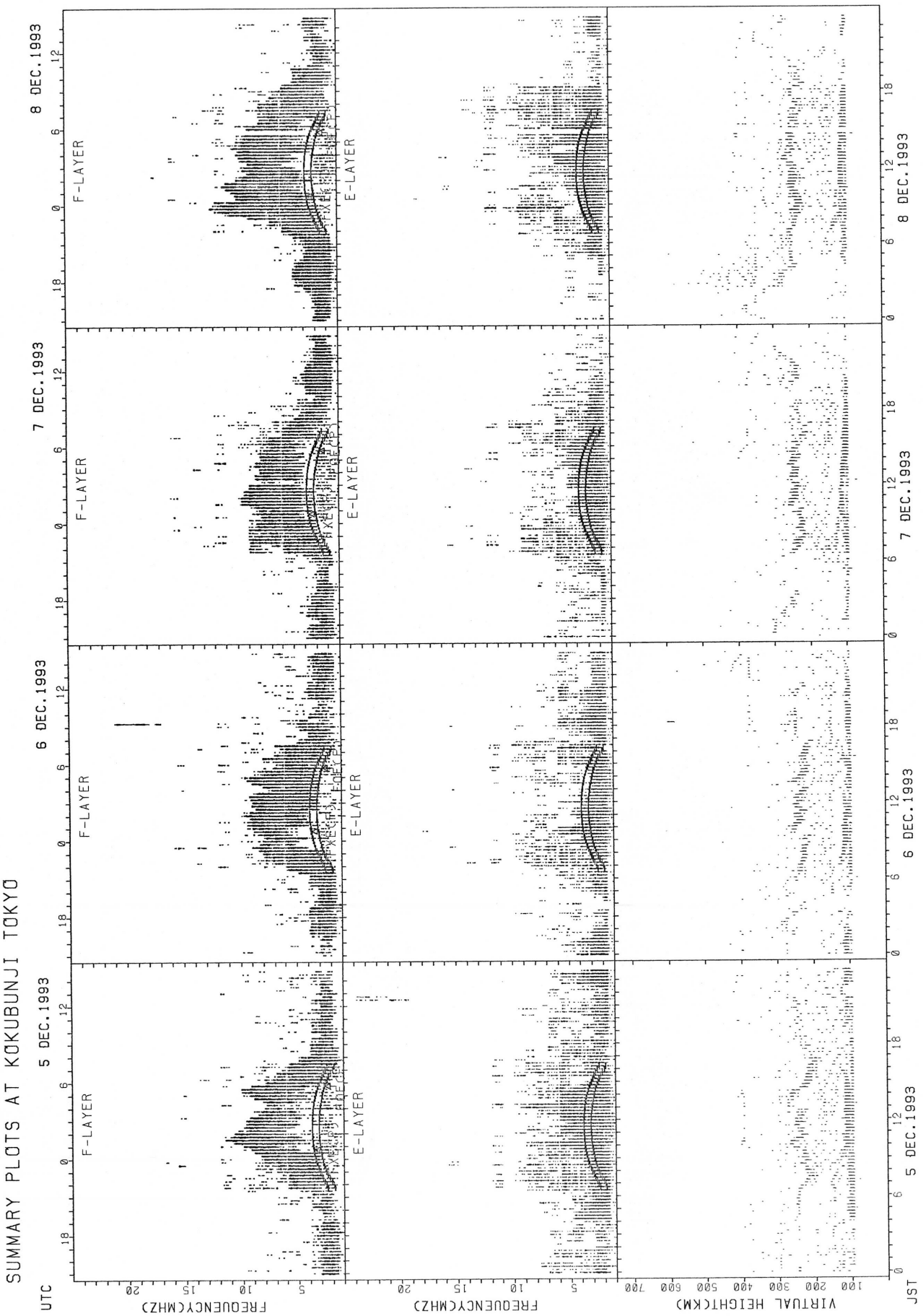
SUMMARY PLOTS AT WAKKANAI



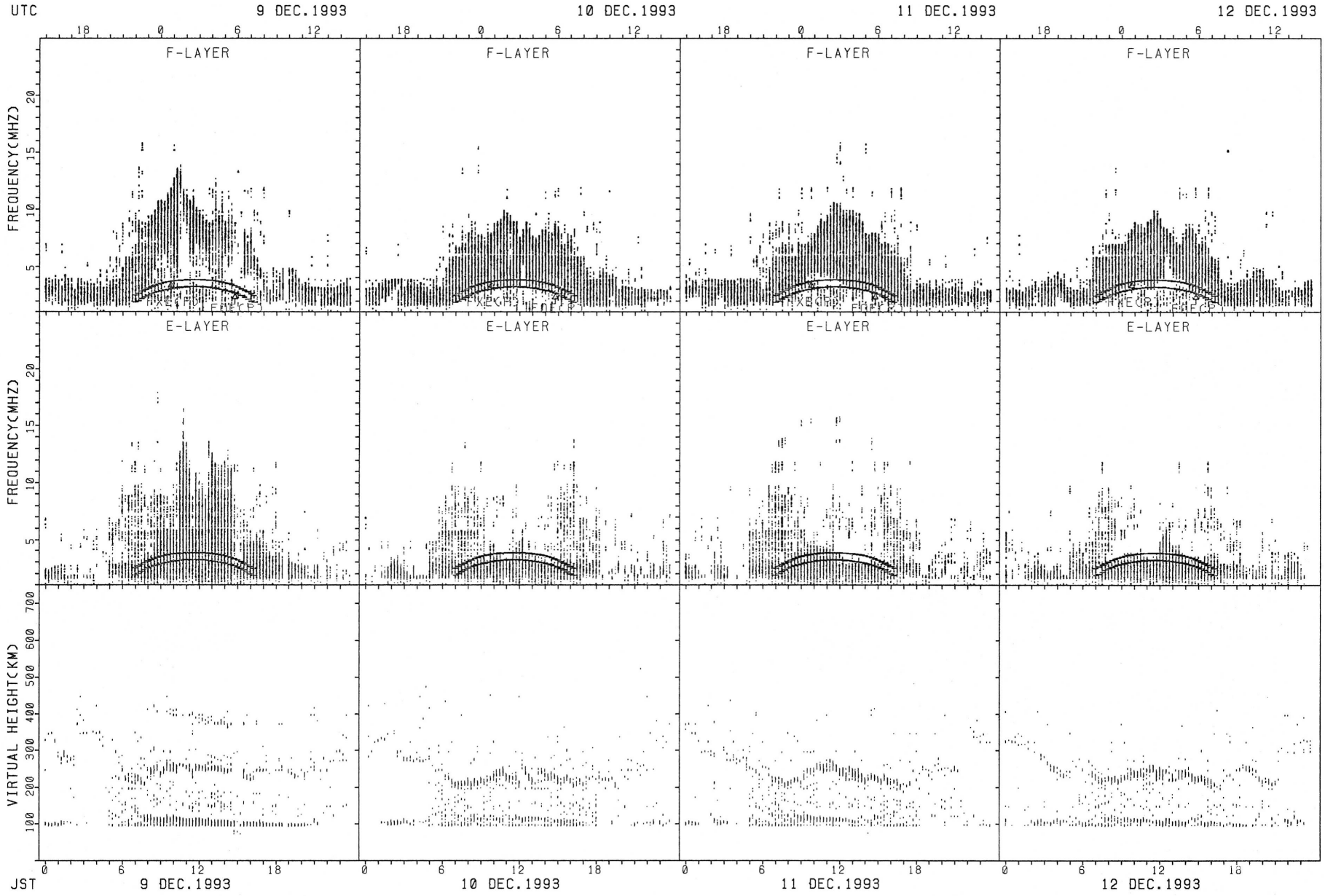
FXE(P): PREDICTED VALUE FOR FXE
FOE(P): PREDICTED VALUE FOR FOE


SUMMARY PLOTS AT WAKKANAI
UTC
29 DEC.1993
30 DEC.1993
31 DEC.1993
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

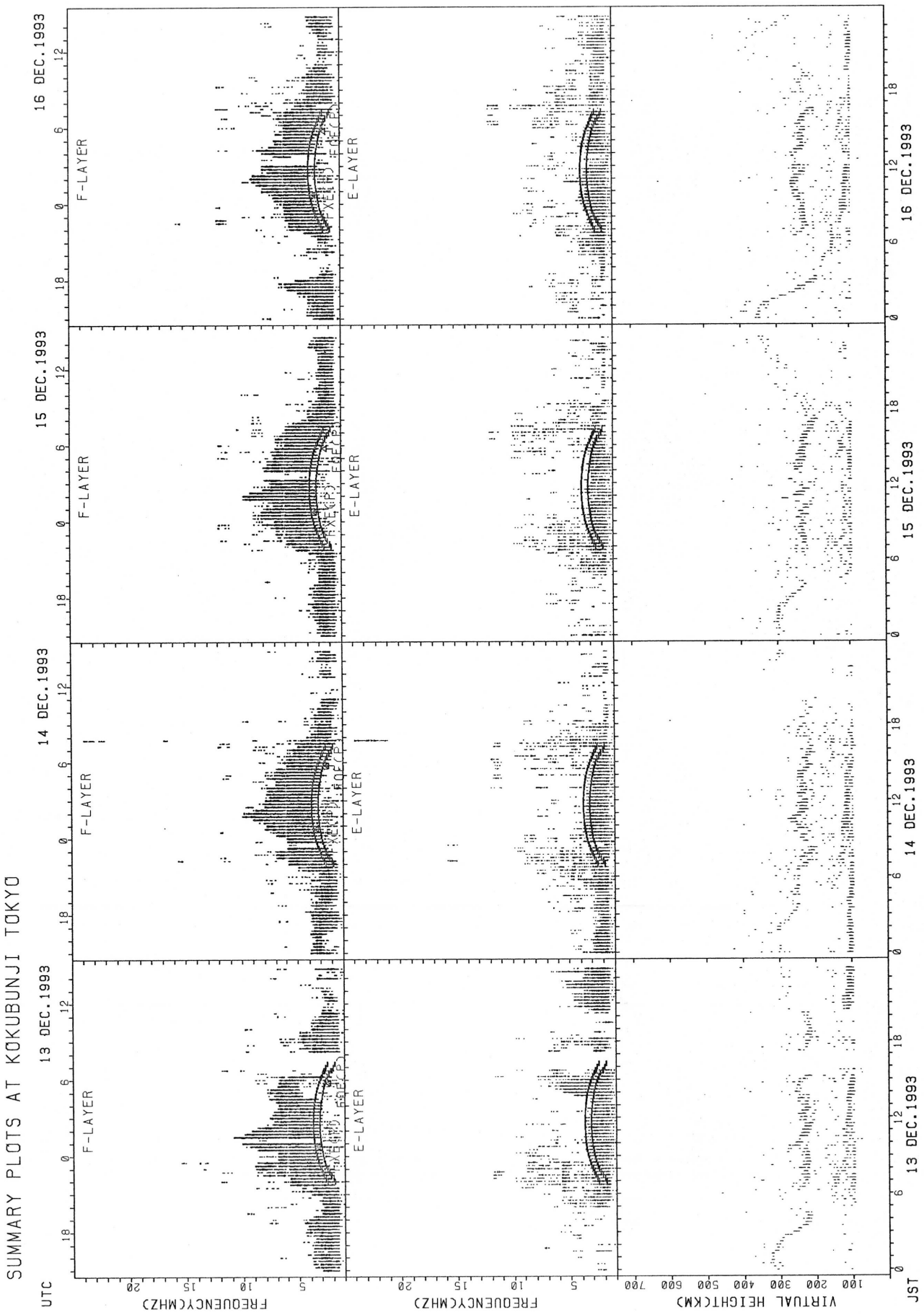

SUMMARY PLOTS AT KOKUBUNJI TOKYO
UTC
1 DEC.1993
2 DEC.1993
3 DEC.1993
4 DEC.1993
F-LAYER
E-LAYER
FXE(P)
FOE(P)
FREQUENCY(MHZ)
VIRTUAL HEIGHT(KM)
JST
FXE(P): PREDICTED VALUE FOR FXE
FOE(P): PREDICTED VALUE FOR FOE


SUMMARY PLOTS AT KOKUBUNJI TOKYO
UTC
5 DEC.1993
6 DEC.1993
7 DEC.1993
8 DEC.1993
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

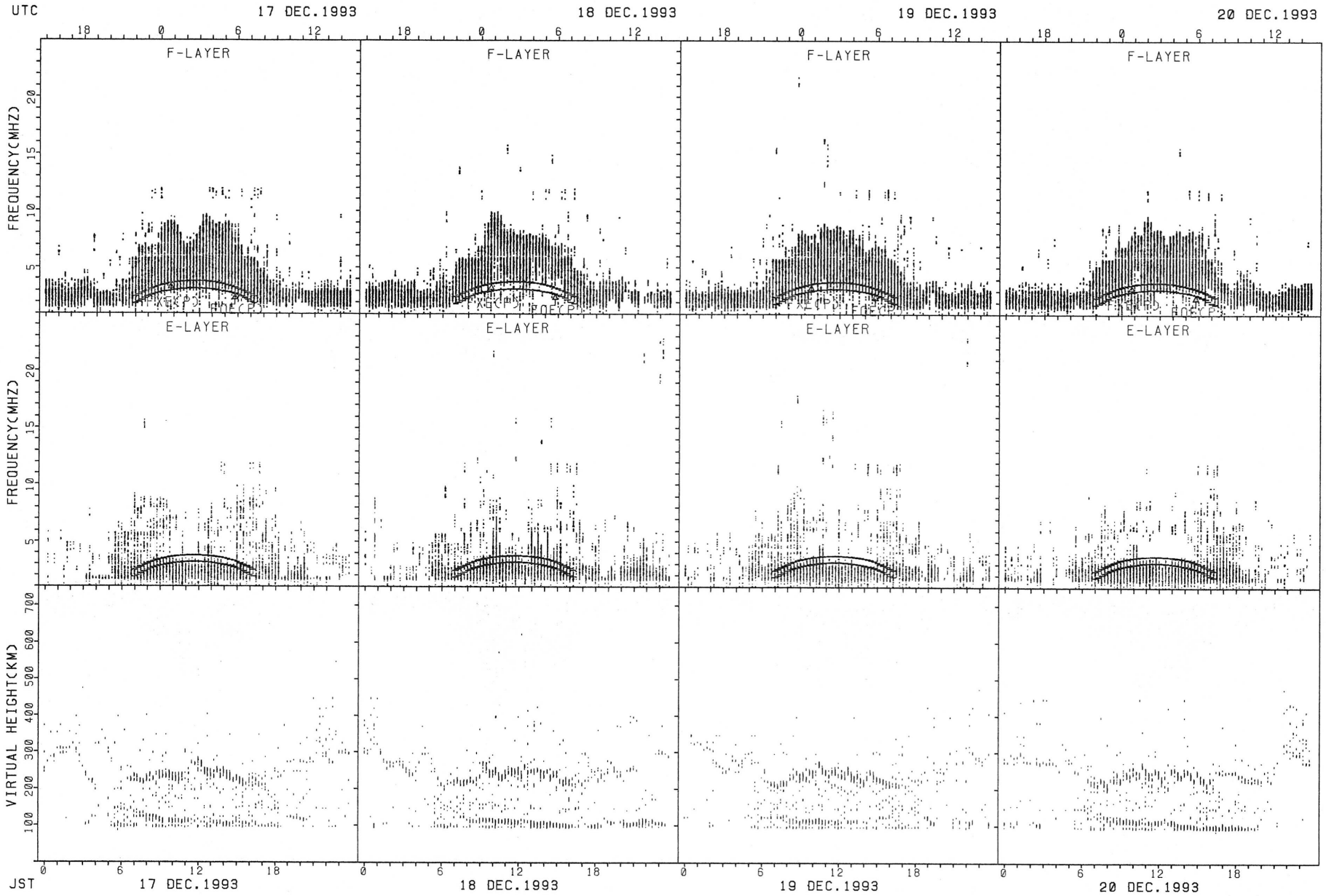
SUMMARY PLOTS AT KOKUBUNJI TOKYO

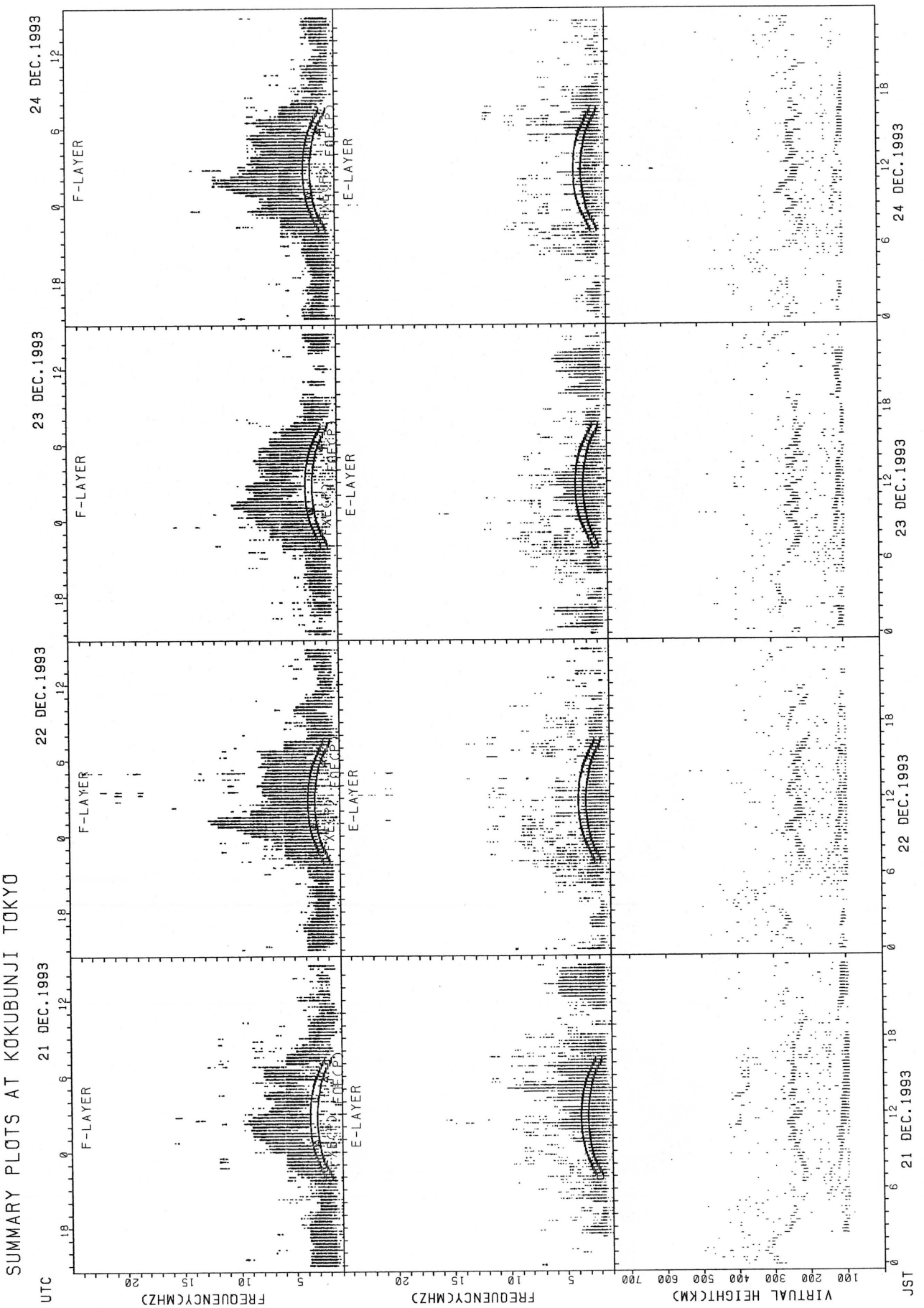


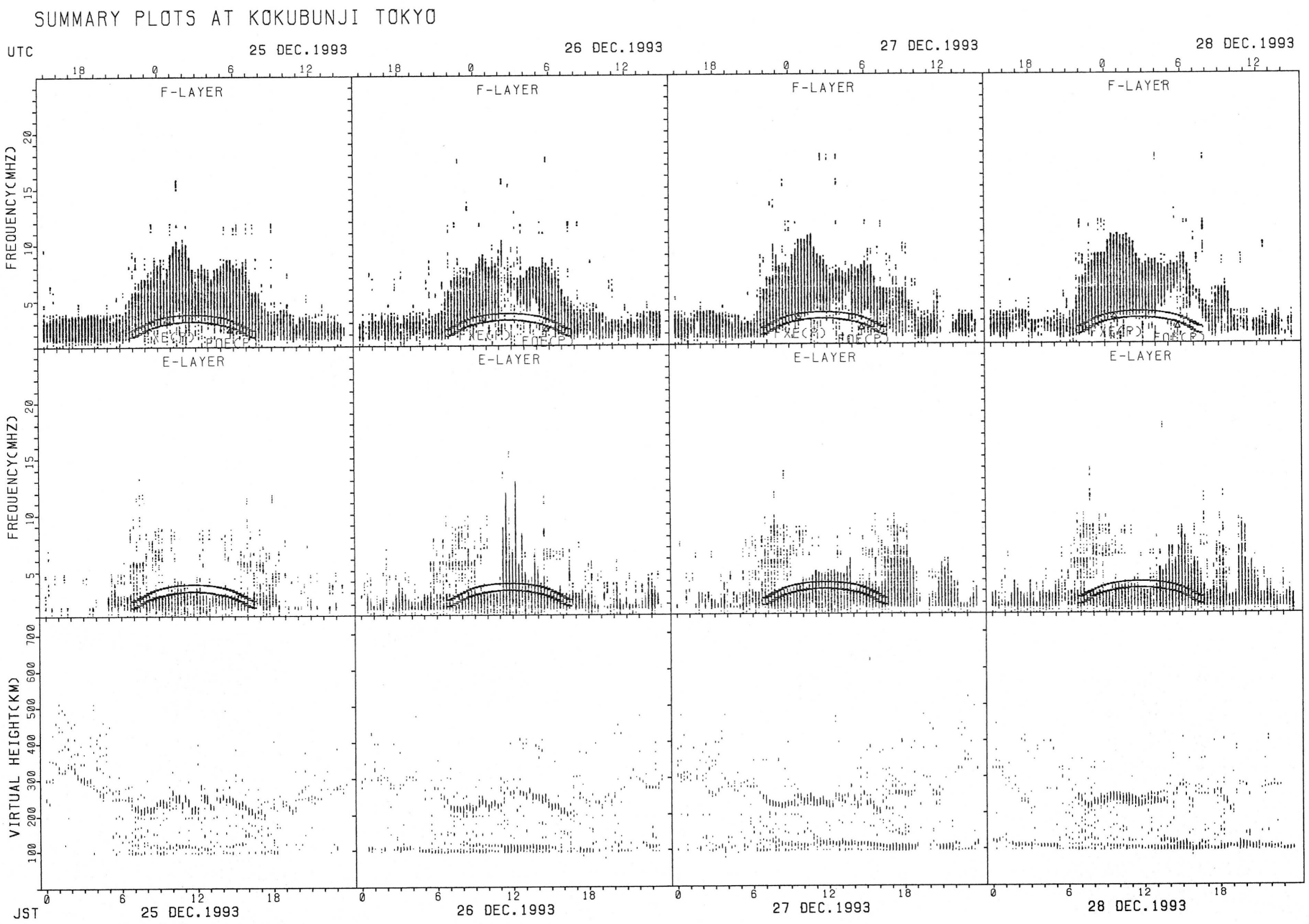
FXE(P); PREDICTED VALUE FOR FXE
FOE(P); PREDICTED VALUE FOR FOE


SUMMARY PLOTS AT KOKUBUNJI TOKYO
UTC
13 DEC.1993
14 DEC.1993
15 DEC.1993
16 DEC.1993
F-LAYER
E-LAYER
FREQUENCY(MHZ)
VIRTUAL HEIGHT(KM)
JST
FXE(P): PREDICTED VALUE FOR FXE
FOE(P): PREDICTED VALUE FOR FOE

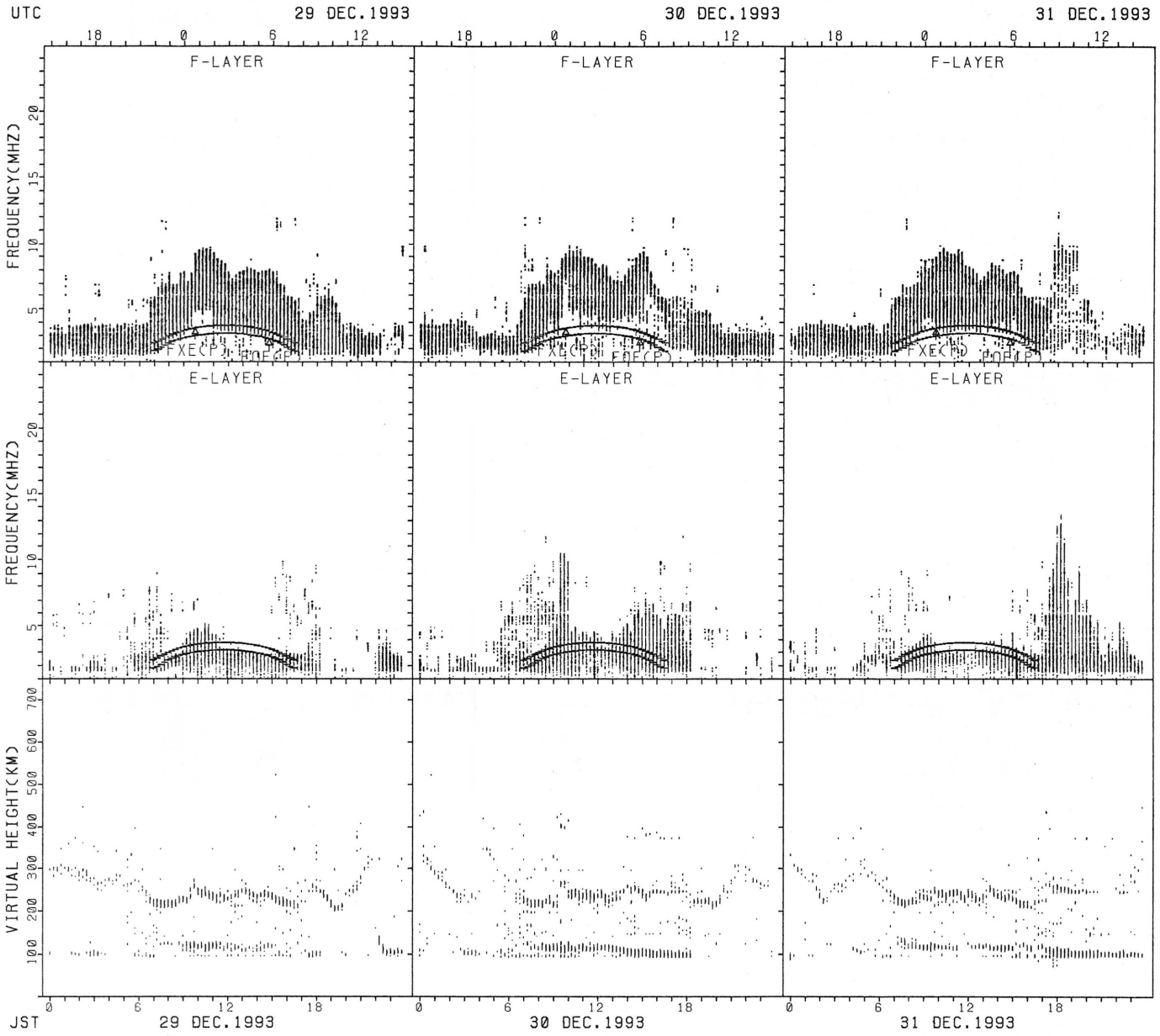
SUMMARY PLOTS AT KOKUBUNJI TOKYO




SUMMARY PLOTS AT KOKUBUNJI TOKYO
UTC
21 DEC.1993
22 DEC.1993
23 DEC.1993
24 DEC.1993
F-LAYER
E-LAYER
FREQUENCY(MHZ)
VIRTUAL HEIGHT(KM)
FXE(P); PREDICTED VALUE FOR FXE
FOE(P); PREDICTED VALUE FOR FOE
JST

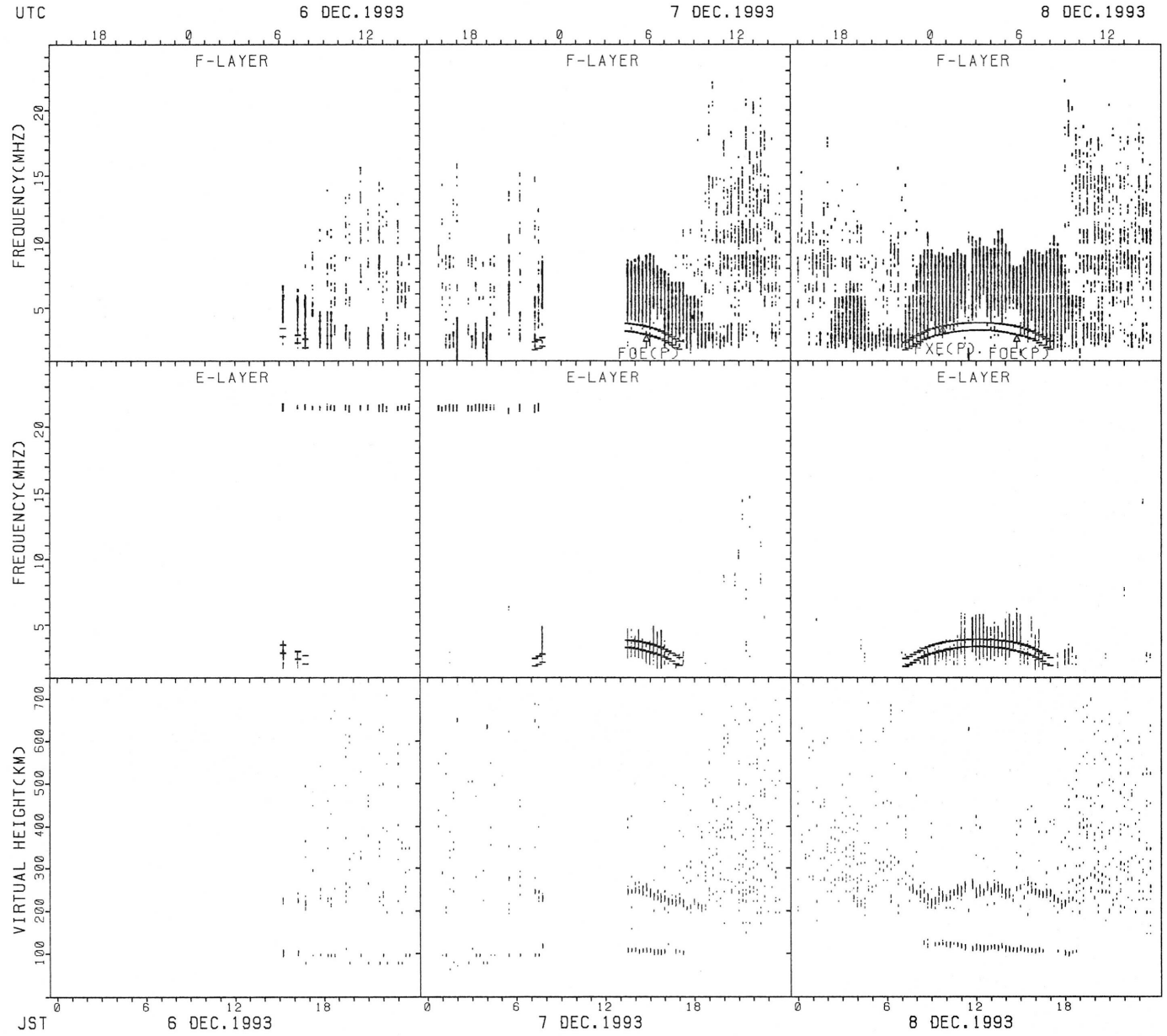

SUMMARY PLOTS AT KOKUBUNJI TOKYO
UTC
25 DEC.1993
26 DEC.1993
27 DEC.1993
28 DEC.1993
F-LAYER
E-LAYER
FREQUENCY(MHZ)
VIRTUAL HEIGHT(KM)
JST
FXE(P); PREDICTED VALUE FOR FXE
FOE(P); PREDICTED VALUE FOR FOE

SUMMARY PLOTS AT KOKUBUNJI TOKYO



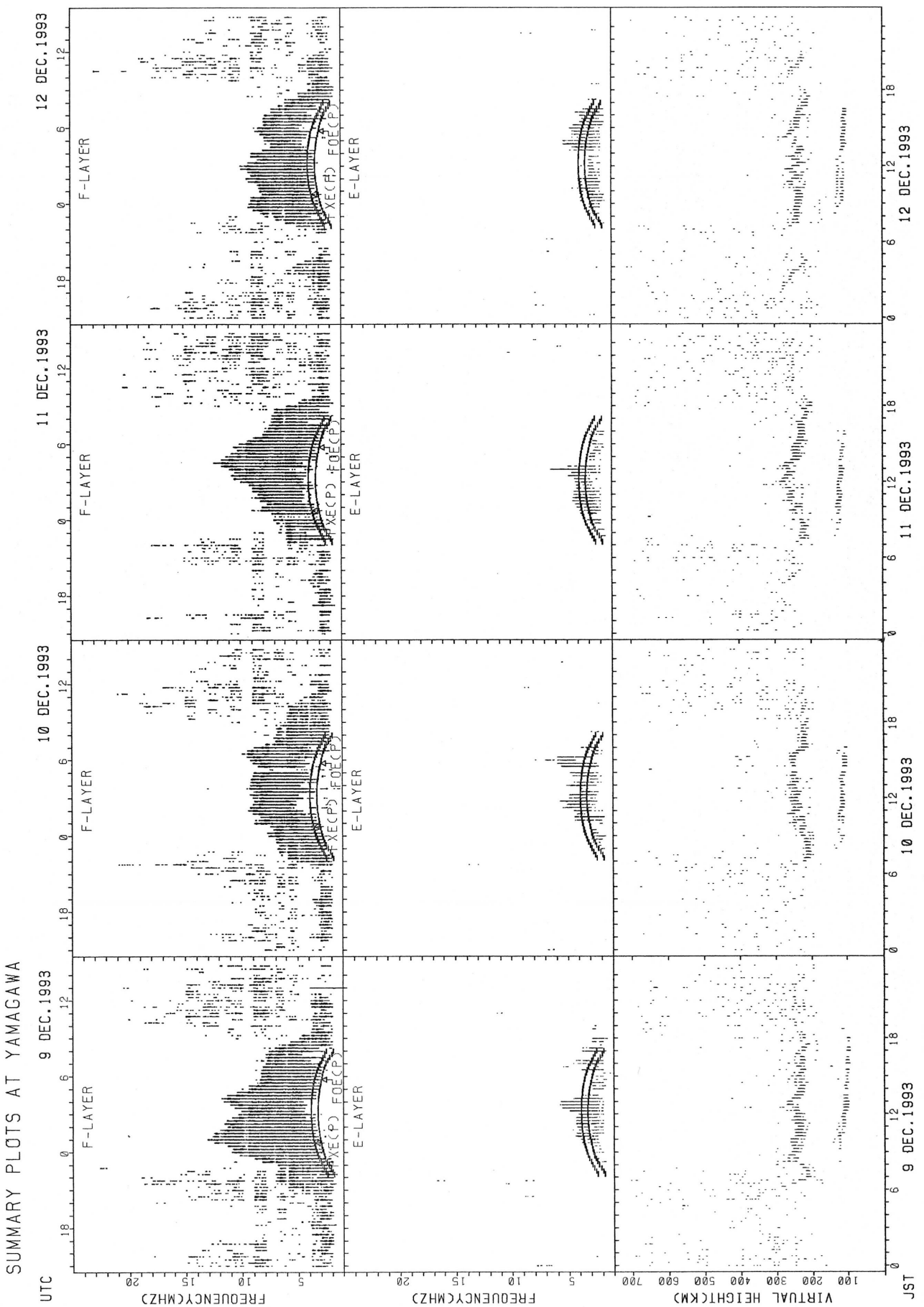
FXE(P); PREDICTED VALUE FOR FXE
FOE(P); PREDICTED VALUE FOR FOE

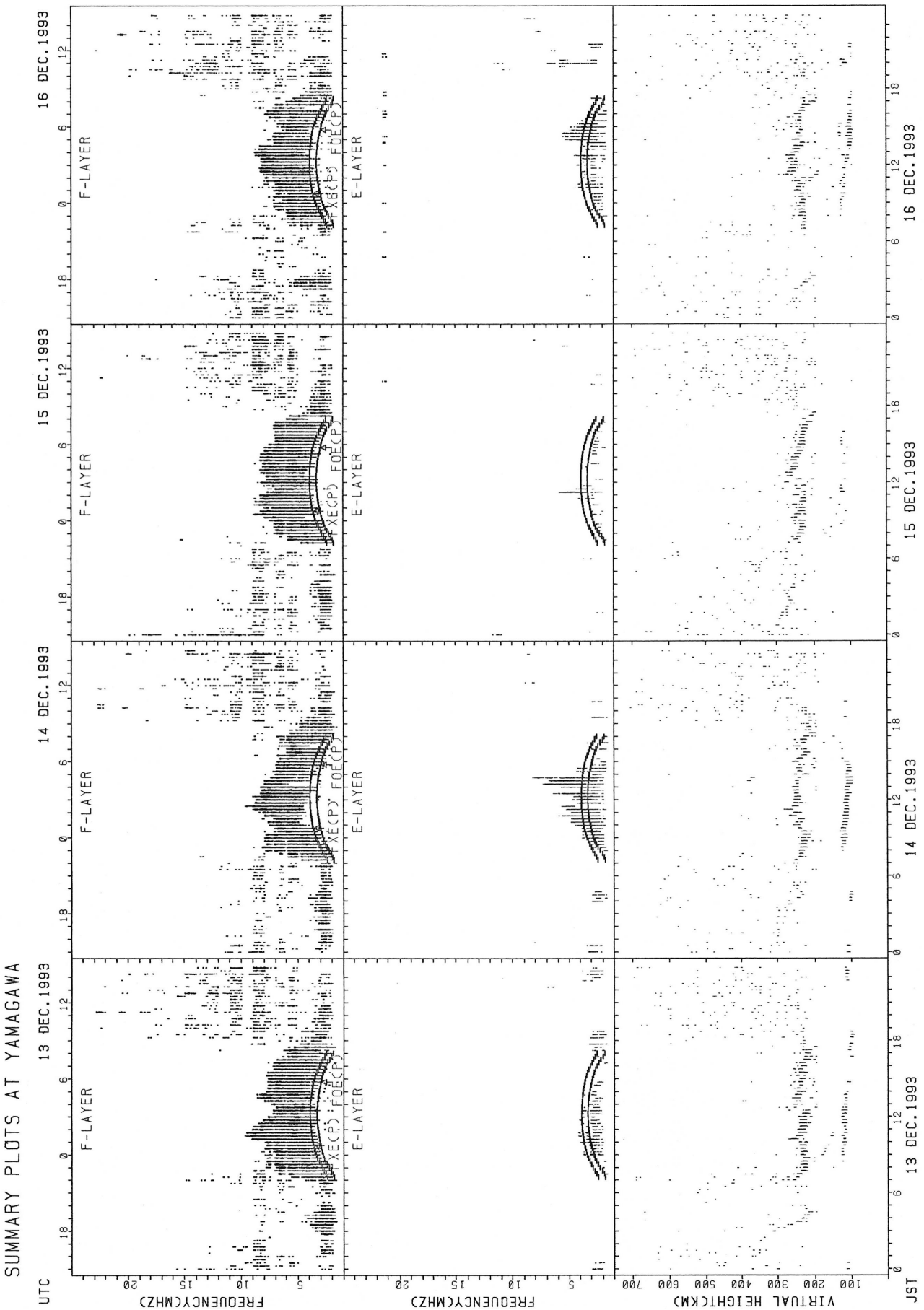
SUMMARY PLOTS AT YAMAGAWA

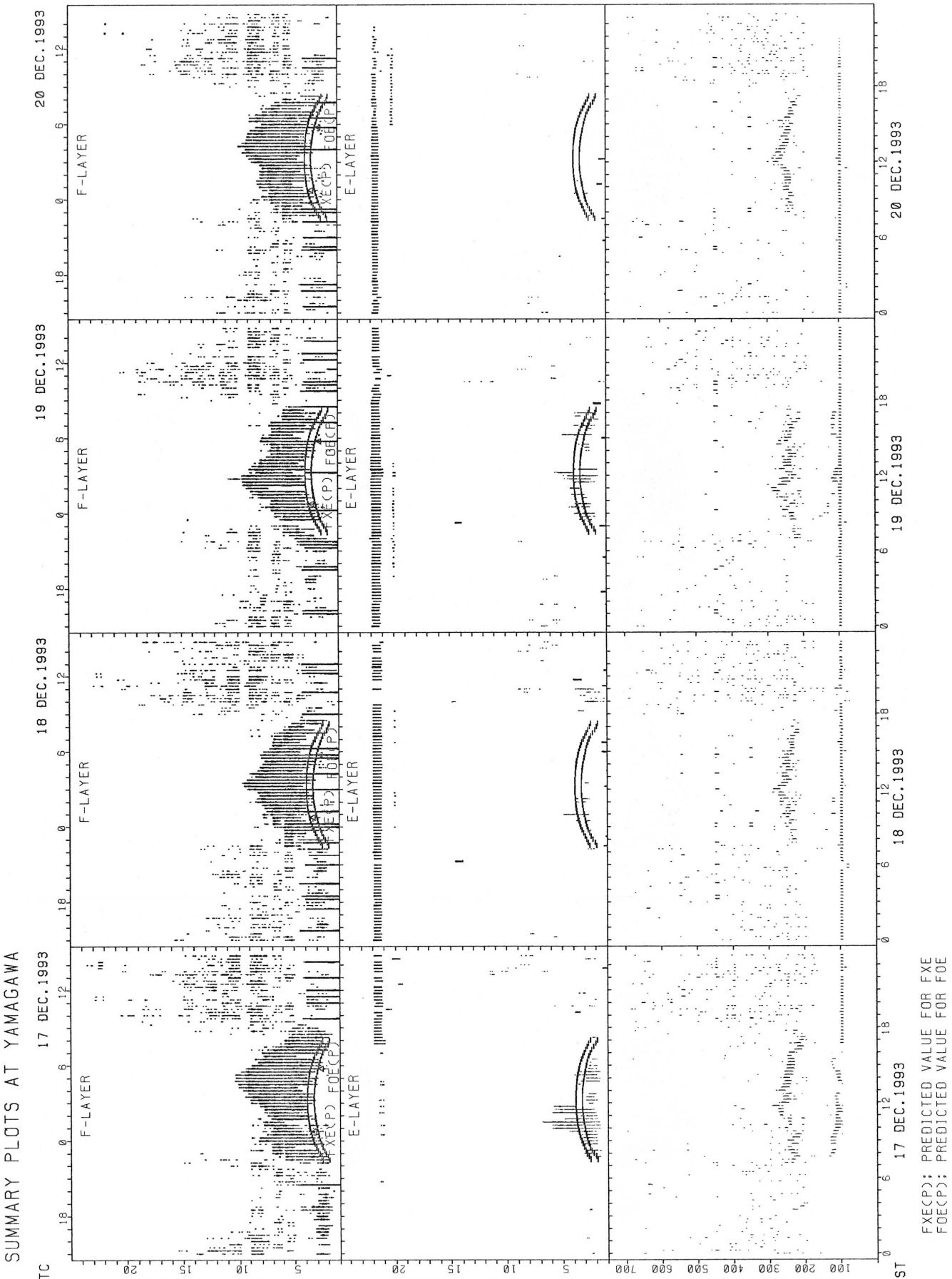


FXE(P): PREDICTED VALUE FOR FXE
FOE(P): PREDICTED VALUE FOR FOE

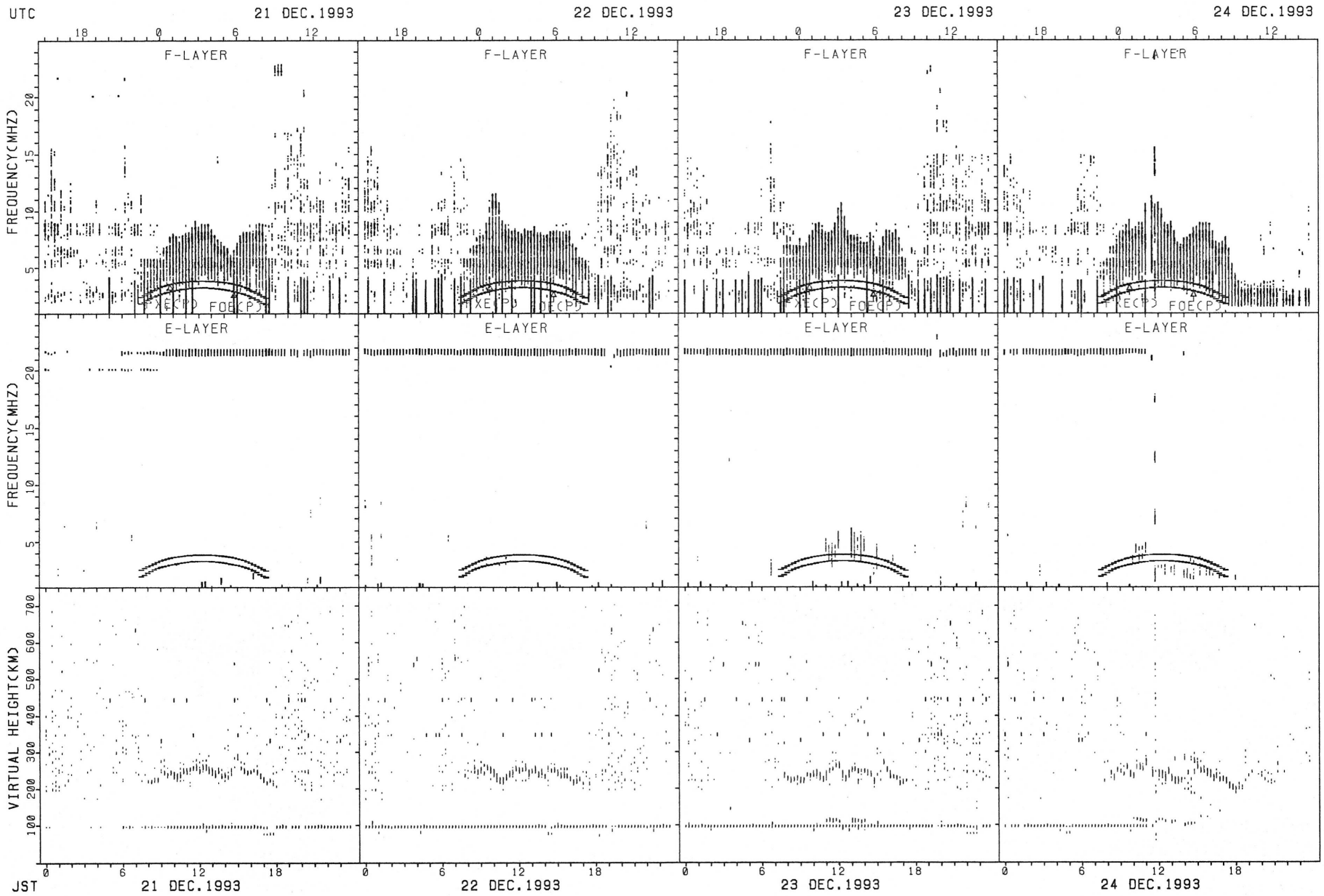
Notes : No data of Summary Plots were collected on December 1 to 5, 1993 at Yamagawa.


SUMMARY PLOTS AT YAMAGAWA
UTC
JST
9 DEC.1993
10 DEC.1993
11 DEC.1993
12 DEC.1993
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

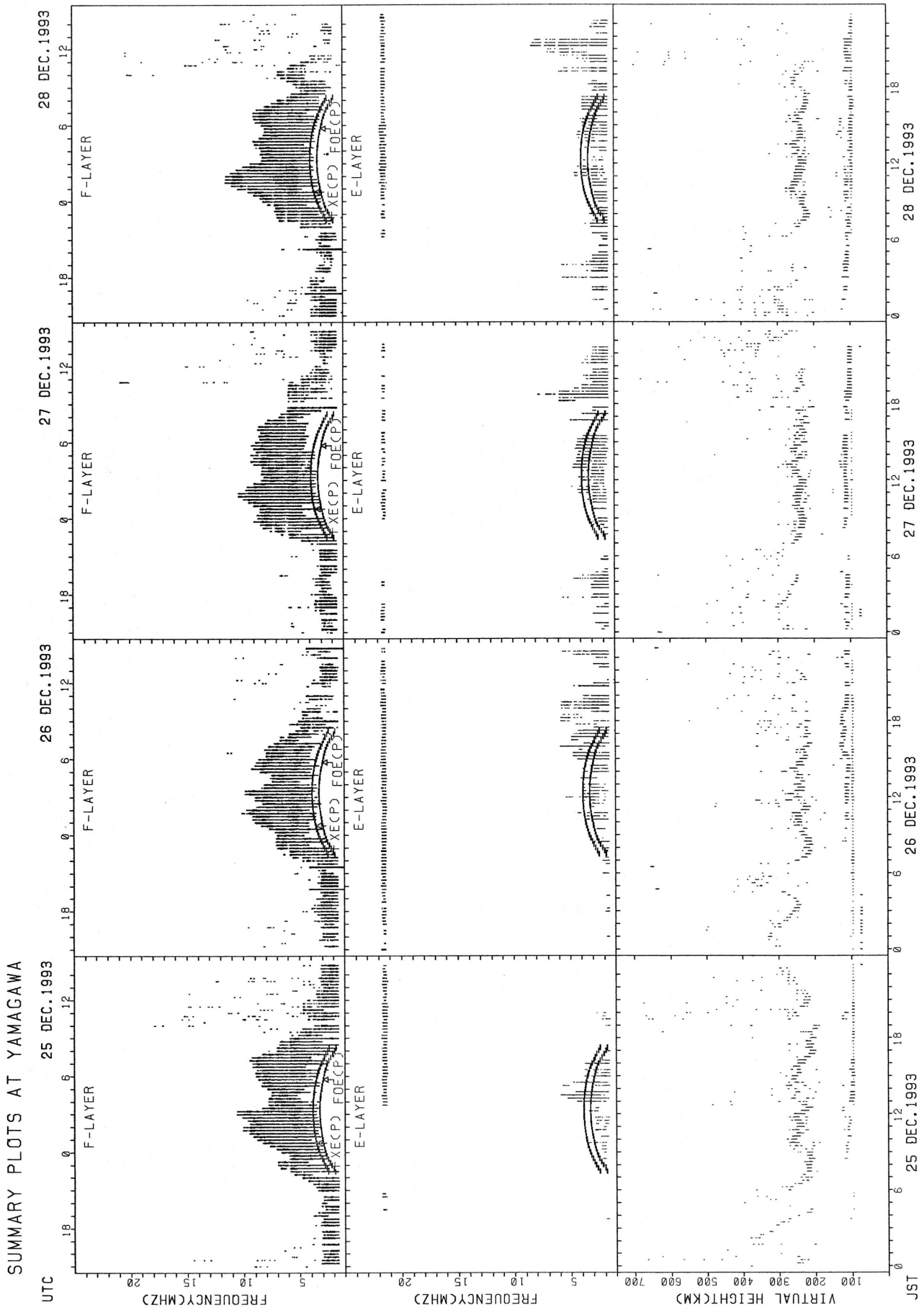

SUMMARY PLOTS AT YAMAGAWA
UTC
13 DEC.1993
14 DEC.1993
15 DEC.1993
16 DEC.1993
F-LAYER
E-LAYER
FXE(P); FOE(P)
FREQUENCY(MHZ)
VIRTUAL HEIGHT(KM)
JST
FXE(P): PREDICTED VALUE FOR FXE
FOE(P): PREDICTED VALUE FOR FOE


SUMMARY PLOTS AT YAMAGAWA
UTC
17 DEC.1993
18 DEC.1993
19 DEC.1993
20 DEC.1993
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

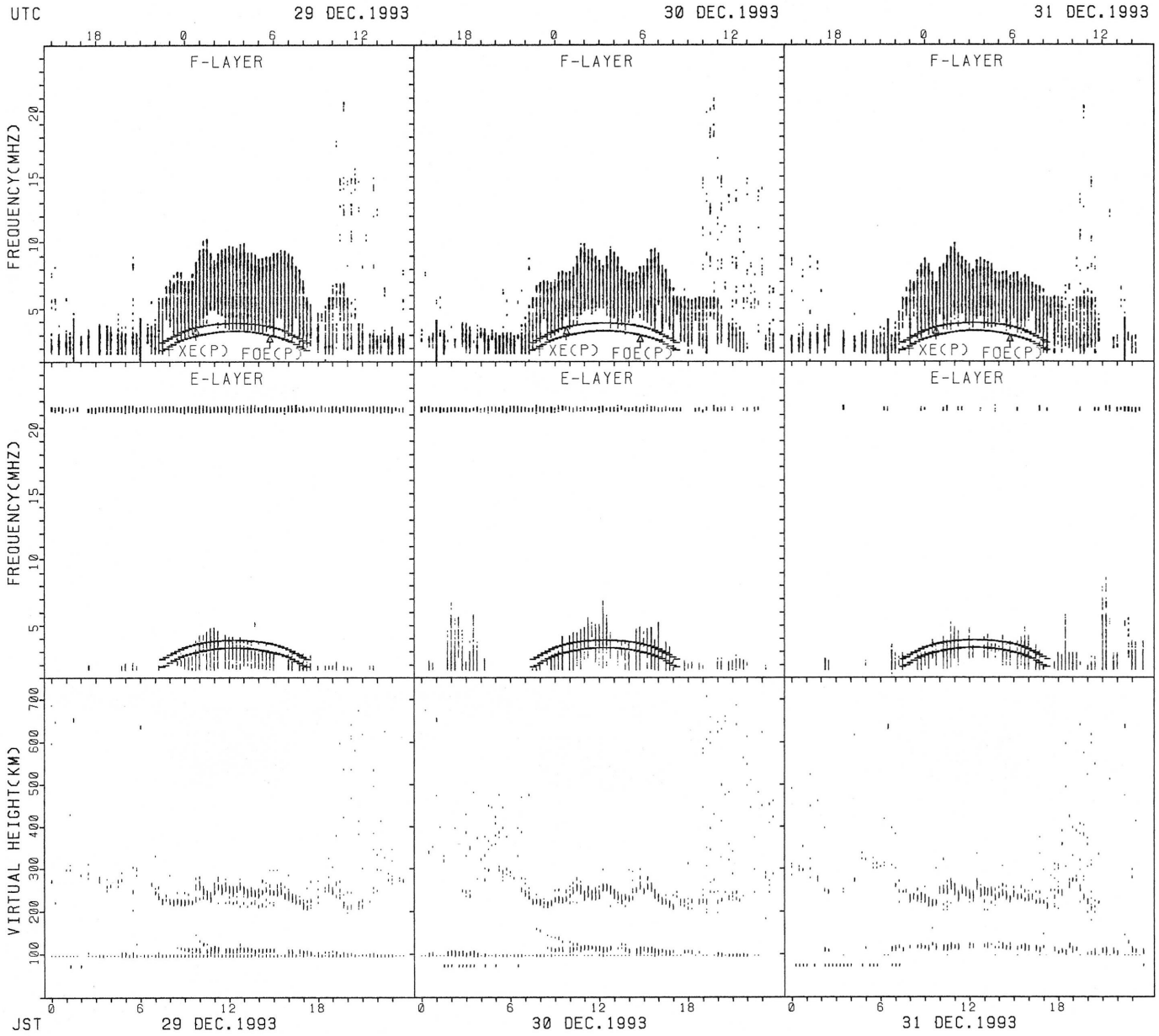
SUMMARY PLOTS AT YAMAGAWA



FXE(P): PREDICTED VALUE FOR FXE
FOE(P): PREDICTED VALUE FOR FOE


SUMMARY PLOTS AT YAMAGAWA
UTC
25 DEC.1993
26 DEC.1993
27 DEC.1993
28 DEC.1993
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



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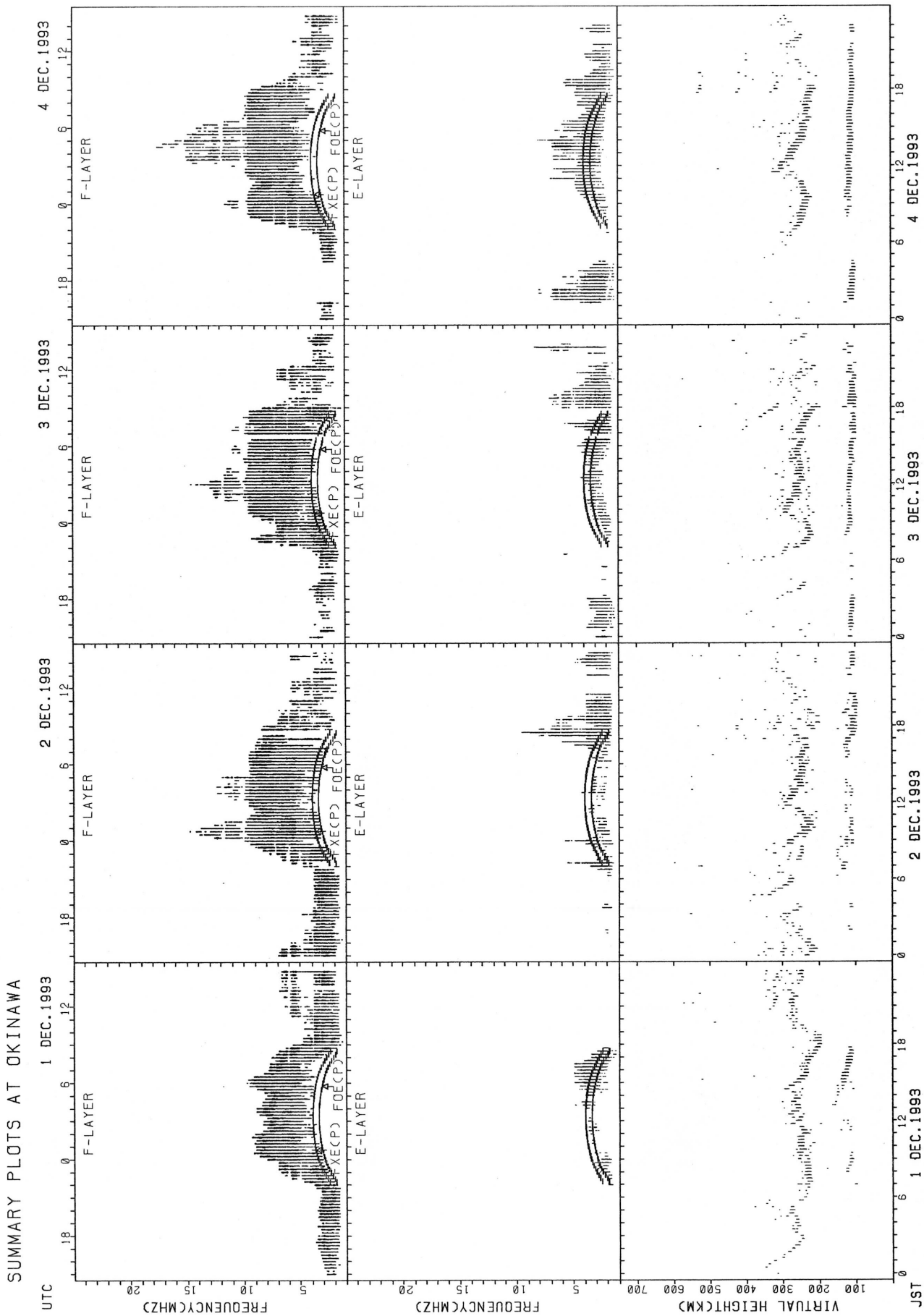
SUMMARY PLOTS AT OKINAWA
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1 DEC.1993
2 DEC.1993
3 DEC.1993
4 DEC.1993
F-LAYER
E-LAYER
FXE(P) FOE(P)
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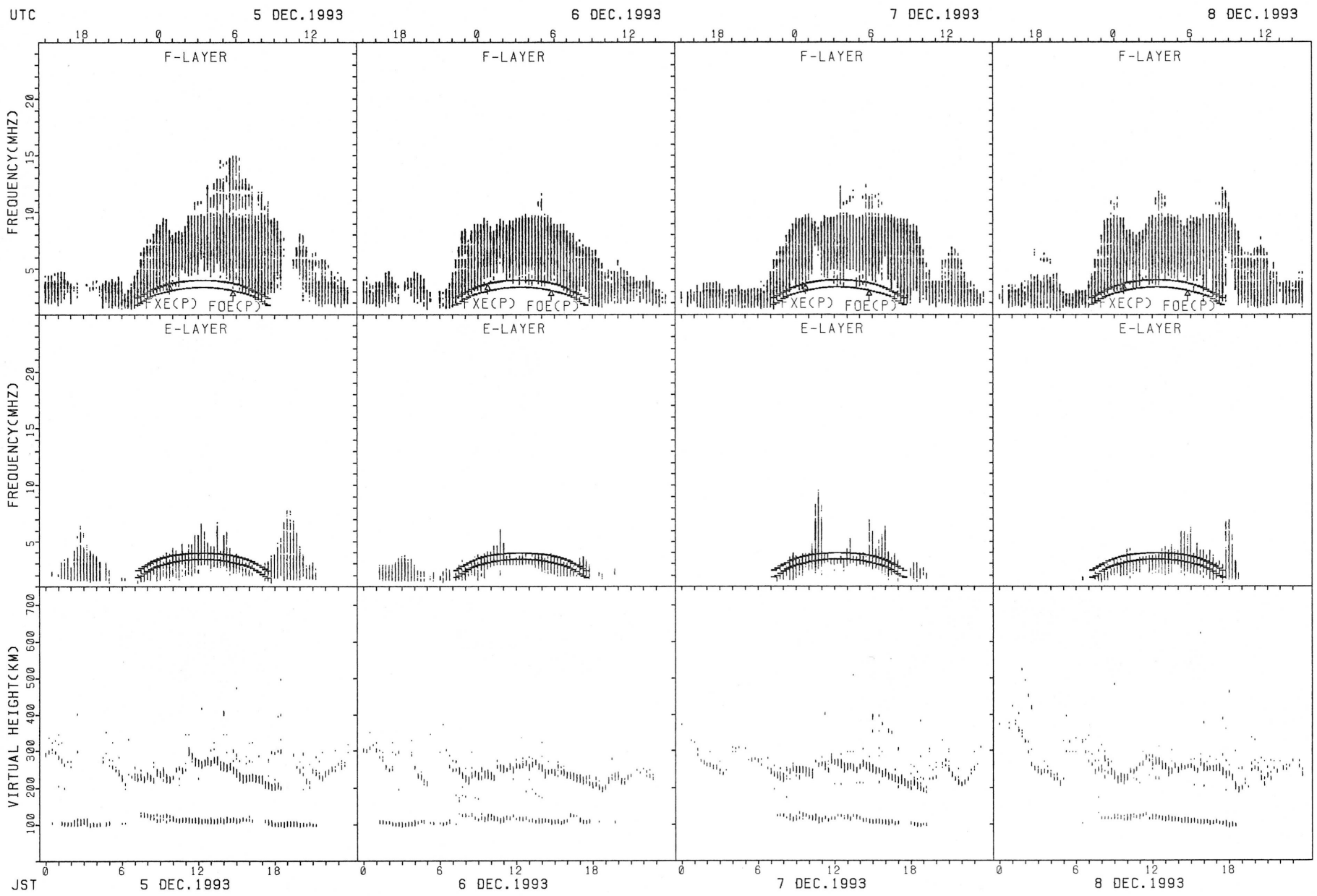
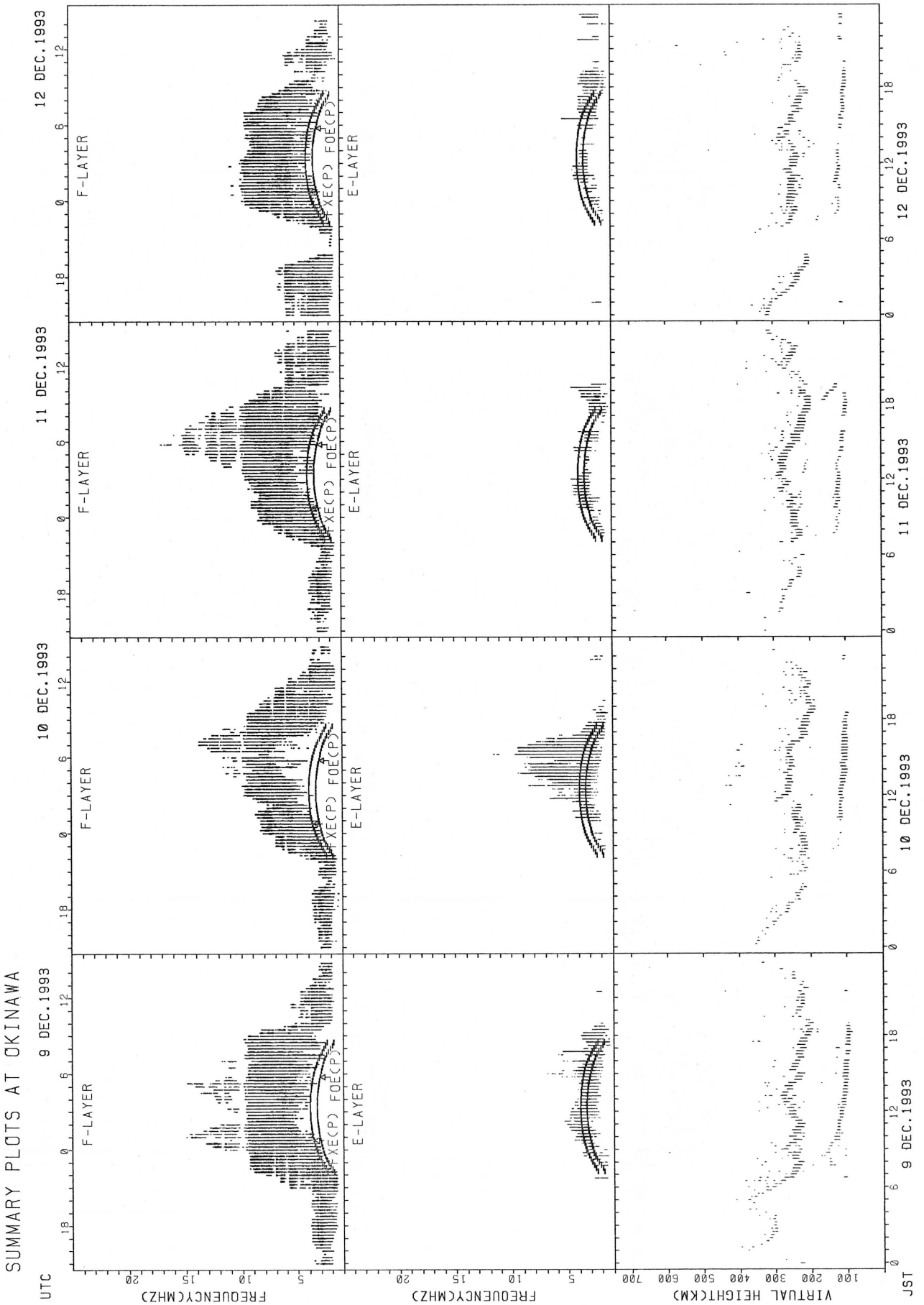
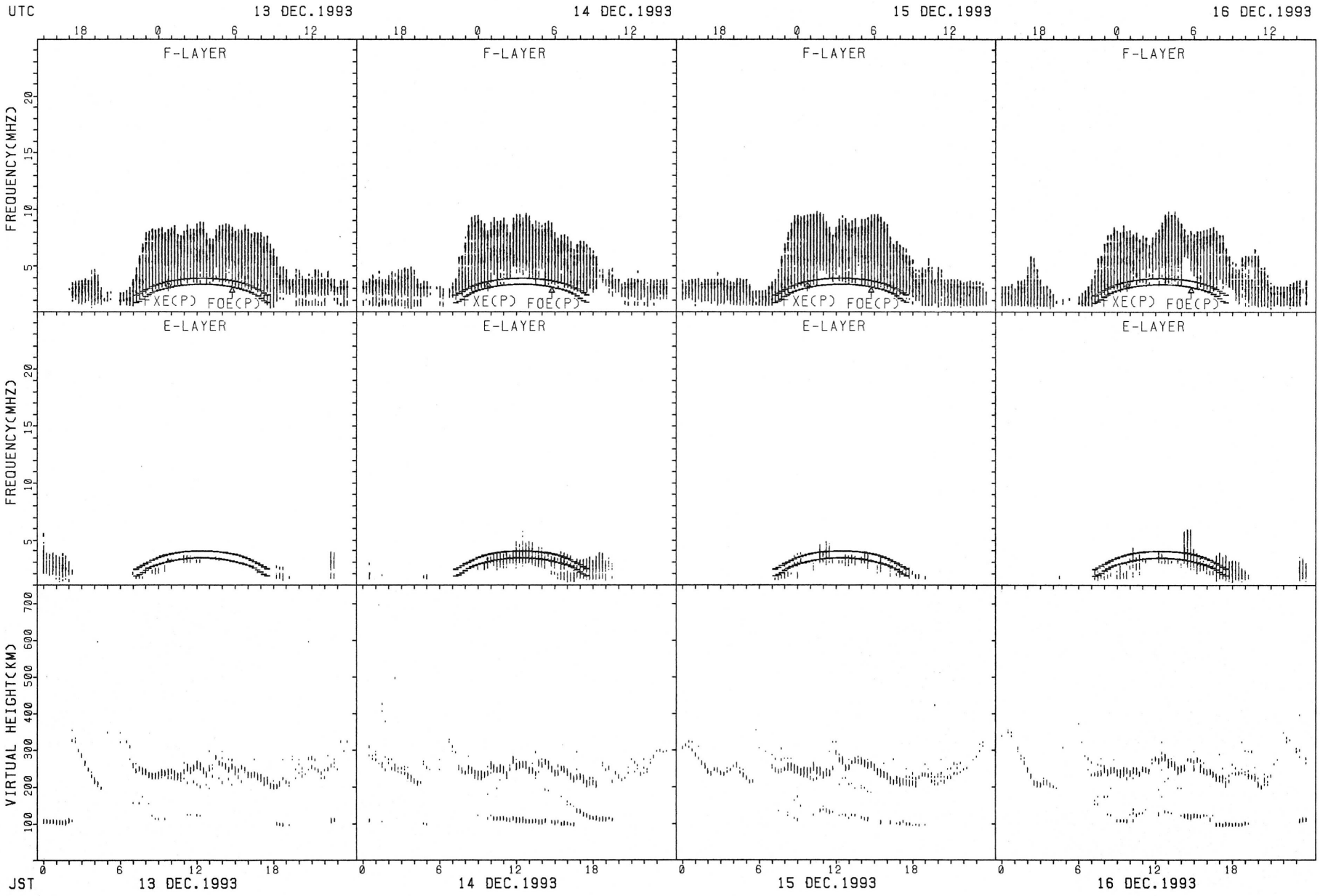
VIRTUAL HEIGHT(KM)
JST
FXE(P): PREDICTED VALUE FOR FXE
FOE(P): PREDICTED VALUE FOR FOE


SUMMARY PLOTS AT OKINAWA
UTC
5 DEC.1993
6 DEC.1993
7 DEC.1993
8 DEC.1993
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

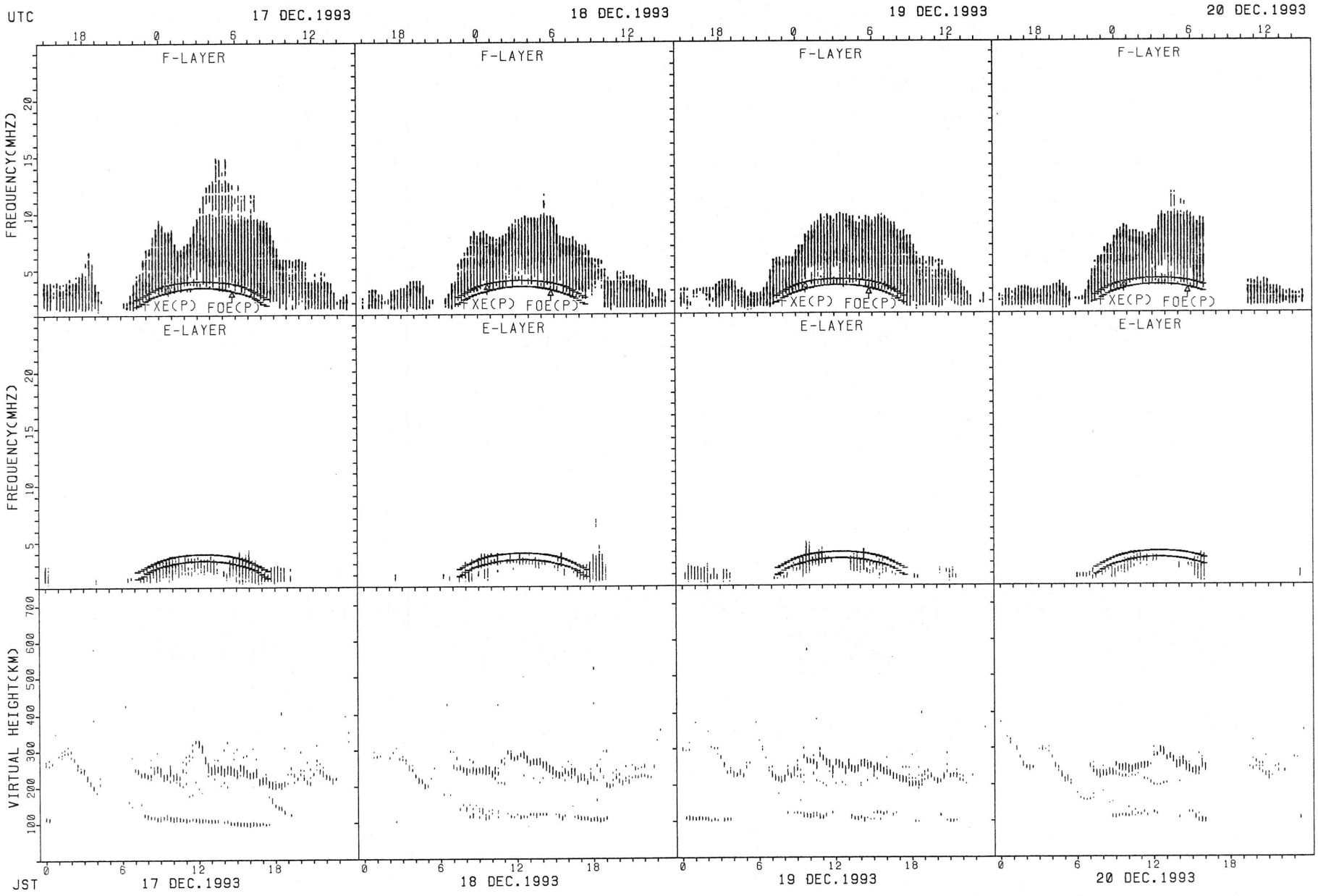

SUMMARY PLOTS AT OKINAWA
UTC
9 DEC.1993
10 DEC.1993
11 DEC.1993
12 DEC.1993
F-LAYER
E-LAYER
FXE(P) FOE(P)
FREQUENCY(MHZ)
VIRTUAL HEIGHT(KM)
JST
FXE(P): PREDICTED VALUE FOR FXE
FOE(P): PREDICTED VALUE FOR FOE

SUMMARY PLOTS AT OKINAWA



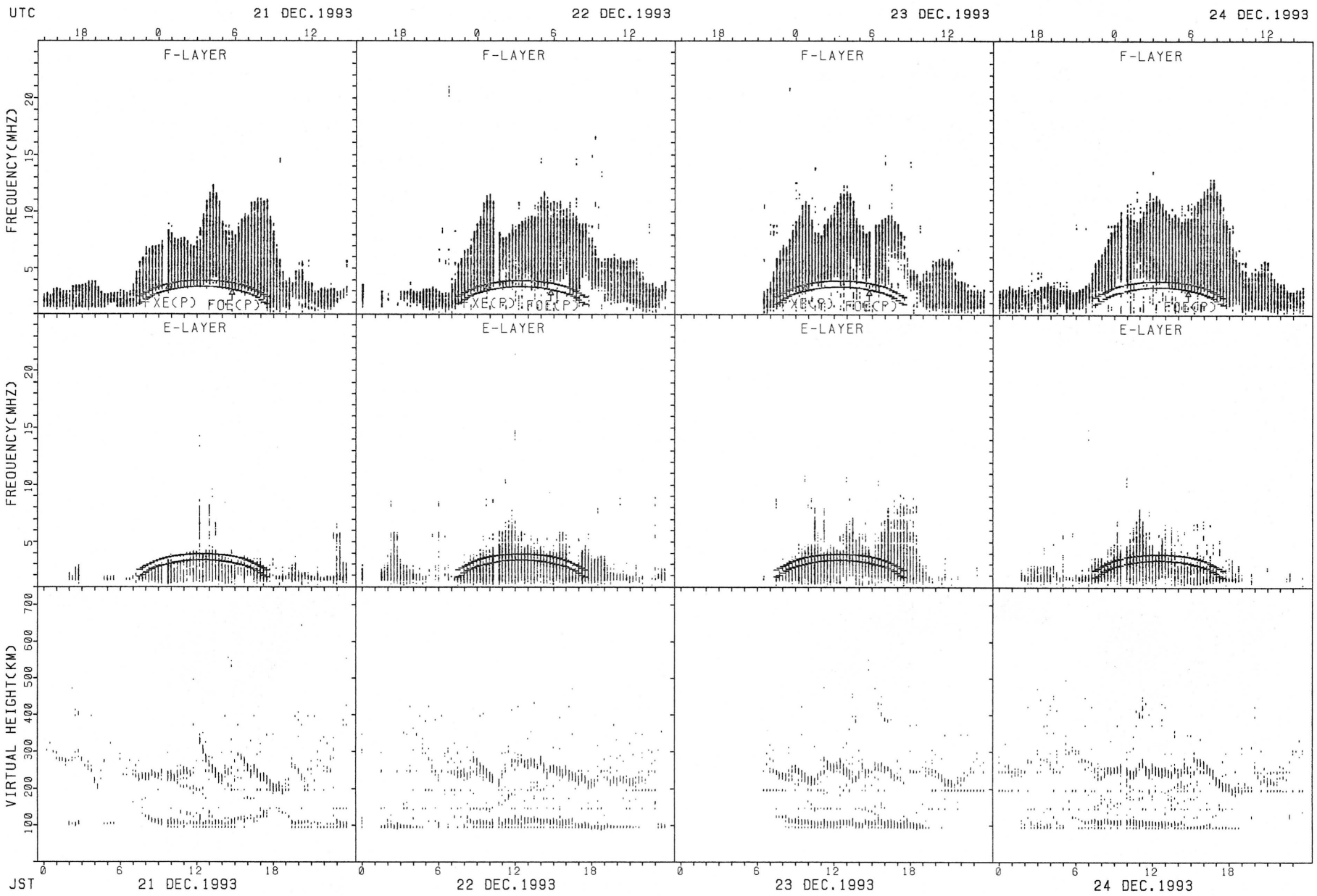
FXE(P): PREDICTED VALUE FOR FXE
FOE(P): PREDICTED VALUE FOR FOE

SUMMARY PLOTS AT OKINAWA

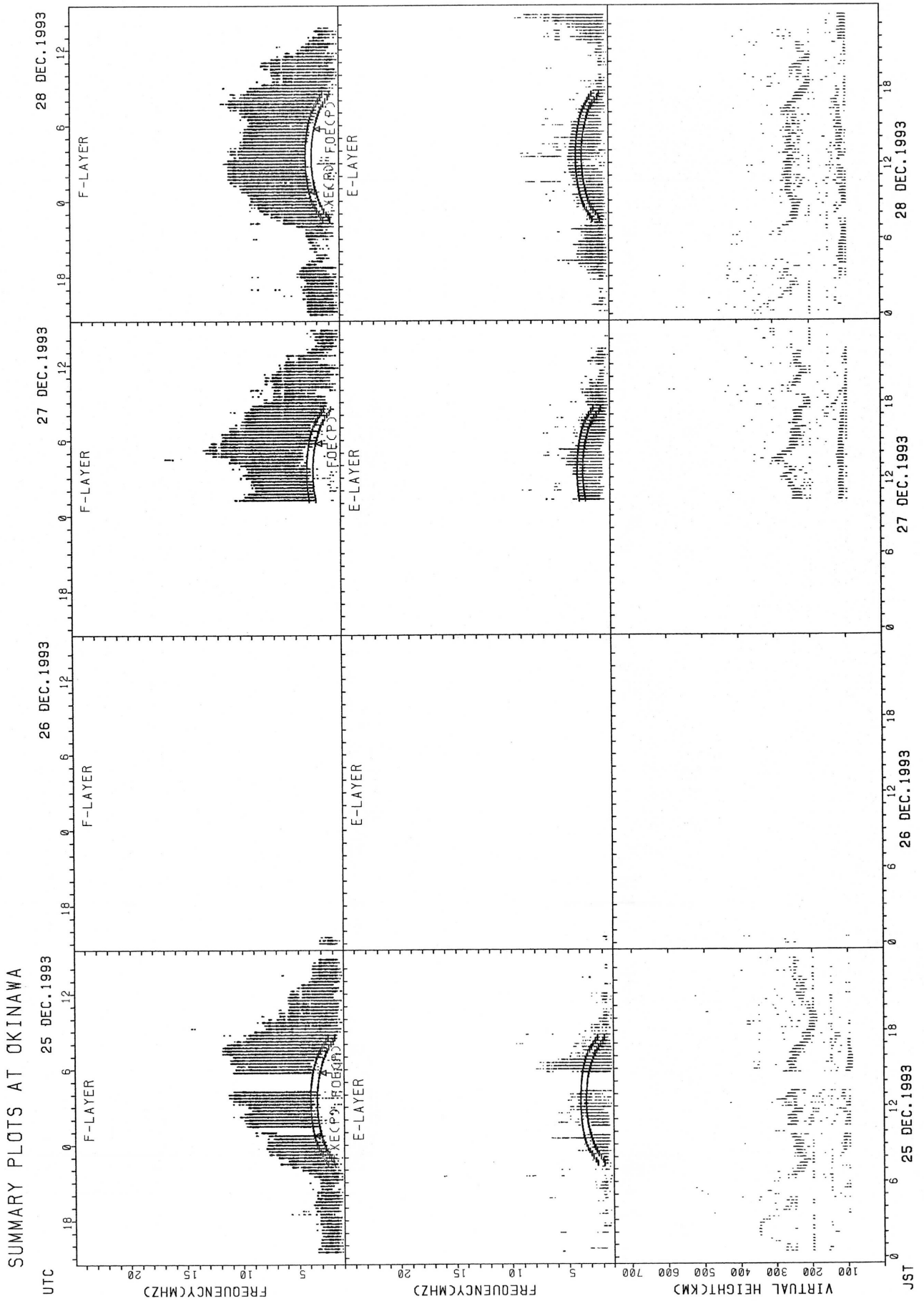


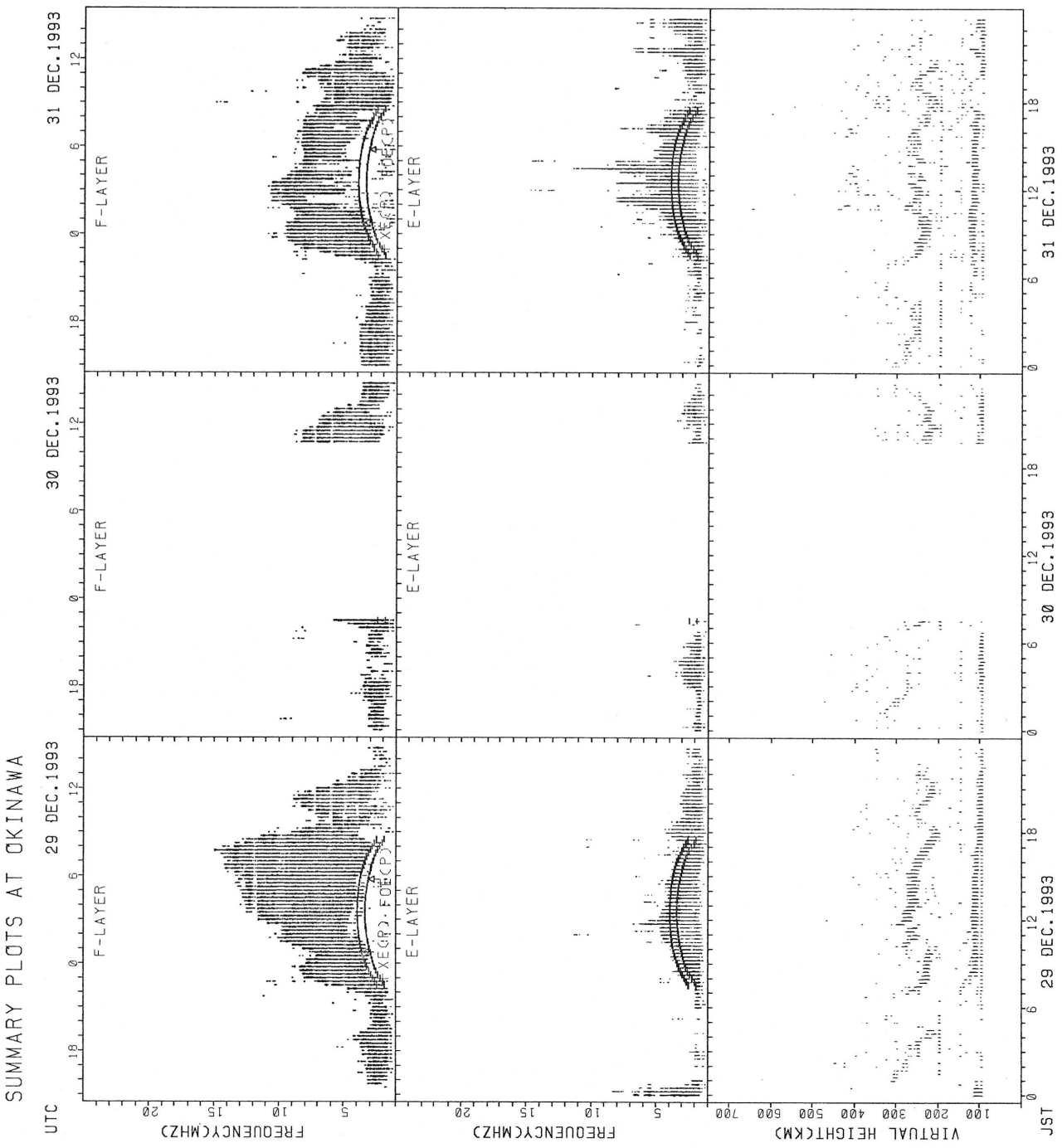
FXE(P); PREDICTED VALUE FOR FXE
FOE(P); PREDICTED VALUE FOR FOE

SUMMARY PLOTS AT OKINAWA



FXE(P): PREDICTED VALUE FOR FXE
FOE(P): PREDICTED VALUE FOR FOE


SUMMARY PLOTS AT OKINAWA
UTC
JST
25 DEC.1993
26 DEC.1993
27 DEC.1993
28 DEC.1993
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
UTC
29 DEC.1993
30 DEC.1993
31 DEC.1993
F-LAYER
E-LAYER
FREQUENCY(MHZ)
VIRTUAL HEIGHT(KM)
JST
FXE(P); PREDICTED VALUE FOR FXE
FOE(P); PREDICTED VALUE FOR FOE

MONTHLY MEDIANS OF H'F AND H'ES

DEC. 1993 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									18	26	30	31	27	30	30	15								
MED									239	240	232	234	234	244	240	238								
U Q									254	252	238	238	248	248	248	242								
L Q									234	226	226	228	228	236	230	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		13	11	11				12	12	10							13	13	14	16	13	13	12	12
MED		107	107	113				121	122	117							109	111	114	115	111	109	113	110
U Q		110	111	127				151	131	137							116	113	119	117	121	120	121	112
L Q		104	105	105				114	115	111							106	105	107	111	106	106	109	107

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								10	23	27	29	30	29	27	28	23								
MED								252	242	240	238	236	238	242	246	238								
U Q								294	262	252	250	244	252	258	253	240								
L Q								192	230	232	232	230	236	234	238	234								

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	14		10	10			10	11	18	19	20	16	16	14	16	19	19	18	19	15	13	17	12	16
MED	107		110	106			109	137	115	113	115	110	112	109	105	105	105	103	99	107	107	105	109	107
U Q	111		113	107			141	149	119	117	121	114	116	113	108	111	125	107	107	111	113	111	114	109
L Q	103		105	105			105	105	107	109	111	107	107	105	103	101	101	101	99	103	101	100	106	105

MONTHLY MEDIANS OF H'F AND H'ES
DEC. 1993 135E MEAN TIME(UTC+9H) AUTOMATIC SCALING

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									14	20	23	24	24	24	23	20	21							
MED									244	239	246	241	244	249	250	251	238							
U Q									250	254	258	252	255	260	260	258	246							
L Q									232	233	240	235	233	245	244	238	233							

H'ES

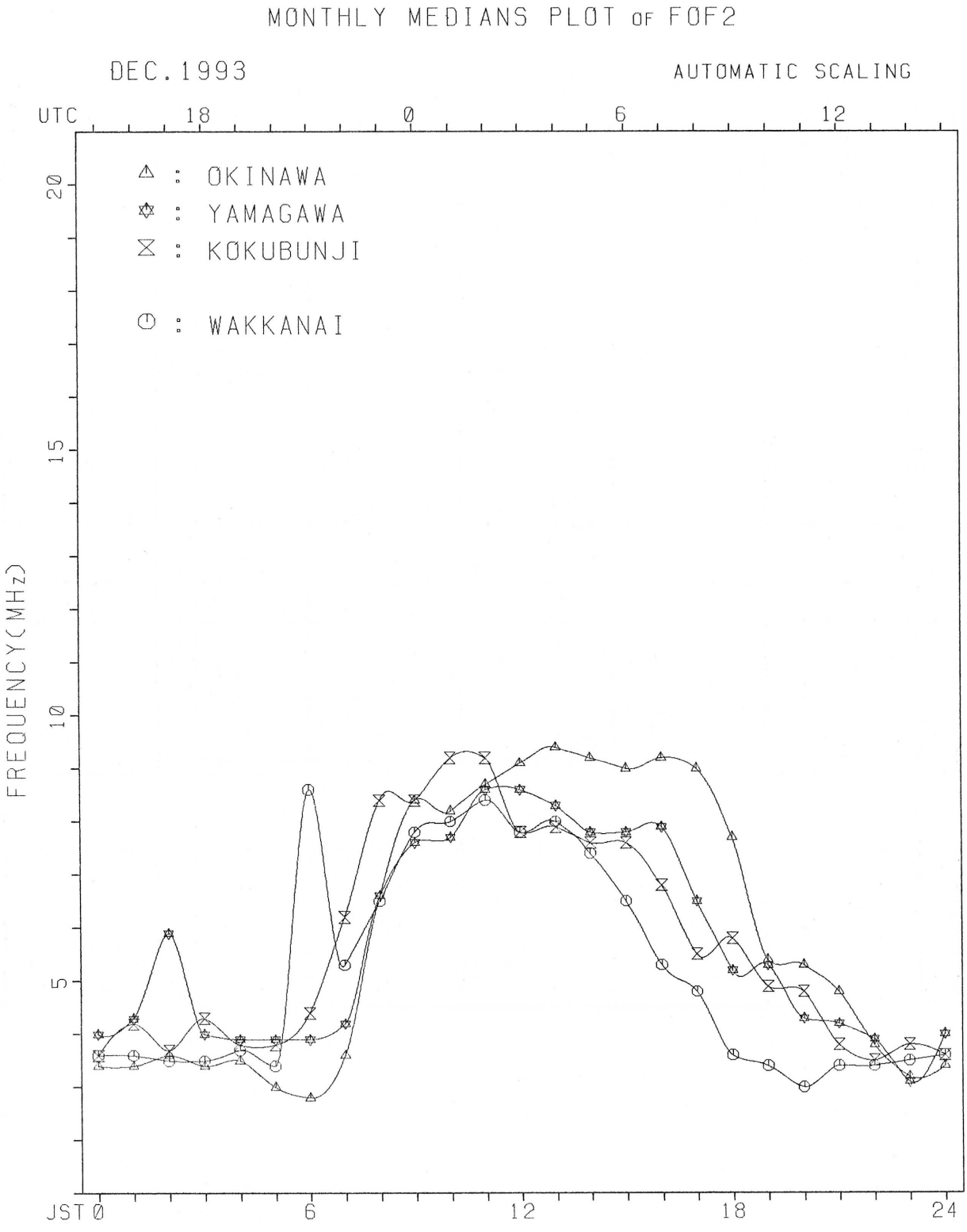
	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
CNT												14	13	11	11	10	10							
MED												117	115	113	111	108	106							
U Q												119	125	121	117	115	115							
L Q												115	113	111	109	107	105							

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									20	28	29	28			29	29	31	28	17					
MED									244	244	234	245			250	246	242	225	218					
U Q									262	255	245	258			260	256	250	235	225					
L Q									238	233	226	232			240	233	228	219	208					

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			11						12	15	17	21	17	19	17	23	22	24	21	16	10	10		
MED			107						137	125	125	117	117	115	113	111	108	112	107	111	103	102		
U Q			115						211	173	152	127	124	123	136	117	119	129	125	122	109	113		
L Q			105						122	115	117	113	110	111	107	107	103	107	99	104	99	99		


MONTHLY MEDIANS PLOT OF FOF2
DEC. 1993
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.1993 FXI (0.1MHZ) 135°E MEAN TIME (G.M.T. + 9H)

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	X 39	X 40	X 43	47	X 44	42	X 46											X 47	X 42	X 40	X 40	X 41	X 38	X 40
2	X 43	X 40	X 39	X 38	X 38	X 39	X 47	71										X 56	X 45	X 36	X 39	O X 39	X 37	X 42
3	A	X 40	X 40	X 41	X 40	X 38	A											X 69	X 54	X 47	X 51	X 36	X 42	X 38
4	A	A	X 34	X 35	X 36	X 35	X 37											X 56	X 40	X 32	41	33	X 31	X 31
5	X 32	X 35	X 33	X 35	X 34	X 36	X 32											X 48	X 40	X 38	X 37	X 36	X 31	X 34
6	X 38	X 40	X 39	X 41	X 35	X 36	X 40											X 43	X 47	X 37	S	X 40	X 33	34
7	X 37	X 38	X 38	X 37	X 31	X 30	X 32											X 54	X 42	X 36	X 43	X 40	X 33	X 33
8	X 36	X 35	X 35	38	50	39	37			114								X 76	X 65	X 48	X 38	X 34	X 38	X 43
9	X 41	X 47	X 41	X 38	X 39	X 40	X 51											X 43	X 41	X 49	X 38	X 36	X 33	X 36
10	X 37	X 38	X 40	X 39	X 36	X 34	X 37											X 51	X 43	X 45	X 35	X 32	X 29	X 34
11	X 38	X 38	X 39	X 38	X 37	X 41	X 34											X 48	X 36	X 36	X 37	X 33	X 32	X 35
12	X 36	X 37	X 37	X 40	X 44	X 33	X 34											X 39	X 39	X 45	X 45	X 34	X 34	X 37
13	X 39	X 40	X 39	X 42	X 44	X 34	X 38											C	X 48	X 45	X 33	X 30	X 31	35
14	38	39	X 38	X 39	X 37	X 36	X 33											X 45	X 38	X 36	X 30	S	X 33	X 34
15	X 36	X 35	X 37	X 38	X 35	X 33	X 33											X 45	X 38	X 31	X 32	X 34	X 34	39
16	X 37	X 39	X 48	X 56	O X 31	O X 29	X 24											X 48	X 42	X 45	X 32	X 31	X 34	X 39
17	X 38	X 36	X 36	X 40	X 30	X 30	34											X 48	X 38	X 32	X 34	X 33	X 36	X 33
18	X 34	X 35	X 39	X 37	X 33	X 33	X 42											X 45	X 38	X 39	X 42	X 31	X 30	X 33
19	X 31	X 34	X 33	X 36	X 36	X 33	X 37											X 45	X 38	X 39	X 33	X 33	X 34	X 37
20	X 36	X 34	X 37	X 37	X 34	X 33	X 32											X 43	X 43	X 40	X 34	X 31	36	38
21	40	39	40	43	X 34	32	X 27											X 51	X 43	X 44	X 29	A	A	X 32
22	X 38	37	40	X 33	34	X 33	X 37											X 39	X 39	X 51	X 35	X 29	X 32	X 36
23	X 39	X 33	X 37	X 36	X 36	X 36	X 38											X 42	X 43	X 39	X 31	X 32	X 34	X 36
24	X 38	X 37	X 36	X 34	X 35	X 36	X 37											X 48	X 38	X 36	X 34	X 25	X 34	X 37
25	X 36	33	38	38	X 38	X 36	X 34											X 57	X 41	X 46	X 34	X 34	X 34	X 35
26	X 34	X 38	X 38	X 38	X 38	X 38	X 39											X 39	X 42	X 39	X 36	X 32	X 38	X 40
27	X 38	X 37	X 38	X 36	X 36	X 36	X 34											X 54	X 57	X 36	X 36	X 30	X 34	X 35
28	X 36	X 38	X 43	X 37	X 33	X 33	X 36											X 47	X 62	X 41	X 32	X 34	X 36	X 36
29	X 37	X 38	X 38	X 38	X 38	X 38	X 37											X 44	X 56	X 64	X 39	X 34	X 34	X 39
30	X 39	X 42	X 42	X 42	X 29	X 33	X 34											X 54	X 50	X 48	X 39	X 32	X 34	X 39
31	X 37	X 39	X 42	X 37	X 36	X 38	X 39											X 55	A	A	X 58	X 31	X 34	X 38
	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
CNT	29	30	31	31	31	31	30	1		1								30	30	30	30	29	30	31
MED	X 37	X 38	X 38	X 38	X 36	X 36	X 37	71		114								X 48	X 42	X 40	X 36	X 33	X 34	X 36
U Q	X 38	X 39	X 40	X 40	X 38	X 38	X 38											X 54	X 47	X 45	X 39	X 35	X 36	X 39
L Q	X 36	X 35	X 37	X 37	X 34	X 33	X 34											X 44	X 39	X 36	X 33	X 31	X 33	X 34

IONOSPHERIC DATA STATION KOKUBUNJI

DEC. 1993 FOF2 (0.1MHZ) 135°E MEAN TIME (G.M.T. + 9H)

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	33	J R 34	37	F 38	38	35	40	56	68	70	68	87	71	70	74	66	56	41	36	34	34	35	J R 32	34
2	37	34	33	32	32	33	41	F 63	90	133	145	H 113	92	87	71	85	63	50	39	30	33	S 33	31	36
3	I A 34	34	34	35	34	32	I A 31	69	69	81	100	103	98	89	81	I S 78	68	63	48	41	45	30	36	32
4	I A 30	I A 26	28	29	30	29	31	65	84	104	98	90	94	103	93	72	62	50	34	26	F 34	F 25	25	25
5	26	29	27	29	28	30	26	57	66	76	95	102	92	74	89	73	61	42	35	32	31	30	25	28
6	32	J R 34	33	35	29	30	34	60	75	77	84	92	82	68	87	63	60	37	41	31	I S 30	34	27	F 26
7	31	32	32	31	25	24	26	59	75	75	73	93	84	74	72	68	60	48	36	30	37	34	27	27
8	30	29	29	F 26	F 33	F 28	F 29	54	87	107	97	95	86	95	95	83	69	70	59	42	32	28	32	37
9	35	41	35	32	33	34	45	66	84	102	124	112	93	90	83	I S 75	72	37	35	43	32	30	27	30
10	31	32	V 34	33	30	28	31	60	74	71	81	92	71	72	76	79	70	45	37	39	29	26	23	28
11	32	32	33	32	31	35	28	58	59	62	74	92	98	95	73	71	60	42	30	30	31	27	26	29
12	30	31	31	34	38	27	28	54	68	66	84	85	87	71	77	66	54	32	33	39	39	28	28	31
13	33	34	33	36	38	28	32	55	83	67	97	87	71	64	72	65	I C 55	I C 43	42	39	27	I A 26	V 25	27
14	F 31	31	32	33	31	30	27	53	J R 67	59	74	89	73	71	66	56	50	39	32	30	24	S	27	28
15	30	29	31	32	29	27	27	48	63	68	H 71	93	69	I C 70	64	60	58	39	32	25	26	28	28	31
16	31	33	42	50	R 25	23	18	47	55	60	69	86	74	71	64	H 57	60	42	36	39	26	25	28	33
17	32	30	30	34	24	24	F 25	57	63	77	84	69	82	85	84	70	56	42	32	26	28	27	30	27
18	28	29	33	31	27	27	36	48	58	63	Z 93	76	76	74	71	67	56	39	32	33	36	25	24	27
19	25	28	27	30	30	27	31	52	56	73	75	H 83	81	78	60	66	53	39	32	33	27	27	28	31
20	30	28	31	31	28	27	26	46	53	67	77	93	79	76	74	76	52	37	37	34	28	25	F 28	J R 30
21	32	30	F 32	33	V 27	F 25	21	42	53	65	79	84	81	66	I A 68	77	59	45	37	38	23	I A 22	I A 24	26
22	32	28	32	27	F 25	27	31	45	62	83	118	85	65	78	71	69	58	34	33	45	29	23	26	30
23	33	27	31	30	30	30	32	52	68	77	97	79	H 78	V 69	71	64	53	36	37	33	25	26	28	30
24	32	31	30	28	29	30	31	49	63	70	97	104	77	69	77	67	58	42	32	30	28	19	28	31
25	30	F 25	F 29	F 30	31	30	28	54	68	79	89	96	H 67	69	78	78	71	51	35	40	28	27	28	29
26	28	32	32	32	32	32	33	56	67	69	80	74	69	66	72	72	56	33	36	33	30	26	32	34
27	32	J R 31	32	30	30	30	28	55	71	74	98	91	70	70	76	81	58	48	51	30	30	U A 24	28	29
28	30	32	37	31	27	27	30	60	77	87	101	97	74	78	73	83	57	41	56	35	26	28	30	30
29	31	32	32	32	32	32	31	56	70	73	91	87	71	74	74	74	58	38	50	57	33	J R 28	28	33
30	33	36	36	36	23	27	28	55	69	73	89	87	77	68	75	88	60	48	44	42	33	26	28	32
31	31	33	36	31	30	32	33	55	62	76	87	88	77	72	75	72	54	49	I A 45	I A 44	52	25	28	33
	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
CNT	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	30	31	31
MED	31	31	32	32	30	29	31	55	68	73	89	90	77	72	74	72	58	42	36	34	30	27	28	30
U Q	32	33	34	34	32	32	32	59	75	79	97	95	86	78	78	78	61	48	42	40	33	28	28	32
L Q	30	29	31	30	27	27	27	52	62	67	77	85	71	69	71	66	56	38	33	30	27	25	26	28

DEC. 1993 FOF2 (0.1MHZ) COMMUNICATIONS RESEARCH LABORATORY, JAPAN

IONOSPHERIC DATA STATION KOKUBUNJI

DEC. 1993 FOF1 (0.01MHZ) 135° E MEAN TIME (G.M.T. + 9H)

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	L	U L 440												
2									L	L	L		L	L										
3											L	L	L	L	L									
4									L	U L 400	L	L	L	L	L	L								
5									L 320	L			L											
6											L 440	U L 440	L	L	L									
7										L		U L 460	U L 450	L	L									
8									L	L	L	L	L	L										
9											U L 490		L											
10										L	L	L	L	L										
11												L	L	L	L	L								
12											L	L	U L 440	U L 410	L									
13										L	L	U L 440	L	U L 410										
14									290	L 370	L	L	L	U L 390	L									
15										L	U L 420	L 420	U L 450	I C 400	L	L								
16									L			U L 440	U L 430	L	L	L								
17									U L 330	U L 340	U L 390	U L 415	L	L	L									
18										L	U L 440	U L 430	L 410		U L 400									
19										L	U L 430	L 420	L	L	L									
20											L	L	U L 450	U L 400	L									
21										L	L	U L 430	L	U L 440										
22										L	U L 460	L	L	U L 410	L									
23									L	L	L	L	U L 430	L	L									
24										L	L	U L 450	U L 450	380	L 330									
25										L	L	L	L	U L 410	U L 430									
26									L	L	L	L		L	L	L								
27										L	L	L	L	L	L									
28										L	L	U L 470	L	L										
29											L	L	L	L	L	L								
30											L	U L 460	U L 460	L										
31										L	L	U L 460	U L 465	L	L									
	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
CNT									3	3	7	14	10	9	3									
MED									L 320	U L 370	U L 440	U L 440	U L 450	U L 410	U L 400									
U Q									U L 330	U L 400	U L 460	U L 460	U L 450	U L 410	U L 430									
L Q									290	U L 340	U L 420	L 430	U L 430	U 395	L 330									

DEC. 1993 FOF1 (0.01MHZ) COMMUNICATIONS RESEARCH LABORATORY, JAPAN

IONOSPHERIC DATA STATION KOKUBUNJI

DEC. 1993 FOE (0.01MHZ) 135°E MEAN TIME (G.M.T. + 9H)

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	R	285		B	B	R 315	B	300	B	B						
2								A	A	A	A	A	A	A	A	A	A	A						
3								A	A	A	A	A	A	280	A	S	A 155							
4								150	A	A	A	A	A	A	A	A	175							
5								A	250	A	A	A	A	A	A	A	165							
6								A	A	A	A	A	R 305	A	275	A	175							
7								170	255	A	A	A	A	A	A	A	A							
8								165	255	A	A	A	A	A	A	A	A							
9								A	A	A	A	A	A	A	A	S	A							
10								175	235	290	300	A	A	A	R 270	A	A							
11								155	230	U A 270	U A 285	A	A	300	260	U S 235	B							
12								170	235	275	295	310	A	A	A	255	A							
13								A	265	285	295	300	A	295	A	A	C							
14								B	240	275	A	310	315	305	280	235	175							
15								150	245	275	290	305	315	I C 300	270	A	B							
16								170	H 230	280	300	A	305	305	270	230	B							
17								155	225	A	300	305	300	285	260	235	B							
18								160	230	275	A 300	310	A	A	A	A	A							
19								B	240	285	300	R	R	280	265	240	195							
20								150	220	A 265	A	A	300	A	265	235	A							
21								155	220	275	300	A	A	A	A	A	A							
22								B	215	260	300	A	A	290	270	245	A							
23								B	230	A	A	A	A	A	280	240	175							
24								B	245	290	A	A	A	U S 300	265	A	220							
25								B	235	275	285	A	315	300	270	270	210							
26								A	230	275	R 285	A	A	A	A	245	190							
27								B	225	270	300	305	315	300	280	A	A							
28								B	240	295	310	320	B	315	A	A	A							
29								B	240	285	300	310	325	300	300	265	190							
30								B	A	A	A	A	A	A	A	A	A							
31								B	A 245	U A 275	305	315	325	A	A	A	A							
	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
CNT								13	24	20	17	10	11	14	16	12	11							
MED								160	235	275	300	310	315	300	270	240	175							
U Q								170	245	285	300	310	315	300	280	250	195							
L Q								152	230	275	292	305	305	290	265	235	175							

IONOSPHERIC DATA STATION KOKUBUNJI

DEC. 1993 FOES (0.1MHZ) 135°E MEAN TIME (G.M.T. + 9H)

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 18	E B 12	E B 13	E B 14	E B 11	E B 13	19	G	G	G 22	E B 36	E B 34	G	E B 36	33	33	26	J A 48	E B 13	22	E B 11	E B 14	E B 14	E B 12
2	E S 20	E B 14	E B 13	E B 14	E B 14	E B 15	E B 14	23	J A 30	J A 53	J A 89	J A 70	J A 86	58	J A 47	39	24	32	J A 50	33	J A 33	J A 32	J A 26	J A 22
3	59	25	19	J A 13	J A 13	E B 14	B J A 51	J A 26	J A 34	J A 60	J A 63	J A 52	J A 43	J A 34	J A 43	E S 32	20	E B 13	J A 21	J A 26	27	J A 24	J A 18	J A 63
4	J A 89	J A 39	22	19	21	J A 19	19	G	J A 29	J A 52	J A 35	J A 31	33	J A 37	J A 33	27	24	E B 14	J A 15	J A 30	J A 33	22	J A 30	J A 36
5	21	20	E B 12	E B 13	20	J A 35	24	J A 27	J G 22	J A 37	70	J A 54	J A 54	J A 90	J A 53	27	G	E B 13	24	19	21	22	E B 13	35
6	J A 26	J A 42	J A 21	22	E B 12	15	18	18	J A 27	J A 43	J A 53	J A 43	G 28	31	G 25	33	G	J A 18	J A 35	J A 33	E S 19	22	E B 12	E B 11
7	E B 14	E B 13	19	20	19	20	E B 12	22	J G 24	33	34	J A 37	47	J A 37	J A 43	48	27	24	J A 23	22	21	E B 13	E B 12	E B 13
8	19	E B 13	E B 14	E B 14	18	20	22	22	G 21	J A 30	41	33	J A 43	J A 67	53	J A 45	J A 25	29	J A 24	E B 13	21	14	20	J A 23
9	J A 18	23	19	E B 15	E B 13	14	E B 12	21	J A 33	58	J A 65	J A 129	J A 105	127	J A 105	62	J A 45	36	J A 29	32	J A 19	J A 22	E B 13	E B 13
10	E B 14	E B 13	J A 32	J A 20	19	E B 12	E B 14	G	G	G	36	32	37	33	G 25	J A 28	J A 27	E B 14	E B 13	J A 17	E B 13	J A 20	20	J A 22
11	J A 22	J A 18	E B 13	20	18	J A 50	E B 14	G	G	J A 36	J A 38	J A 38	37	G 26	G	G	E B 17	E B 13	E B 11	E B 13	J A 16	J A 13	E B 14	E B 14
12	J A 51	E B 15	J A 19	24	J A 20	17	J A 18	G	G 24	32	33	35	J A 44	J A 40	35	G	J A 26	J A 14	20	E B 13	E B 13	E B 12	J A 38	J A 21
13	E B 13	E B 12	E B 13	E B 13	E B 12	E B 14	E B 13	21	G	G	34	33	33	G	J A 51	54	C	C	E B 14	E B 13	E B 15	J A 33	J A 30	J A 33
14	27	J A 28	J A 22	J A 19	J A 21	J A 22	20	J A 25	G	G	J A 33	33	G 29	G	G	G 21	G	20	17	E B 14	E B 13	S	19	E B 14
15	E B 13	E B 13	E B 14	E B 14	E B 11	18	17	20	G	31	32	34	G	C	30	27	E B 19	E B 13	J A 14	E B 14	E B 14	E B 14	E B 14	20
16	E B 13	E B 13	E B 13	E B 11	18	20	22	22	26	33	35	J A 35	G 24	G	34	G	22	E B 14	13	A E B 12	18	J A 21	J A 26	E B 13
17	E B 13	E B 12	E B 13	18	18	19	20	G	G	J A 29	G 26	G	G	G 27	G 24	G	E B 17	E B 14	18	19	J A 21	18	19	E B 13
18	E B 12	E B 13	18	E B 12	18	E B 13	J A 13	G	G	G	J A 55	J A 37	33	J A 58	35	42	22	E B 14	J A 22	21	20	J A 31	J A 26	23
19	E B 13	E B 13	18	E B 13	E B 13	E B 14	E B 14	E B 17	G	J A 27	J A 33	G 28	G 27	G	G	G	G	E B 14	E B 14	J A 22	E B 14	24	20	E B 13
20	J A 18	21	20	E B 15	E B 14	E B 14	J A 14	G	27	30	J A 47	35	G	J A 31	J A 31	G	35	J A 42	24	19	18	E B 13	E B 14	E B 13
21	E B 14	E B 14	E B 14	J A 26	20	J A 23	20	G	27	G	J A 43	J A 53	J A 45	J A 55	J A 98	52	J A 53	J A 42	J A 18	A E B 16	E B 14	31	58	J A 49
22	J A 29	19	J A 21	19	E B 13	E B 12	E B 15	E B 16	25	33	G 30	35	36	G 26	G	G	J A 26	22	E B 13	J A 26	J A 31	E B 14	22	E B 14
23	20	J A 28	J A 52	J A 21	E B 15	J A 22	E B 14	E B 16	G	J A 34	38	J A 44	J A 49	J A 33	G 23	27	22	21	20	J A 47	J A 27	J A 36	J A 53	E B 14
24	E B 13	E B 13	J A 24	E B 12	E B 13	E B 13	E B 14	E B 16	G	30	34	J A 33	32	G	G 24	47	G 20	J A 34	J A 27	21	E B 13	E B 14	E B 13	E B 13
25	E B 14	E B 14	E B 12	E B 12	E B 12	E B 13	E B 13	E B 17	G	29	32	34	G 31	G	G	30	G	E B 13	E B 13	E B 14	19	E B 13	E B 13	23
26	E B 13	19	E B 14	B J A 34	20	J A 21	21	22	G	30	G 18	33	66	49	51	27	G	E B 14	21	E B 11	18	20	E B 14	J A 24
27	19	E B 13	J A 25	21	19	19	E B 14	E B 16	G 20	30	37	J A 42	40	40	32	J A 35	J A 27	J A 53	J A 54	24	J A 19	J A 50	J A 31	E B 12
28	24	21	J A 28	J A 33	J A 25	J A 29	E B 14	E B 13	G	G	36	36	E B 33	37	J A 51	J A 77	J A 51	J A 23	J A 22	27	81	27	J A 28	J A 21
29	J A 18	18	19	J A 19	18	E B 14	E B 13	E B 16	G	33	J A 45	J A 39	G	G	G	G	G	E B 14	22	E B 14	19	E B 12	E B 14	J A 26
30	22	21	18	J A 21	19	19	E B 15	E B 14	25	J A 42	J A 98	J A 41	35	J A 39	53	49	J A 53	J A 51	24	E B 13	E B 14	E B 14	E B 14	E B 14
31	22	E B 13	E B 14	18	18	19	E B 15	E B 17	27	37	G	G 29	G	34	34	J A 40	J A 24	J A 20	J A 122	60	J A 64	J A 26	J A 26	23
	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	31	31	31	31	30	31	31	30	30	31	31	31	30	31	31
MED	18	E B 14	18	18	18	18	E B 15	G	G	31	36	J A 35	33	34	33	29	23	19	21	19	19	20	19	20
U O	J A 22	21	J A 21	J A 21	19	J A 20	20	22	J A 27	J A 37	J A 47	J A 42	J A 44	J A 40	J A 51	45	J A 27	J A 32	J A 24	26	J A 21	J A 26	J A 26	J A 23
L O	E B 13	E B 13	E B 13	E B 13	E B 13	E B 14	E B 14	E B 17	G	G 27	33	33	G	G	G	G	G	E B 14	E B 14	E B 14	E B 14	E B 14	E B 14	E B 13

DEC. 1993 FOES (0.1MHZ) COMMUNICATIONS RESEARCH LABORATORY, JAPAN

IONOSPHERIC DATA STATION KOKUBUNJI

DEC. 1993 FBES (0.1MHZ) 135°E MEAN TIME (G.M.T. + 9H)

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 18	E B 12	E B 13	E B 14	E B 11	E B 13	15	G	G	G 22	E B 36	E B 34	G	E B 36	33	30	25	15	E B 13	16	E B 11	E B 14	E B 14	E B 12
2	E S 20	E B 14	E B 13	E B 14	E B 14	E B 15	E B 14	20	27	37	36	54	37	35	37	32	20	25	20	21	21	24	13	E B 12
3	A A 59	E B 14	E B 13	E B 13	E B 13	E B 14	A A 51	23	31	49	38	33	31	G 21	32	E S 32	20	E B 13	19	19	21	E B 13	E B 13	16
4	A A 89	A A 39	16	E B 12	16	E B 14	E B 14	G	26	32	33	31	32	34	31	26	24	E B 14	E B 14	E B 14	17	15	17	18
5	E B 13	E B 13	E B 12	E B 13	E B 13	26	16	21	G 17	31	63	47	32	65	44	26	G	E B 13	E B 12	E B 13	E B 13	17	E B 13	21
6	17	33	E B 13	E B 14	E B 12	15	E B 13	17	25	36	32	30	G 26	30	G 24	28	G	E B 14	30	25	E S 19	E B 13	E B 12	E B 11
7	E B 14	E B 13	E B 13	E B 12	E B 12	15	E B 12	20	G 17	29	33	33	31	29	37	34	19	17	22	E B 14	E B 13	E B 13	E B 12	E B 13
8	E B 13	E B 13	E B 14	E B 14	E B 13	12	E B 12	G	G 19	29	34	32	34	33	39	29	20	20	20	E B 13	E B 13	E B 14	19	16
9	16	E B 13	E B 13	E B 15	E B 13	13	E B 12	19	25	44	31	70	38	69	45	U S 55	36	26	22	23	15	15	E B 13	E B 13
10	E B 14	E B 13	16	16	E B 13	E B 12	E B 14	G	G	G	33	31	33	32	G 21	27	20	E B 14	E B 13	E B 13	E B 13	17	19	16
11	E B 13	E B 14	E B 13	E B 13	E B 13	E B 13	E B 14	G	G	33	35	34	33	G 23	G	G	E B 17	E B 13	E B 11	E B 13	E B 13	E B 13	E B 14	E B 14
12	E B 13	E B 15	E B 12	E B 14	E B 13	E B 12	E B 13	G	G 17	31	32	34	36	34	32	G	19	14	E B 14	E B 13	E B 13	E B 12	16	E B 13
13	E B 13	E B 12	E B 13	E B 13	E B 12	E B 14	E B 13	20	G	G	32	32	33	G	35	32	C	C	E B 14	E B 13	E B 15	15	16	E B 13
14	E B 13	19	E B 12	E B 12	E B 13	E B 15	E B E B 13	17	G	G	31	32	G 26	G	G	G 21	G	E B 13	E B 13	E B 14	E B 13	S	E B 13	E B 14
15	E B 13	E B 13	E B 14	E B 14	E B 11	E B 13	E B 13	18	G	28	31	32	G	C	30	26	E B 19	E B 13	E B 14	E B 14	E B 14	E B 14	E B 14	E B 13
16	E B 13	E B 13	E B 13	E B 11	16	17	16	19	25	31	33	32	G 20	G	30	G	21	E B 14	E B 14	E B 12	17	15	17	E B 13
17	E B 13	E B 12	E B 13	E B 12	E B 12	E B 14	E B 13	G	G	27	G 25	G	G	G 26	G 22	G	E B 17	E B 14	E B 13	E B 13	14	E B 12	E B 12	E B 13
18	E B 12	E B 13	E B 13	E B 12	E B 13	E B 13	E B 13	G	G	G	G 30	G 25	31	56	29	35	21	E B 14	16	E B 14	E B 11	16	15	15
19	E B 13	E B 13	E B 14	E B 13	E B 13	E B 14	E B E B 14	17	G	G 24	G 27	U G 28	U G 27	G	G	G	G	E B 14	E B 14	15	E B 14	16	E B 12	E B 13
20	15	E B 12	E B 13	E B 15	E B 14	E B 14	E B 13	G	26	29	32	31	G	30	G 21	G	26	18	E B 14	17	14	E B 13	E B 14	E B 13
21	E B 14	E B 14	E B 14	E B 12	E B 12	E B 13	E B 14	G	25	G	36	33	38	31	A A 98	34	27	29	16	E B 16	E B 14	A A 31	A A 58	16
22	16	E B 12	E B 12	E B 13	E B E B 13	E B 12	E B E B 15	16	23	28	G 26	31	32	G 25	G	G	25	E B 11	E B 13	17	E B 12	E B 14	E B 15	E B 14
23	E B 14	22	E B 13	16	E B 15	E B 13	E B E B 14	16	G	31	32	41	31	32	G 21	27	22	E B 12	E B 15	22	16	18	18	E B 14
24	E B 13	E B 13	E B 12	E B 12	E B 13	E B 13	E B E B 14	16	G	30	33	33	32	G	G 23	38	G 18	26	22	16	E B 13	E B 14	E B 13	E B 13
25	E B 14	E B 14	E B 12	E B 12	E B 12	E B 13	E B E B 13	17	G	28	31	33	G 28	G	G	30	G	E B 13	E B 13	E B 14	E B 13	E B 13	E B 13	E B 13
26	E B 13	E B 14	E B 14	16	E B 14	18	E B 14	16	G	30	G 17	33	47	35	35	26	G	E B 14	18	E B 11	E B 14	E B 13	E B 14	18
27	E B 13	E B 13	E B 14	E B 13	E B E B 14	E B 12	E B 14	G 16	19	29	34	39	39	38	30	32	24	33	29	E B 15	E B 14	U A 19	16	E B 12
28	E B 14	E B 14	24	15	15	21	E B 14	E B 13	G	G	34	35	E B 33	35	47	65	42	17	20	18	17	15	16	18
29	16	E B 14	E B 12	13	E B 15	E B 14	E B 13	E B 16	G	30	41	35	G	G	G	G	G	E B 14	E B 12	E B 14	E B 13	E B 12	E B 14	16
30	E B 13	E B 14	E B 14	16	E B 13	E B 13	E B E B 15	14	25	37	31	35	31	34	46	40	44	30	19	E B 13	E B 14	E B 14	E B 14	E B 14
31	E B 13	E B 13	E B 14	E B 13	E B 14	E B 14	E B 15	E B 17	27	34	G	G 28	G	34	32	30	20	17	A A 122	A A 60	43	20	22	16
	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
CNT	31	31	31	31	31	31	31	31	31	31	31	31	31	30	31	31	30	30	31	31	31	30	31	31
MED	E B 13	E B 13	E B 13	E B 13	E B 13	E B 14	E B 14	G	G	29	32	33	31	31	30	28	20	E B 14	E B 14	E B 14	E B 14	E B 14	E B 14	E B 14
U Q	16	14	E B 14	14	E B 14	15	14	18	25	32	34	35	33	35	37	32	24	18	20	17	16	16	16	16
L Q	E B 13	E B 13	E B 13	E B 12	E B 12	E B 13	E B 13	G	G	G	G 31	31	G	G	G	G	G	E B 13	E B 13	E B 13	E B 13	E B 13	E B 13	E B 13

DEC. 1993 FBES (0.1MHZ) COMMUNICATIONS RESEARCH LABORATORY, JAPAN

IONOSPHERIC DATA STATION KOKUBUNJI

DEC. 1993 FMIN (0.1MHZ) 135°E MEAN TIME (G.M.T. + 9H)

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	18	12	13	14	11	13	12	16	19	16	36	34	25	36	26	27	19	13	13	13	11	14	14	12
2	E S 20	14	13	14	14	15	14	13	12	14	16	17	17	13	15	13	13	13	13	13	14	15	13	12
3	14	14	13	13	13	14	12	14	13	13	13	15	14	13	14	E S 32	12	13	13	13	12	13	13	12
4	14	14	13	12	13	14	14	13	14	13	13	14	19	14	15	13	15	14	14	14	14	13	14	12
5	13	13	12	13	13	14	12	13	12	14	13	15	15	13	13	13	12	13	12	13	13	14	13	13
6	13	14	13	14	12	11	13	13	13	14	13	13	13	15	12	12	13	14	12	14	E S 19	13	12	11
7	14	13	13	12	12	12	12	14	13	15	16	13	18	16	14	13	14	16	12	14	13	13	12	13
8	13	13	14	14	13	12	12	13	15	13	16	16	14	15	14	13	14	13	12	13	13	12	14	13
9	13	13	13	15	13	11	12	12	12	13	13	15	14	16	13	E S 32	15	14	13	12	11	13	13	13
10	14	13	13	13	13	12	14	14	14	16	19	19	20	16	12	14	12	14	13	13	13	13	15	13
11	13	14	13	13	13	13	14	14	12	13	13	13	17	13	13	13	17	13	11	13	13	13	14	14
12	13	15	12	14	13	12	13	14	14	13	13	14	19	13	13	13	13	13	14	13	13	12	11	13
13	13	12	13	13	12	14	13	14	16	13	20	16	15	16	14	14	C	C	14	13	15	14	13	13
14	13	13	12	12	13	15	13	17	14	15	14	16	16	16	13	15	12	13	13	14	13	S	13	14
15	13	13	14	14	11	13	13	13	13	14	14	14	15	C	13	14	19	13	14	14	14	14	14	13
16	13	13	13	11	14	13	13	13	15	14	13	13	14	14	13	14	14	14	14	12	13	12	13	13
17	13	12	13	12	12	14	13	13	14	13	15	15	17	16	15	14	17	14	13	13	12	12	12	13
18	12	13	13	12	13	13	13	14	15	15	15	15	18	19	15	15	13	14	12	14	11	13	13	13
19	13	13	14	13	13	14	14	17	15	13	14	16	17	15	15	15	13	14	14	11	14	14	12	13
20	13	12	13	15	14	14	13	13	14	13	16	19	16	15	13	16	15	14	14	13	13	13	14	13
21	14	14	14	12	12	13	14	13	15	16	16	19	17	17	15	14	14	14	12	16	14	14	13	14
22	13	12	12	13	13	12	15	16	14	14	18	14	16	14	15	14	13	11	13	13	12	14	15	14
23	14	14	13	14	15	13	14	16	14	16	18	21	19	18	17	17	15	12	15	13	13	14	12	14
24	13	13	12	12	13	13	14	16	17	18	25	25	25	23	18	15	13	13	13	13	13	14	13	13
25	14	14	12	12	12	13	13	17	15	15	17	21	21	20	17	16	15	13	13	14	13	13	13	13
26	13	14	14	14	14	12	14	15	13	13	12	19	20	19	15	14	13	14	14	11	14	13	14	12
27	13	13	14	13	14	12	14	16	14	15	16	21	20	20	20	13	14	15	14	15	14	15	12	12
28	14	14	12	12	13	14	14	13	16	15	18	16	33	14	13	13	14	14	12	13	14	13	13	14
29	14	14	12	11	15	14	13	16	14	15	15	21	20	15	16	13	13	14	12	14	13	12	14	13
30	13	14	14	12	13	13	15	14	14	13	16	21	26	20	14	19	15	14	13	13	14	14	14	14
31	13	13	14	13	14	14	15	17	15	13	15	20	27	20	17	16	12	12	15	15	12	14	15	12
	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	31	31	31	31	30	31	31	30	30	31	31	31	30	31	31
MED	13	13	13	13	13	13	13	14	14	14	15	16	17	16	14	14	14	14	13	13	13	13	13	13
U Q	14	14	14	14	14	14	14	16	15	15	17	20	20	19	15	16	15	14	14	14	14	14	14	13
L Q	13	13	12	12	12	12	13	13	13	13	13	14	15	14	13	13	13	13	12	13	13	13	13	12

DEC. 1993 FMIN (0.1MHZ) COMMUNICATIONS RESEARCH LABORATORY, JAPAN

IONOSPHERIC DATA STATION KOKUBUNJI

DEC. 1993 M(3000)F2 (0.01) 135°E MEAN TIME (G.M.T. + 9H)

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	295	J R 310	310	F 300	325	320	350	360	365	365	370	340	340	320	355	360	375	330	345	325	320	310	J R 290	275
2	305	320	285	295	295	290	290	F 335	295	325	345	H 315	330	340	325	350	355	330	325	315	330	S 295	275	295
3	A	285	280	300	295	295	A	335	350	340	325	340	335	325	340	I S 340	345	340	330	320	350	285	320	340
4	A	A	290	275	280	305	335	345	355	350	355	355	325	340	355	370	365	340	375	330	F 320	F 335	305	290
5	320	290	295	310	300	A 320	350	365	365	350	335	340	345	355	340	380	360	345	335	330	330	345	285	295
6	280	J R 295	300	315	305	305	335	355	355	355	350	360	350	360	370	360	360	340	335	360	I S 360	365	290	F 275
7	295	300	315	340	320	295	315	345	365	375	340	360	350	350	350	350	370	350	360	320	330	350	325	280
8	285	270	280	F 325	F 335	F 325	F 335	330	315	355	335	345	340	330	335	340	340	330	335	325	370	300	285	290
9	285	300	315	270	285	290	325	360	325	355	330	340	340	335	360	S	385	345	310	350	340	315	330	315
10	305	295	V 300	310	305	315	320	380	380	370	360	365	365	355	360	380	365	355	330	345	325	330	345	280
11	280	300	300	280	305	330	325	370	390	350	325	305	345	340	360	355	355	340	320	330	335	335	270	290
12	300	285	305	315	340	320	340	350	370	355	350	335	365	370	345	360	395	350	305	330	365	375	275	295
13	290	280	300	315	355	295	310	340	360	355	350	370	365	355	345	355	C	C	350	360	340	295	V 285	310
14	F 315	295	305	320	315	330	330	360	J R 345	345	320	365	350	355	355	355	350	355	360	360	300	S	295	310
15	300	310	295	320	335	310	320	340	360	330	H 360	365	335	I C 340	350	360	365	375	345	350	315	310	295	285
16	270	285	315	390	R 285	295	335	355	370	340	345	355	350	340	355	H 330	355	345	320	355	340	270	270	305
17	320	290	290	330	355	295	F 365	350	360	345	365	320	315	340	340	365	355	330	325	320	320	290	320	295
18	325	290	335	315	320	315	370	355	345	335	Z 345	360	350	350	345	350	365	340	325	335	345	340	260	290
19	290	290	310	325	320	295	330	370	365	370	345	H 340	340	370	365	370	370	350	330	345	335	290	315	310
20	310	315	310	300	305	310	345	375	380	355	345	355	360	340	330	350	360	350	325	360	350	320	F 310	J R 315
21	305	295	F 290	345	V 335	F 295	335	355	340	330	350	340	370	340	A	320	335	330	345	345	320	A	A	285
22	355	310	340	310	F 300	295	365	365	355	320	350	360	315	355	350	345	370	320	310	360	385	280	300	295
23	335	295	320	305	300	325	335	355	345	335	340	365	H 365	V 330	365	355	360	355	330	360	360	285	290	300
24	325	335	310	295	280	290	340	360	300	355	325	350	345	375	345	320	360	340	335	305	380	340	295	320
25	340	F 300	F 265	F 290	320	310	315	365	375	365	330	345	H 325	355	335	355	375	355	340	335	320	360	295	300
26	305	290	310	290	295	295	320	360	380	350	365	345	355	340	350	370	370	335	325	345	325	300	310	315
27	305	J R 330	290	300	325	305	320	340	355	350	355	365	370	350	345	330	370	320	350	335	320	A	295	270
28	295	310	335	370	280	295	310	355	345	340	355	355	350	360	335	345	360	325	340	375	330	330	295	305
29	295	310	310	310	305	325	315	360	380	360	355	365	360	335	335	350	355	325	315	375	325	J R 305	295	285
30	290	300	330	355	300	290	310	355	370	370	350	350	355	350	335	350	365	325	335	340	355	285	300	325
31	295	310	340	325	310	310	320	350	355	350	350	340	350	320	350	365	365	325	A	A	365	265	275	305
	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
CNT	29	30	31	31	31	31	30	31	31	31	31	31	31	31	30	30	30	30	30	30	31	28	30	31
MED	300	298	305	310	305	305	330	355	360	350	350	350	350	340	348	355	362	340	332	342	335	310	295	295
U Q	318	310	315	325	325	320	340	360	370	355	355	360	360	355	355	360	370	350	345	360	355	338	310	310
L Q	290	290	290	300	295	295	320	345	345	340	335	340	340	340	340	345	355	330	325	330	320	290	285	285

DEC. 1993 M(3000)F2 (0.01) COMMUNICATIONS RESEARCH LABORATORY, JAPAN

IONOSPHERIC DATA STATION KOKUBUNJI

DEC. 1993 M(3000)F1 (0.01) 135°E MEAN TIME (G.M.T. + 9H)

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	L	U L 390												
2									L	L	L	A	L	L										
3											L	L	L	L	L									
4									L	U L 370	L	L	L	L	L	L								
5									L 415	L	A	A	L	A	A									
6											L 380	U L 365	L	L	L									
7										L		U L 370	U L 370	L	L									
8									L	L	L	L	L	L										
9											L	A	L	A	A	S								
10										L	L	L	L	L										
11												L	L	L	L	L								
12											L	L	U L 380	U L 390	L									
13										L	L	U L 365	L	U L 385			C							
14									420	L 415	L	L	L	U L 400	L									
15										L	U L 395	L 355	U L 390	C	L	L								
16									L			U L 360	U L 370	L	L	L								
17									L	U L 415	U L 405	U L 375	L	L	L									
18										L	U L 390	U L 395	L 375	A	U L 375									
19										L	U L 370	L 380	L	L	L									
20											L	L	U L 360	U L 365	L									
21										L	L	U L 370	L	U L 370	A									
22										L	L	L	L	U L 375	L									
23									L	L	L	L	L	L	L									
24										L	L	L	U L 405	415	L 430									
25										L	L	L	L	U L 385	U L 335									
26									L	L	L	L	A	L	L	L								
27										L	L	L	L	L	L									
28										L	L	U L 380	L	L		A								
29											L	L	L	L	L	L								
30											L	L	U L 380	L										
31											L	U L 390	U L 365	L	L									
	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
CNT									2	3	5	12	9	8	3									
MED									418	U L 415	U L 390	U L 372	U L 375	U L 385	U L 375									
U Q										U L 415	U L 400	U L 385	U L 385	U L 395	L 430									
L Q										U L 370	L 375	U L 365	U L 368	U L 372	U L 335									

DEC. 1993 M(3000)F1 (0.01) COMMUNICATIONS RESEARCH LABORATORY, JAPAN

IONOSPHERIC DATA STATION KOKUBUNJI

DEC. 1993 H'F2 (KM) 135°E MEAN TIME (G.M.T. + 9H)

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										235	230	255												
2									290	260	225	235	255	235										
3											270	235	235	240	235									
4									220	240	230	230	275	245	235	210								
5									215	235	A 250	240	240	A	260									
6											250	240	235	220	225									
7										220		235	235	240	230									
8									250	225	235	240	240	250										
9											255	245	235	A 265	230	S								
10										220	240	230	215	225										
11												265	240	240	215	220								
12											240	250	245	220	240									
13										230	250	225	230	230			C							
14									210	240	250	235	230	235	240									
15										235	220	240	260	I C 250	235	220								
16									225			250	240	255	240	230								
17									230	240	230	250	280	240	250									
18										275	235	235	250	E A 250	240									
19										225	240	250	240	230	220									
20											250	250	245	255	250									
21										270	255	255	230	270	A									
22										275	245	230	255	245	240									
23									250	255	255	230	220	250	220									
24										235	270	235	225	225	245									
25										240	265	250	H 220	225	255									
26									210	225	220	230	A 250	250	245	220								
27										230	240	230	220	240	245									
28										240	240	235	235	235		A 260								
29											245	240	235	255	245	235								
30											240	240	240	230										
31										240	245	240	240	230	240									
	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									9	22	28	31	30	29	23	7								
MED									225	238	242	240	240	240	240	220								
U Q									250	240	250	250	245	250	245	235								
L Q									212	230	235	235	230	230	230	220								

DEC. 1993 H'F2 (KM) COMMUNICATIONS RESEARCH LABORATORY, JAPAN

IONOSPHERIC DATA STATION KOKUBUNJI

DEC. 1993 H'F (KM) 135°E MEAN TIME (G.M.T. + 9H)

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	295	275	290	270	240	265	220	215	230	225	225	215	230	240	240	225	220	210	230	235	225	270	310	335
2	285	265	320	305	335	325	280	240	230	A 250	230	A	230	A 240	230	235	215	235	240	255	A 265	E A 340	330	300
3	A	300	310	290	290	300	A	255	215	A 250	A 250	225	215	210	225	235	225	220	230	250	235	320	260	230
4	A	A 295	335	315	280	250	250	225	215	235	220	215	230	230	220	215	215	210	250	265	290	345	365
5	310	290	300	305	300	E A 325	230	215	205	225	A	A	225	A	A	215	210	210	220	250	240	240	E B 310	E A 375
6	340	A	280	260	215	270	240	230	225	220	210	210	215	220	240	215	220	210	270	A 255	320	215	290	385
7	310	290	260	240	270	320	290	230	210	220	225	220	220	220	A	225	210	220	235	245	250	235	270	305
8	310	360	325	280	235	250	250	250	225	H 205	210	215	220	200	240	230	235	225	245	230	210	275	345	295
9	305	290	265	355	335	310	250	215	230	230	215	A	A 240	A	A	S	220	230	280	250	235	250	250	280
10	270	305	310	275	265	270	250	205	215	220	225	215	210	210	235	220	220	210	235	225	230	260	290	325
11	320	310	290	310	265	235	235	220	205	215	230	A 230	235	235	220	225	215	200	220	235	250	245	335	325
12	305	315	305	280	235	240	255	230	225	220	230	220	A 235	215	230	220	210	220	270	250	210	205	A 290	310
13	300	305	305	260	220	285	280	235	240	225	235	220	220	205	230	225	I C 220	I C 235	220	215	225	270	310	285
14	290	335	290	260	240	255	250	230	200	210	210	H 215	225	205	235	220	210	215	215	215	E B 285	S	300	305
15	285	300	290	265	225	275	250	220	230	225	210	210	210	I C 195	215	230	220	200	230	220	270	270	305	320
16	345	330	255	195	360	H 330	320	230	230	230	245	230	215	205	230	215	225	215	235	220	235	360	385	295
17	260	295	305	265	210	300	260	235	220	205	205	200	205	225	215	230	220	210	250	260	250	280	280	285
18	290	305	260	260	255	285	215	220	220	240	225	230	210	A	210	240	220	220	245	230	230	245	350	300
19	320	330	305	255	265	280	240	215	215	235	220	210	205	H 200	220	230	215	215	235	240	230	285	285	275
20	280	280	270	270	260	280	245	215	210	225	225	230	210	200	230	245	220	235	250	220	220	240	305	290
21	280	325	305	250	250	315	E B 270	220	220	240	240	210	A 240	210	A	245	225	A 250	235	225	B 240	A	A	340
22	240	275	255	270	340	295	225	220	230	235	230	220	215	215	215	230	210	205	230	235	210	E B 315	310	295
23	235	A 335	270	270	280	280	225	230	220	235	220	A	225	220	220	220	220	215	225	A 230	230	A 335	A 340	300
24	240	245	270	260	310	310	225	220	H 215	225	245	240	210	190	205	240	210	230	270	265	205	E B 250	295	260
25	250	330	335	295	275	270	260	220	220	205	225	H 200	200	200	190	230	215	215	225	235	260	245	275	265
26	285	310	290	285	305	300	265	225	210	220	220	215	A	A 240	E A 240	230	210	190	240	225	240	260	305	275
27	295	300	305	250	265	270	275	235	230	210	235	A 240	230	A 240	205	230	210	A 270	240	220	265	A	305	355
28	310	295	A 265	220	315	E A 360	275	240	225	230	235	225	225	230	A 250	A	A 235	230	250	210	260	260	290	285
29	305	290	290	265	270	265	260	220	220	230	A	230	225	215	230	245	H 220	225	255	220	230	265	315	310
30	320	295	260	230	230	305	280	230	220	220	230	225	220	215	E A 260	235	A 235	A 255	240	220	220	270	295	270
31	300	290	240	250	265	285	270	235	220	235	220	220	220	220	235	230	215	235	A	A	E A 255	A	E A 380	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	29	29	31	31	31	31	30	31	31	31	29	27	30	28	27	29	31	31	30	30	31	27	30	31
MED	295	300	290	265	265	282	250	230	220	225	225	220	220	215	230	230	220	220	235	232	235	262	304	298
U Q	310	320	305	285	305	310	270	235	230	235	235	230	225	228	235	235	220	230	250	250	260	285	330	325
L Q	280	290	265	255	240	270	240	220	215	220	220	215	210	205	215	220	210	210	230	220	225	245	290	280

DEC. 1993 H'F (KM) COMMUNICATIONS RESEARCH LABORATORY, JAPAN

IONOSPHERIC DATA STATION KOKUBUNJI

DEC. 1993 H'E (KM) 135°E MEAN TIME (G.M.T. + 9H)

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 155	120	A 120	B	B	130	B	B 130	B	B							
2								A	A	A	A	A	A	A	A	A	A							
3								A	A	A	A	A	A	A 130	A	S	A							
4								170	A	A	A	A	A	A	A	A	B							
5								A	A 125	A	110	A	A	A	A	A	125							
6								A	A	A	A	A	A 130	A	A 120	A	150							
7								130	A 120	A 115	A	A	A	A	A	A	A							
8								130	A 125	A	A	A	A	A	A	A	A							
9								140	A	A	A	A	A	A	A	S	A							
10								130	120	115	120	115	A	A	E A 150	A	A							
11								150	120	110	110	A	A	A 130	120	120	B							
12								E B 160	A 135	115	A 130	A 130	A	A	A	115	A							
13								A	130	120	125	A 120	A	120	A	A	C							
14								B	120	115	A	A 125	A 130	115	110	A 130	120							
15								130	120	110	115	115	120	I C 115	120	120	B							
16								150	125	A 140	120	A	A 125	115	120	125	B							
17								125	120	A	A 130	120	120	E A 145	A 120	120	B							
18								145	120	120	A	A 135	A	A	A	A	A							
19								B	120	E A 145	A	A	A	115	120	120	E B 165							
20								130	120	120	A	A	115	A	A 125	120	A							
21								155	125	120	120	A	A	A	A	A	A							
22								B	125	120	A 145	A	A	A 125	120	115	A							
23								B	120	A	A	A	A	A	A 120	130	115							
24								B	125	125	A	A	A	120	A 125	A	E A 130							
25								B	130	120	120	A	A	115	125	120	130							
26								A	125	115	120	A	A	A	A	110	155							
27								B	A 130	120	A 135	120	120	120	120	A	A							
28								B	125	115	A 125	A 120	B	120	A	A	A							
29								B	125	120	120	120	120	120	120	120	115							
30								B	A	A	A	A	A	A	A	A	A							
31								B	120	120	120	A 125	B 120	A	A	A	A							
	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
CNT								14	25	21	16	11	10	14	16	13	9							
MED								136	125	120	120	A 120	120	120	120	120	128							
U Q								155	A 125	120	A 128	A 125	A 130	A 125	A 125	122	152							
L Q								130	120	115	120	120	120	115	120	118	118							

DEC. 1993 H'E (KM) COMMUNICATIONS RESEARCH LABORATORY, JAPAN

IONOSPHERIC DATA STATION KOKUBUNJI

DEC. 1993 H'ES (KM) 135°E MEAN TIME (G.M.T. + 9H)

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	B	B	B	110	G	G	115	B	B	G	B	155	135	125	120	B	105	B	B	B	B
2	S	B	B	B	B	B	B	170	115	105	105	100	120	100	100	95	105	115	130	105	105	105	110	110
3	105	110	120	125	150	B	110	110	110	105	100	105	115	110	110	S	150	B	110	110	110	110	110	125
4	105	105	110	105	105	110	120	G	120	115	115	115	115	115	115	115	180	B	140	120	115	115	115	110
5	110	110	B	B	110	100	105	105	110	120	110	110	110	110	110	110	G	B	105	110	110	110	B	110
6	110	110	110	110	B	145	150	130	115	110	110	110	110	120	100	110	G	110	100	100	S	100	B	B
7	B	B	105	105	100	100	B	145	110	120	115	115	110	110	105	105	105	100	100	100	100	B	B	B
8	105	B	B	B	105	105	110	105	115	120	120	115	110	105	105	110	110	110	105	B	105	155	140	105
9	100	100	110	B	B	110	B	135	115	110	115	105	105	105	100	110	100	100	100	95	95	110	B	B
10	B	B	105	110	110	B	B	G	G	G	145	125	120	115	115	110	110	B	B	110	B	100	110	110
11	105	105	B	110	105	110	B	G	G	120	115	115	115	110	G	G	B	B	B	B	115	120	B	B
12	110	B	110	105	110	110	110	G	115	180	155	140	105	105	105	G	105	105	100	B	B	B	110	115
13	B	B	B	B	B	B	B	145	G	G	155	150	115	G	105	125	C	C	B	B	B	110	110	110
14	105	105	110	110	110	105	100	105	G	G	115	E G 195	115	G	G	110	G	110	105	B	B	S	100	B
15	B	B	B	B	B	110	110	150	G	180	150	130	G	C	150	125	B	B	130	B	B	B	B	120
16	B	B	B	B	125	170	150	170	E G 190	180	160	115	105	G	150	G	165	B	125	B	110	100	100	B
17	B	B	B	115	130	125	155	G	G	120	110	G	G	115	110	G	B	B	110	125	120	120	120	B
18	B	B	120	B	105	B	160	G	G	G	115	115	110	105	110	105	105	B	100	120	115	110	110	110
19	B	B	120	B	B	B	B	B	G	115	115	115	110	G	G	G	G	B	B	125	B	115	120	B
20	110	115	110	B	B	B	150	G	125	120	120	125	G	115	105	G	100	105	105	100	120	B	B	B
21	B	B	B	110	120	120	150	G	170	G	120	115	110	120	100	100	105	100	100	B	B	110	110	110
22	110	110	115	110	B	B	B	B	155	130	120	115	115	115	G	G	110	120	B	110	110	B	110	B
23	125	110	115	110	B	120	B	B	G	120	120	110	115	115	110	160	150	110	105	110	115	115	120	B
24	B	B	110	B	B	B	B	B	G	125	120	120	115	G	110	100	110	95	100	105	B	B	B	B
25	B	B	B	B	B	B	B	B	G	140	125	120	115	G	G	E G 195	G	B	B	B	110	B	B	110
26	B	115	B	105	110	105	105	105	G	185	100	120	110	115	110	150	G	B	105	B	120	105	B	115
27	110	B	135	110	120	110	B	B	120	E G 170	150	130	125	120	125	120	115	110	110	120	115	110	120	B
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	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	14	18	18	19	19	15	12	16	25	29	29	24	22	25	22	20	17	24	19	20	20	18	16
MED	110	110	110	110	110	110	110	132	116	120	120	115	115	115	110	110	110	110	105	110	110	110	110	110
U Q	110	115	115	110	120	120	150	148	125	140	135	125	115	115	118	125	122	115	110	120	115	115	120	112
L Q	105	105	110	110	105	105	110	105	115	115	115	115	110	110	105	105	105	102	100	100	105	105	110	110

IONOSPHERIC DATA STATION KOKUBUNJI

DEC. 1993 TYPES OF ES 135°E MEAN TIME (G.M.T. + 9H)

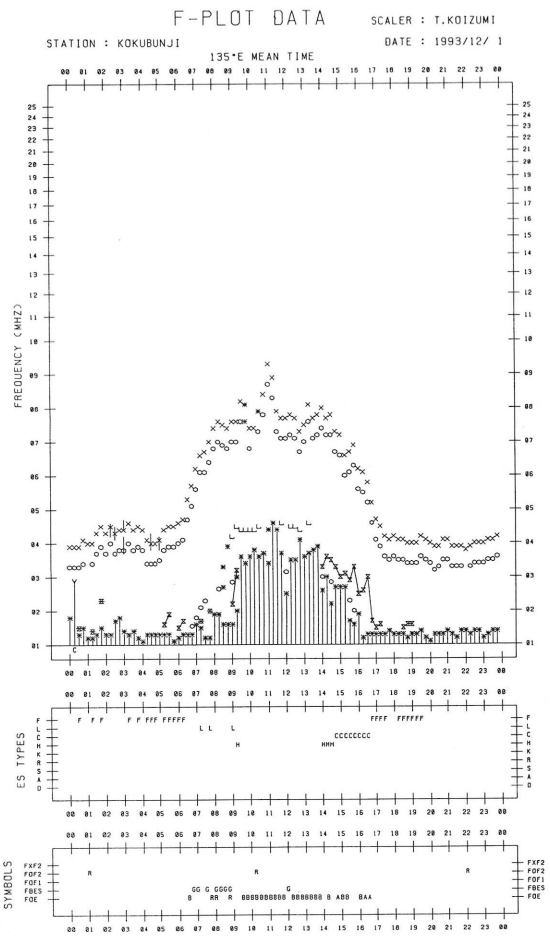
LAT. 35° 42.4'N LON. 139° 29.3'E SWEEP 1.0MHZ TO 25.0MHZ IN 24.0SEC IN MANUAL SCALING

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 1			L 1					H 1	C 1	C 1	F 3		F 1				
2								HL 11	C 2	C 2	L 2	L 3	CL 12	L 2	L 2	L 3	L 1	F 4	FF 12	F 3	F 2	F 3	F 2	F 2
3	F 3	F 2	F 1	F 1	F 1		F 4	C 3	L 3	L 2	L 2	L 2	L 1	L 1	L 1		HL 12		F 2	F 2	F 3	F 1	F 2	FF 13
4	F 4	F 4	F 2	F 1	F 2	F 1	F 1		C 2	C 2	C 1	C 1	C 2	C 2	C 1	C 1	H 1		F 1	F 2	F 2	F 2	F 3	F 3
5	F 1	F 1			F 1	F 4	F 2	L 3	L 2	CL 12	C 4	C 2	L 2	C 3	L 3	L 2			F 1	F 1	F 1	F 2		F 4
6	F 3	F 4	F 2	F 1		F 1	F 1	C 1	L 2	L 3	L 2	L 1	L 1	CL 11	L 1	L 1		F 1	F 3	F 3		F 1		
7			F 1	F 2	F 2	F 2		H 1	L 2	CL 11	C 1	C 1	C 1	C 1	L 3	L 3	L 2	F 1	F 2	F 1	F 2			
8	F 1				F 1	F 1	F 2	LC 11	L 1	CL 11	CL 11	CL 11	L 2	L 2	L 3	L 2	L 2	F 4	F 3		F 1	F 1	F 1	F 2
9	F 2	F 2	F 1			F 1		C 2	C 1	C 2	C 2	L 3	CL 13	L 3	L 4	L 1	L 3	L 2	F 3	F 3	F 1	F 2		
10			F 2	F 1	F 1						H 1	C 1	C 2	CL 11	L 1	L 2	L 2			F 1		F 2	F 1	F 1
11	F 2	F 1		F 1	F 2	F 1				C 2	C 2	C 1	C 1	L 1							F 1	F 1		
12	F 2		F 1	F 2	F 2	F 1	F 1		L 1	H 1	HL 11	HL 11	L 2	L 2	L 2		L 2	F 1	F 1				F 2	F 1
13								C 2			HL 11	HL 11	C 2		L 2	CL 12						F 2	F 2	F 2
14	F 2	F 3	F 1	F 2	F 2	F 3	F 1	L 1			L 1	HL 11	L 1			L 1		F 1	F 1				F 1	
15						F 1	F 1	H 1		H 1	H 1	H 1			HL 11	C 1			F 1					F 1
16					F 1	F 1	F 2	H 1	H 1	HL 11	H 1	L 2	L 1		H 1		H 1		F 1		F 1	F 2	F 2	
17				F 1	F 1	F 1	F 1			L 1	L 1			L 1	L 1				F 1	F 1	F 1	F 1	F 1	
18			F 1		F 1		F 1				LH 11	L 1	L 1	L 3	L 2	L 2	L 2		F 2	F 1	F 1	F 2	F 2	F 2
19			FF 11							L 2	L 1	L 1	L 1							F 1		F 2	F 2	
20	F 1	F 1	F 1				F 1		C 1	C 1	C 1	C 1		L 2	L 2		L 3	F 3	F 2	F 1	F 1			
21				F 3	F 2	F 1	F 1		H 1		C 2	C 2	L 2	CL 12	L 3	L 3	L 3	F 3	F 2			F 5	F 5	F 4
22	F 2	F 1	F 2	F 2					H 1	C 1	L 1	L 1	L 1	L 1			L 1	F 1		F 2	F 1		F 1	
23	F 1	F 3	F 2	F 2		F 2				L 1	L 1	L 2	L 1	L 1	L 1	H 1	HL 11	F 1	F 1	F 3	F 3	F 3	FF 33	
24			F 2							C 1	C 1	C 1	L 1		L 1	L 3	L 2	F 3	F 2	F 2				
25										H 1	C 1	C 1	L 1			H 1					F 1			F 3
26		F 2		F 3	F 2	F 4	F 2	L 1		HL 11	L 1	L 2	L 3	L 2	L 2	H 1			F 2		F 1	F 2		F 4
27	F 1		FF 11	F 1	F 1	F 1			L 1	H 1	HL 11	H 2	C 2	C 1	C 1	C 2	L 3	F 3	F 4	F 1	F 2	F 4	F 2	
28	F 2	F 2	F 5	F 2	F 3	F 4					HL 11	HL 12		HL 11	CL 31	CL 42	CL 32	F 1	F 3	F 2	F 3	F 2	F 2	F 1
29	F 1	F 1	F 1	F 2	F 1					H 1	C 2	C 1							F 1		F 2			F 2
30	FR 11	F 1	F 1	F 3	F 1	F 2			L 2	C 2	CL 12	C 1	C 1	L 1	L 2	L 4	L 4	FF 13	F 2					
31	F 1			F 1	F 1	F 1			C 1	C 1		L 1		L 1	L 2	L 1	C 1	F 2	F 5	F 5	F 3	F 3	F 3	F 2
	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
CNT																								
MED																								
U Q																								
L Q																								

DEC. 1993 TYPES OF ES COMMUNICATIONS RESEARCH LABORATORY, JAPAN

f-PLOTS OF IONOSPHERIC DATA

KEY OF F-PLOT	
I	SPREAD
○	FOF2, FOF1, FOE
×	FXF2
✳	DOUBTFUL FOF2, FOF1, FOE
⧖	FBES
⌊	ESTIMATED FOF1
*, Y	FMIN
∧	GREATER THAN
∨	LESS THAN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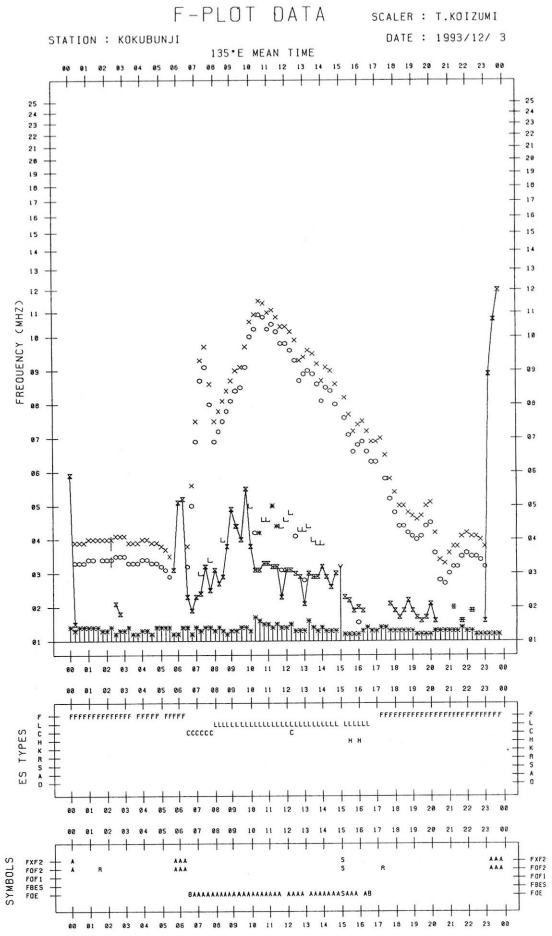
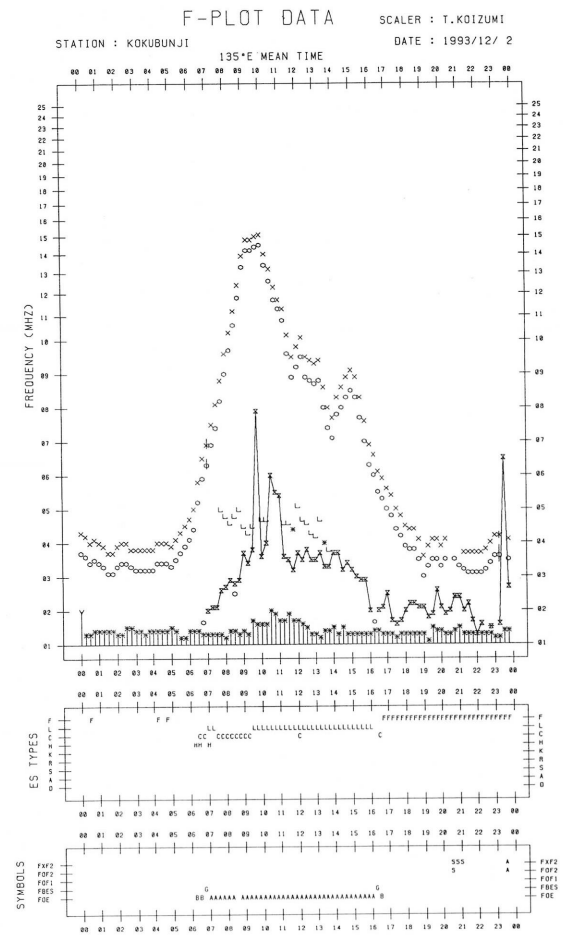
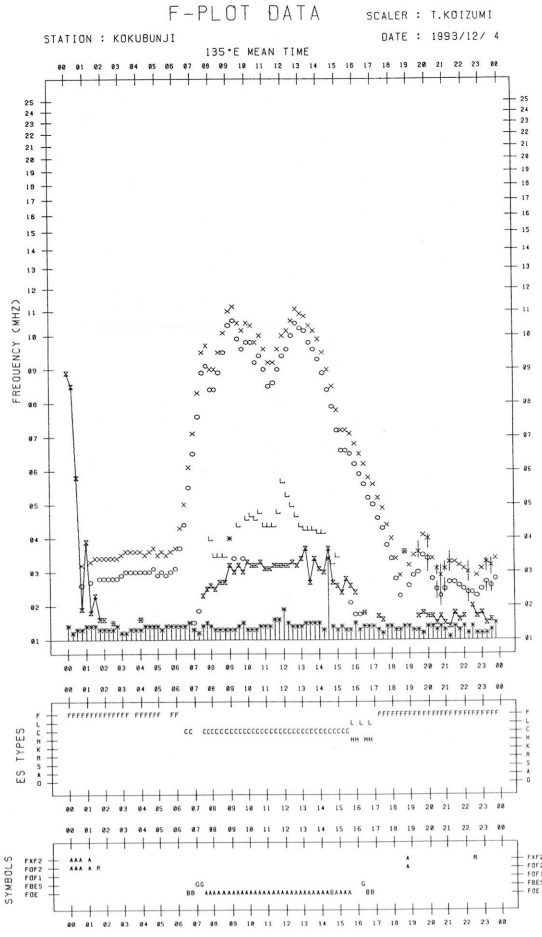
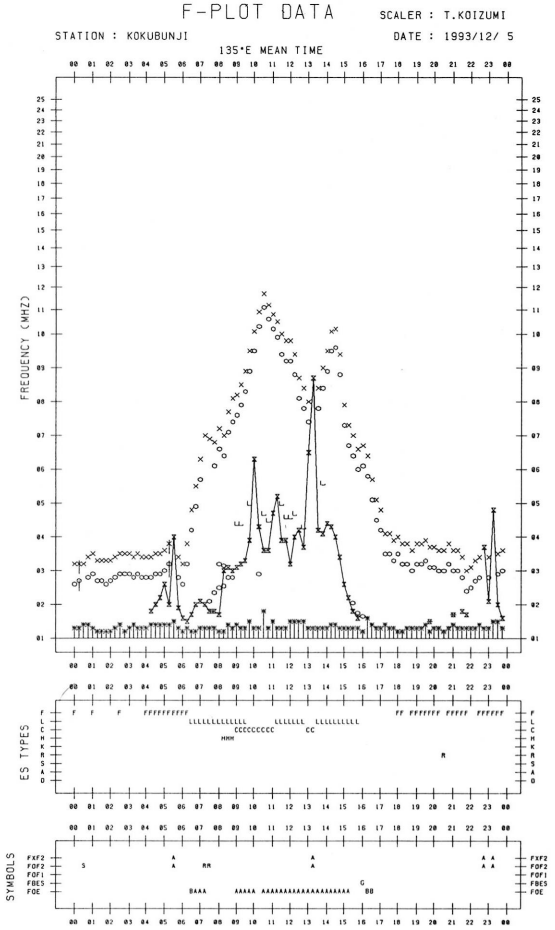
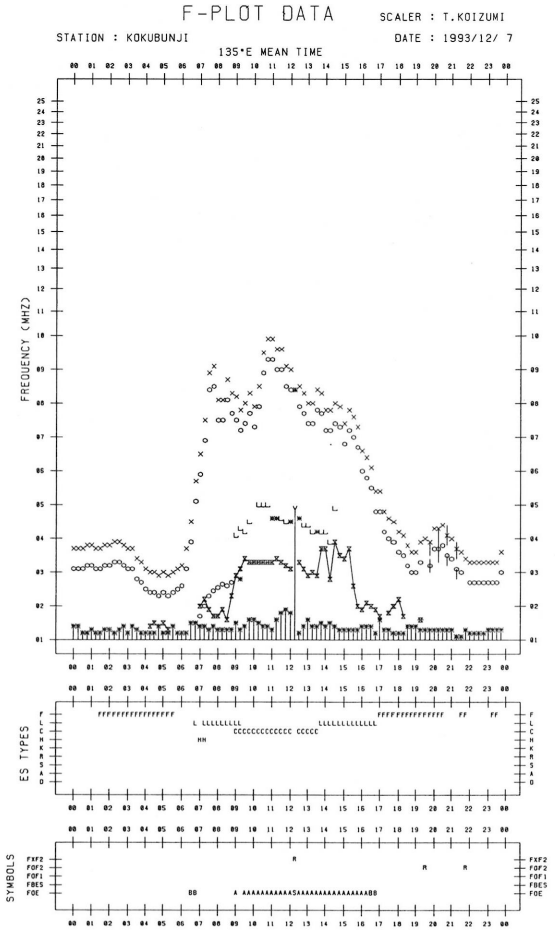
SCALER : T.KOIZUMI
STATION : KOKUBUNJI
DATE : 1993/12/ 1
135°E MEAN TIME
FREQUENCY (MHZ)
ES TYPES
SYMBOLS
FXF2
FOF2
FOF1
FBES
FOE


F-PLOT DATA
SCALER : T.KOIZUMI
STATION : KOKUBUNJI
DATE : 1993/12/ 3
135°E MEAN TIME
FREQUENCY (MHZ)
ES TYPES
SYMBOLS
FXF2
FOF2
FOF1
FBES
FOE


F-PLOT DATA
SCALER : T.KOIZUMI
STATION : KOKUBUNJI
DATE : 1993/12/ 2
135°E MEAN TIME
FREQUENCY (MHZ)
ES TYPES
SYMBOLS
FXF2
FOF2
FOF1
FBES
FOE


F-PLOT DATA
SCALER : T.KOIZUMI
STATION : KOKUBUNJI
DATE : 1993/12/ 4
135°E MEAN TIME
FREQUENCY (MHZ)
ES TYPES
SYMBOLS
FXF2
FOF2
FOF1
FBES
FOE


F-PLOT DATA
SCALER : T.KOIZUMI
STATION : KOKUBUNJI
DATE : 1993/12/ 5
135°E MEAN TIME
FREQUENCY (MHZ)
ES TYPES
SYMBOLS
FXF2
FOF2
FOF1
FBES
FOE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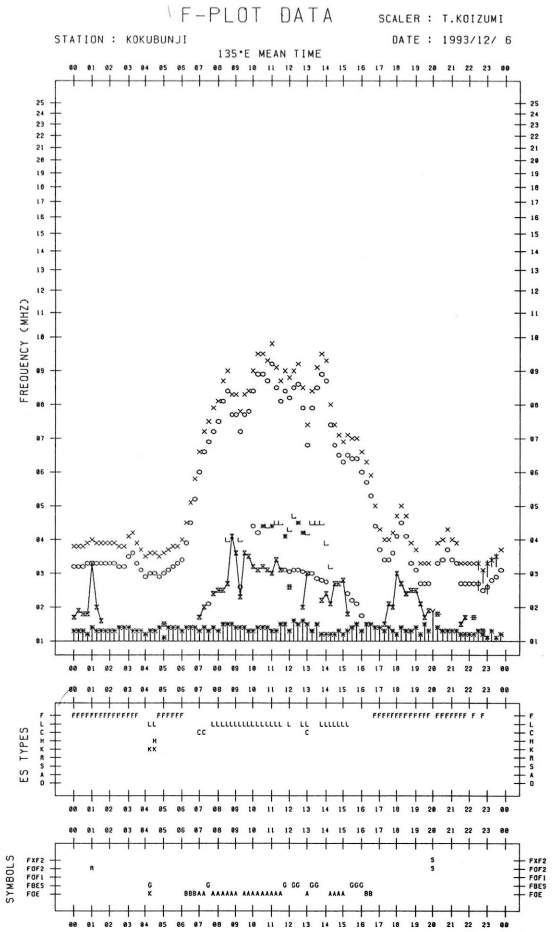
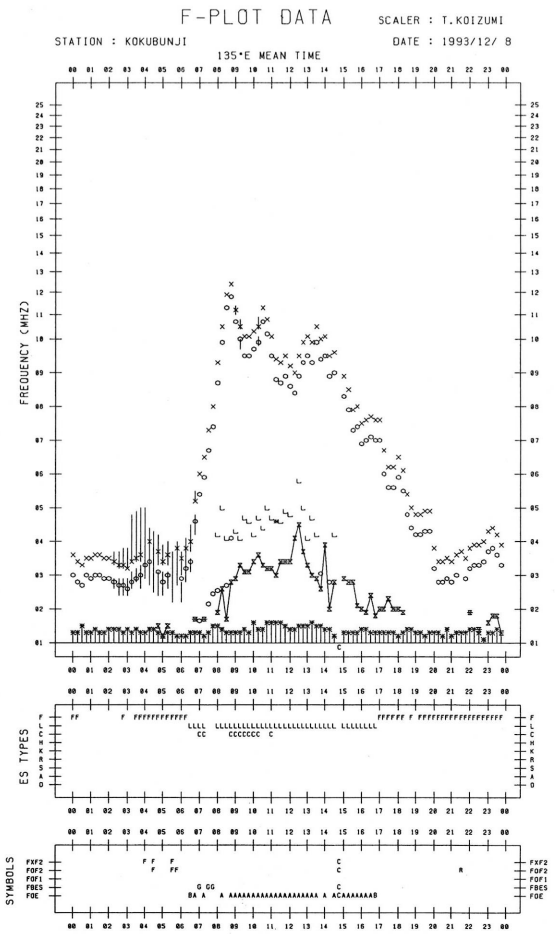
STATION : KOKUBUNJI
DATE : 1993/12/ 7
135°E MEAN TIME
FREQUENCY (MHZ)
ES TYPES
SYMBOLS
FXF2
FOF2
FOF1
FBES
FOE


F-PLOT DATA
SCALER : T.KOIZUMI
STATION : KOKUBUNJI
DATE : 1993/12/ 6
135°E MEAN TIME
FREQUENCY (MHZ)
ES TYPES
SYMBOLS
FXF2
FOF2
FOF1
FBES
FOE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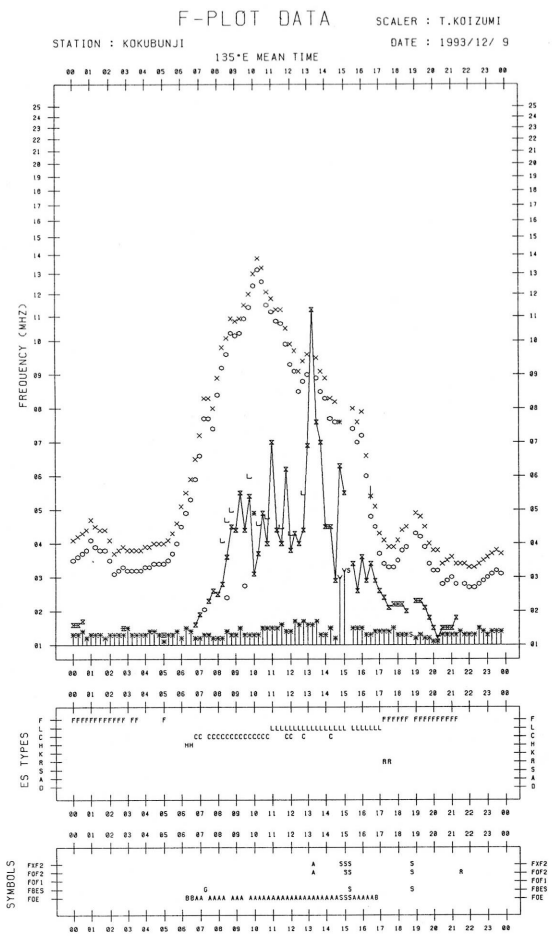
STATION : KOKUBUNJI
DATE : 1993/12/ 8
135°E MEAN TIME
FREQUENCY (MHZ)
ES TYPES
SYMBOLS
FXF2
FOF2
FOF1
FBES
FOE


F-PLOT DATA
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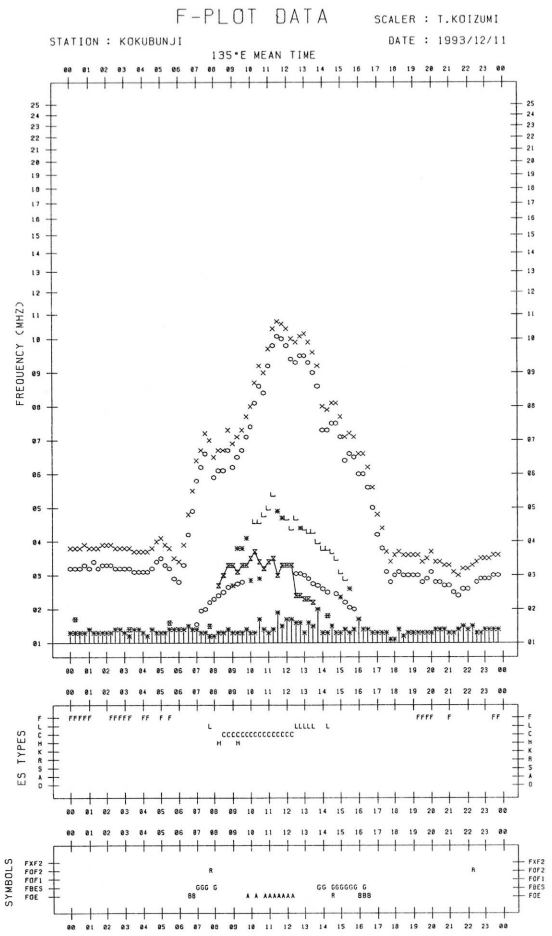
STATION : KOKUBUNJI
DATE : 1993/12/ 9
135°E MEAN TIME
FREQUENCY (MHZ)
ES TYPES
SYMBOLS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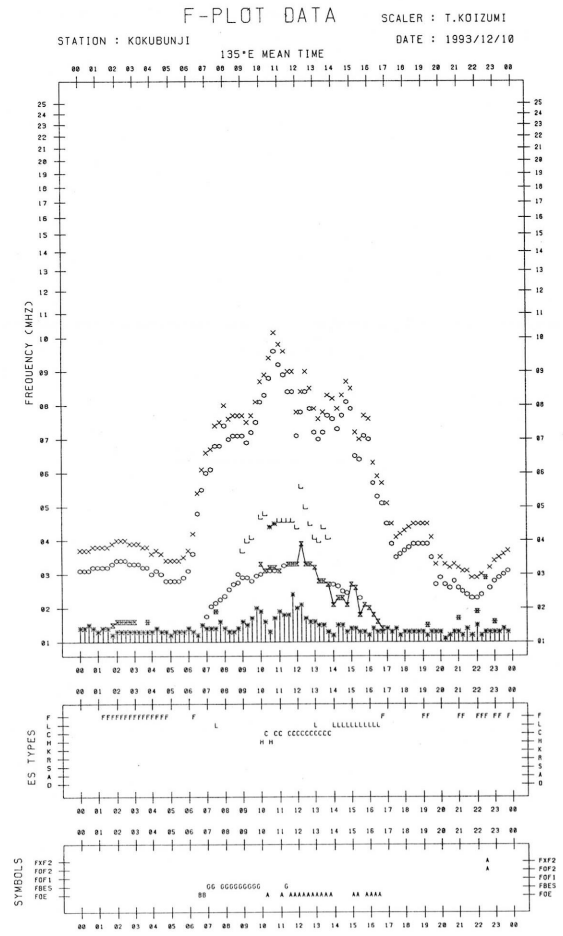
STATION : KOKUBUNJI
DATE : 1993/12/11
135°E MEAN TIME
FREQUENCY (MHZ)
ES TYPES
SYMBOLS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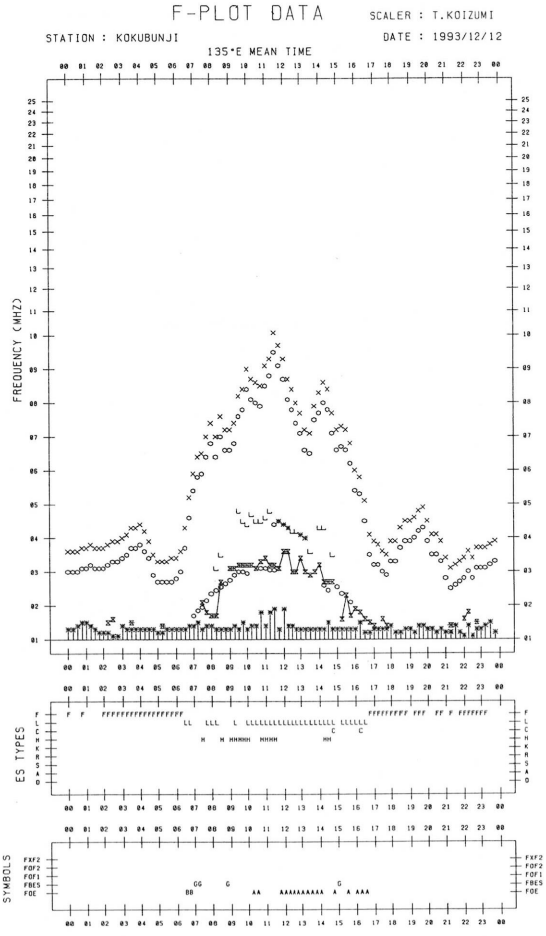
STATION : KOKUBUNJI
DATE : 1993/12/10
135°E MEAN TIME
FREQUENCY (MHZ)
ES TYPES
SYMBOLS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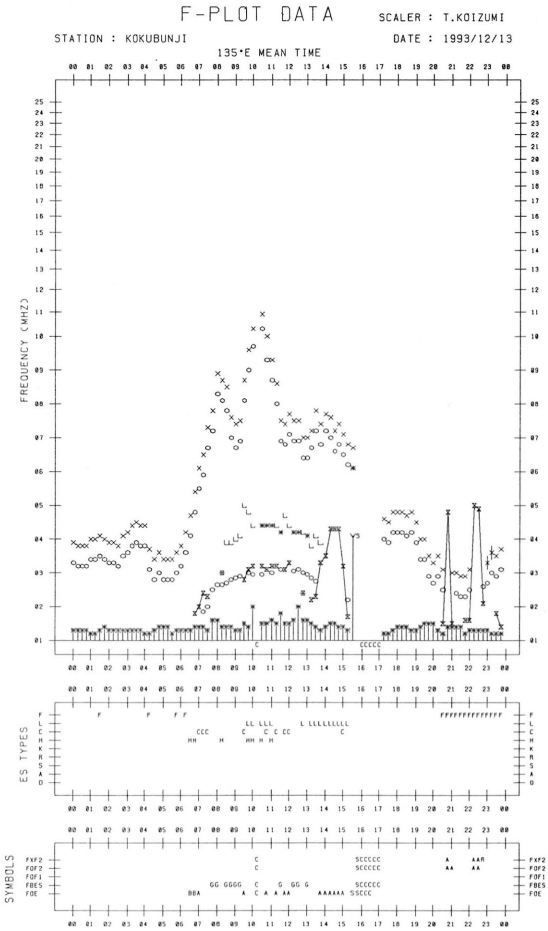
STATION : KOKUBUNJI
DATE : 1993/12/12
135°E MEAN TIME
FREQUENCY (MHZ)
ES TYPES
SYMBOLS


F-PLOT DATA
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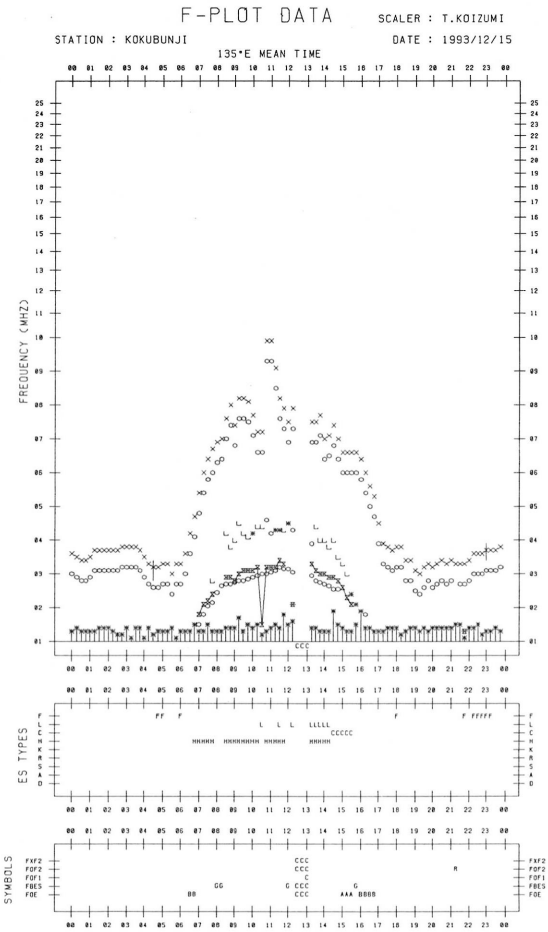
STATION : KOKUBUNJI
DATE : 1993/12/13
135°E MEAN TIME
FREQUENCY (MHZ)
ES TYPES
SYMBOLS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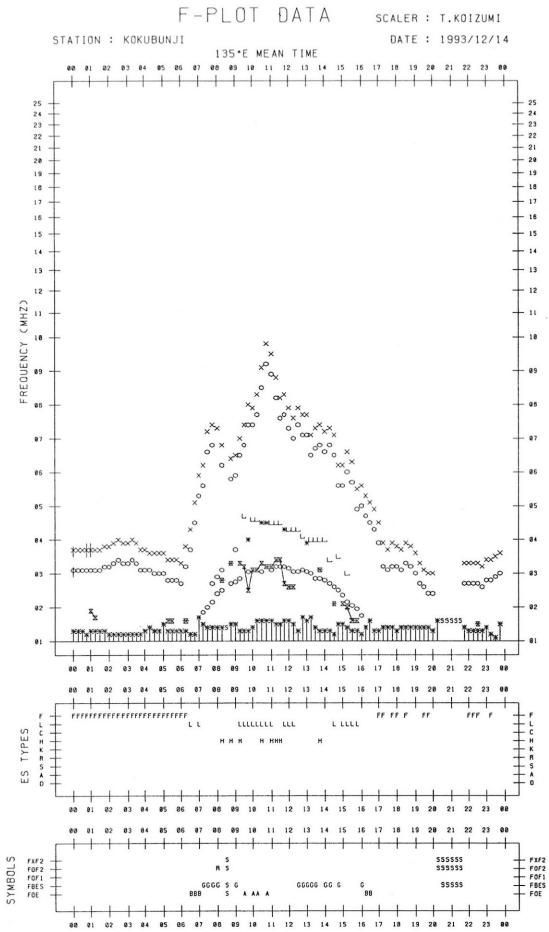
STATION : KOKUBUNJI
DATE : 1993/12/15
135°E MEAN TIME
FREQUENCY (MHZ)
ES TYPES
SYMBOLS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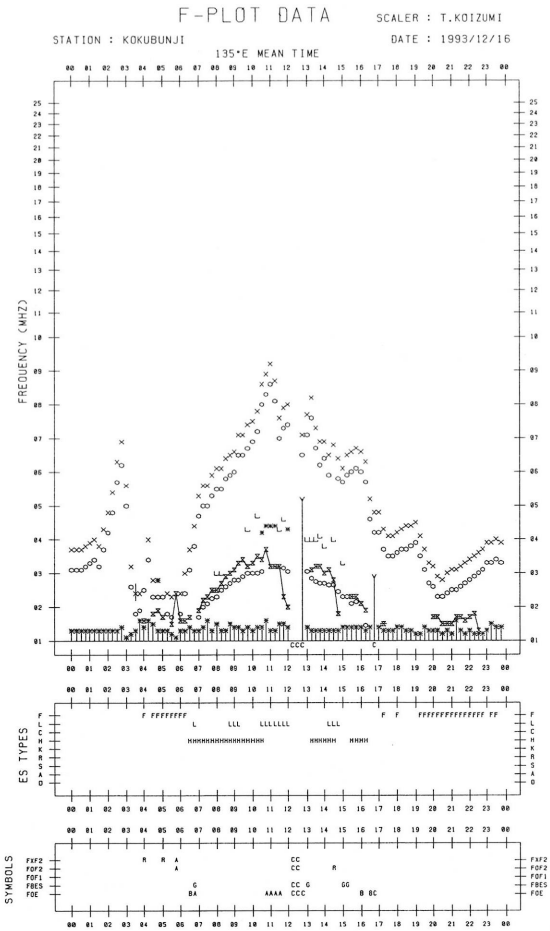
STATION : KOKUBUNJI
DATE : 1993/12/14
135°E MEAN TIME
FREQUENCY (MHZ)
ES TYPES
SYMBOLS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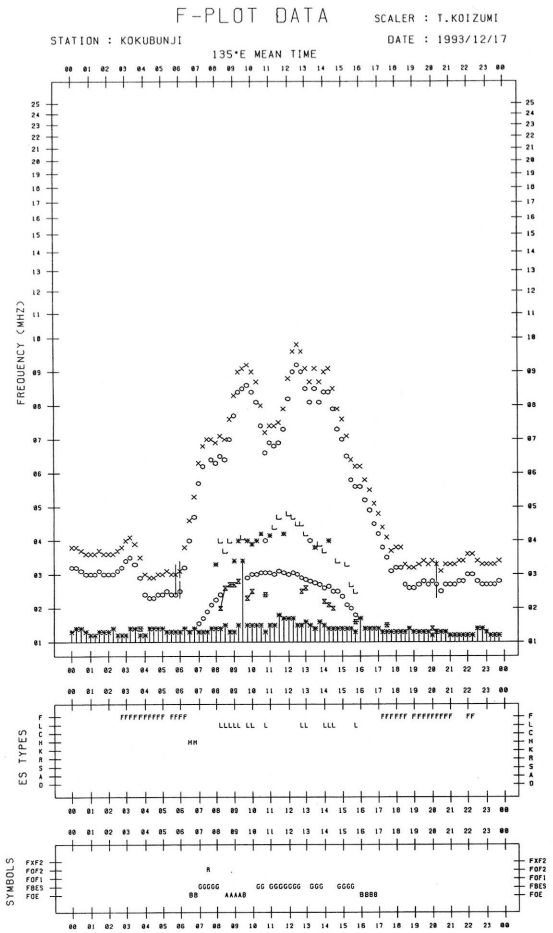
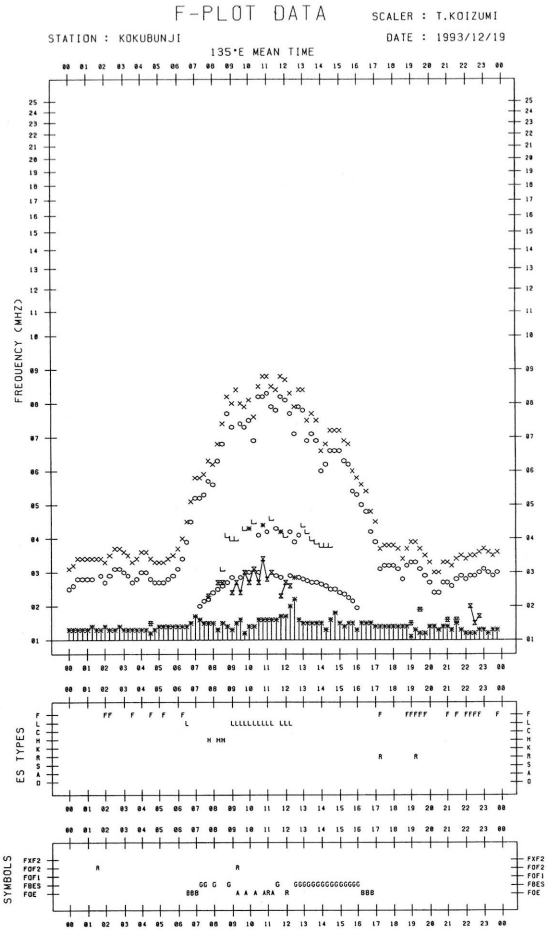
STATION : KOKUBUNJI
DATE : 1993/12/16
135°E MEAN TIME
FREQUENCY (MHZ)
ES TYPES
SYMBOLS


F-PLOT DATA
SCALER : T.KOIZUMI
STATION : KOKUBUNJI
DATE : 1993/12/17
135°E MEAN TIME
FREQUENCY (MHZ)
ES TYPES
SYMBOLS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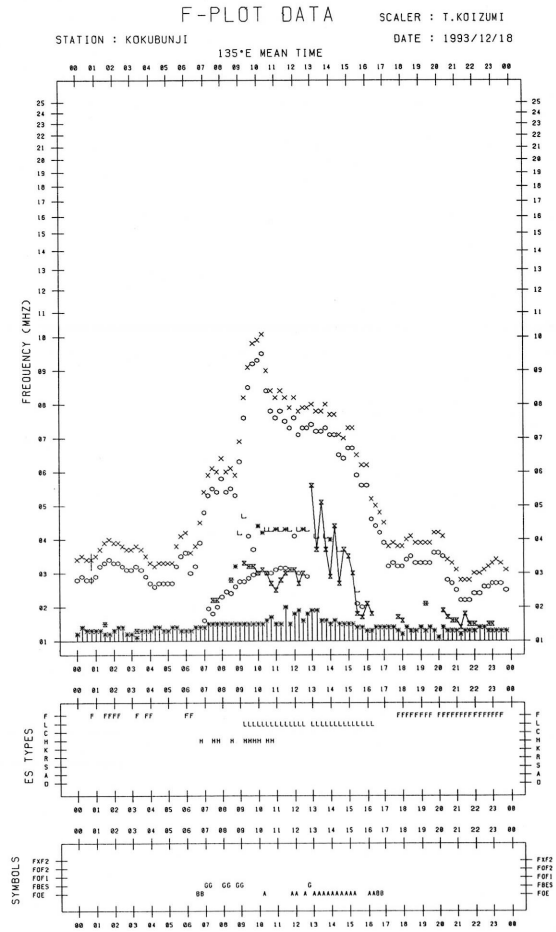
STATION : KOKUBUNJI
DATE : 1993/12/19
135°E MEAN TIME
FREQUENCY (MHZ)
ES TYPES
SYMBOLS


F-PLOT DATA
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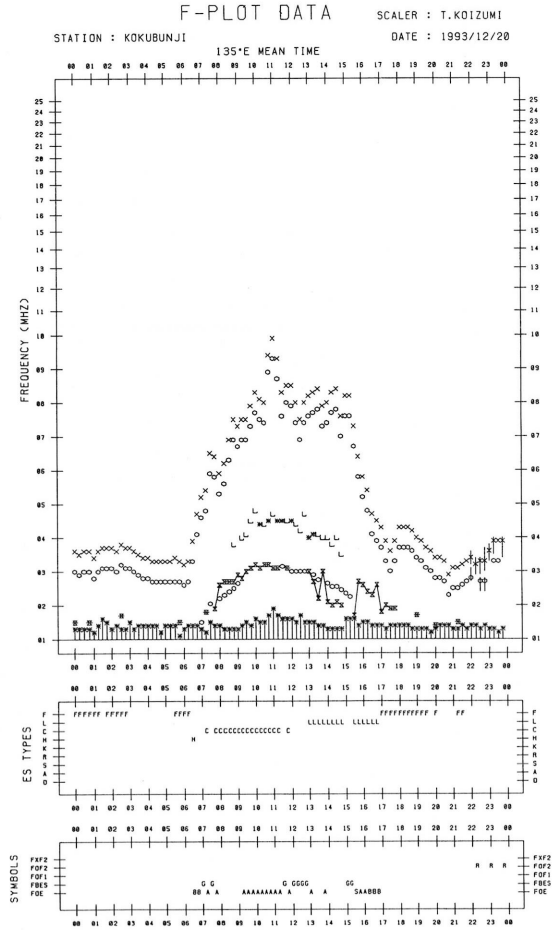
STATION : KOKUBUNJI
DATE : 1993/12/18
135°E MEAN TIME
FREQUENCY (MHZ)
ES TYPES
SYMBOLS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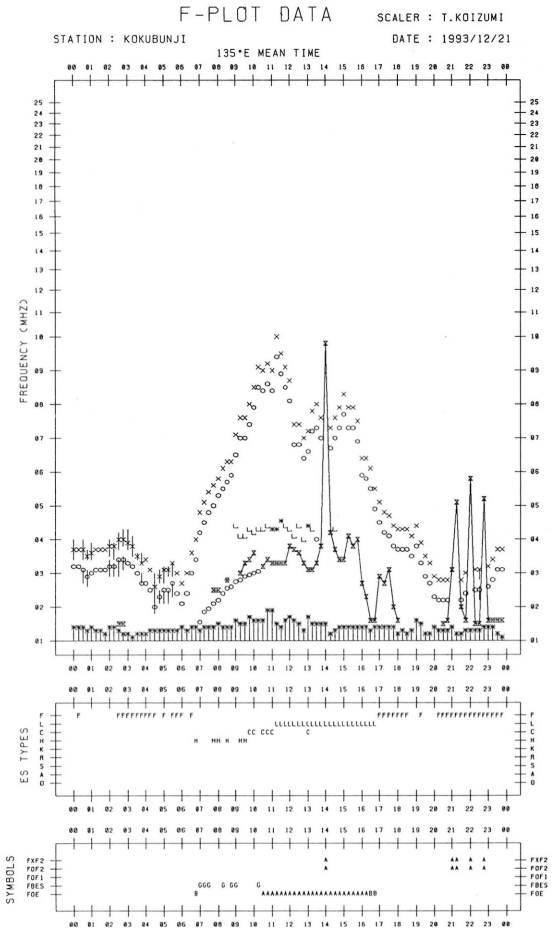
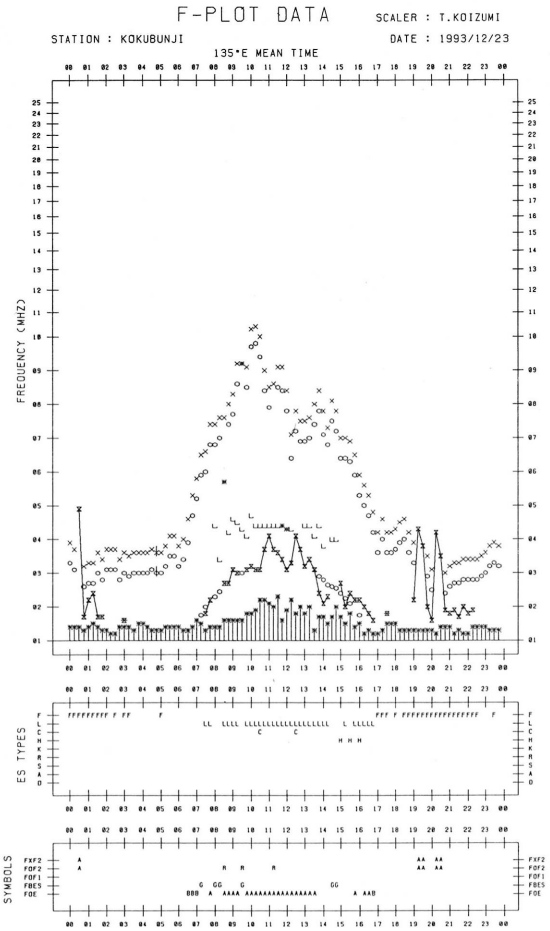
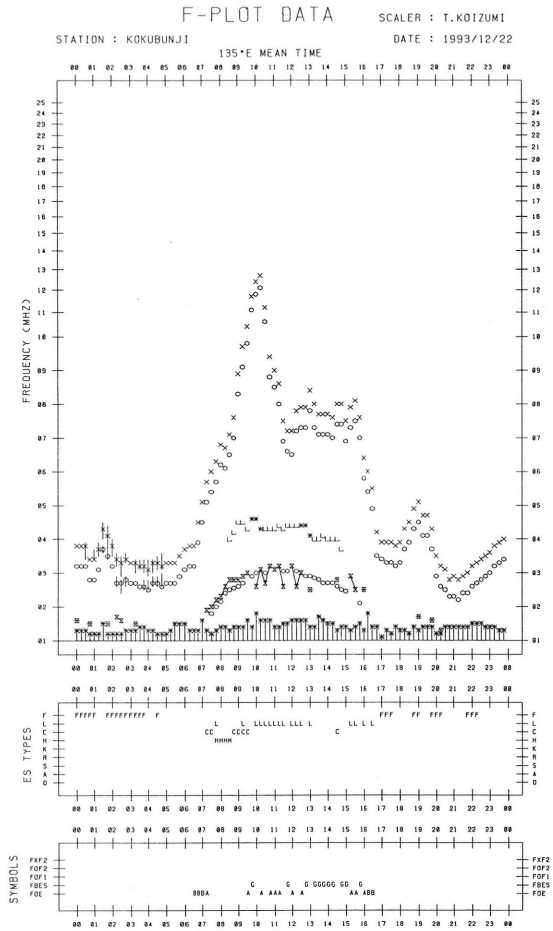
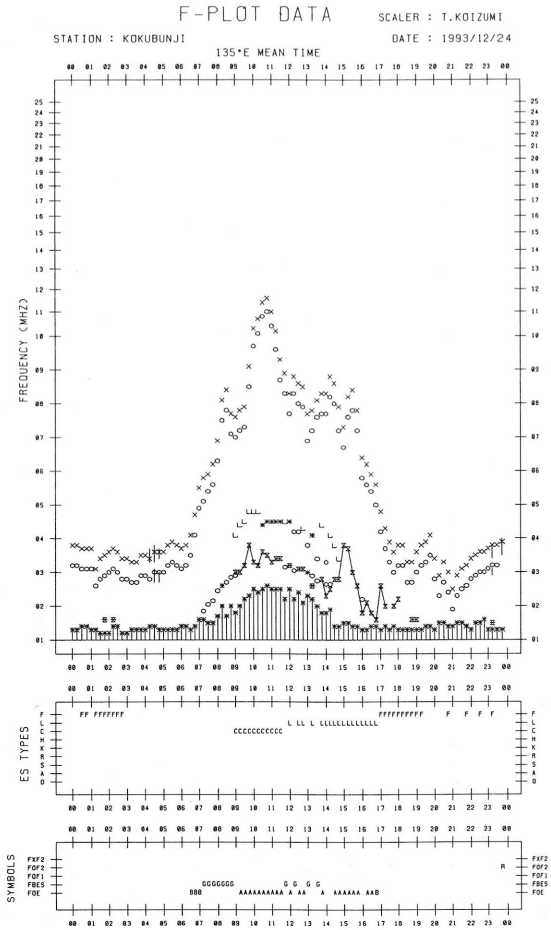
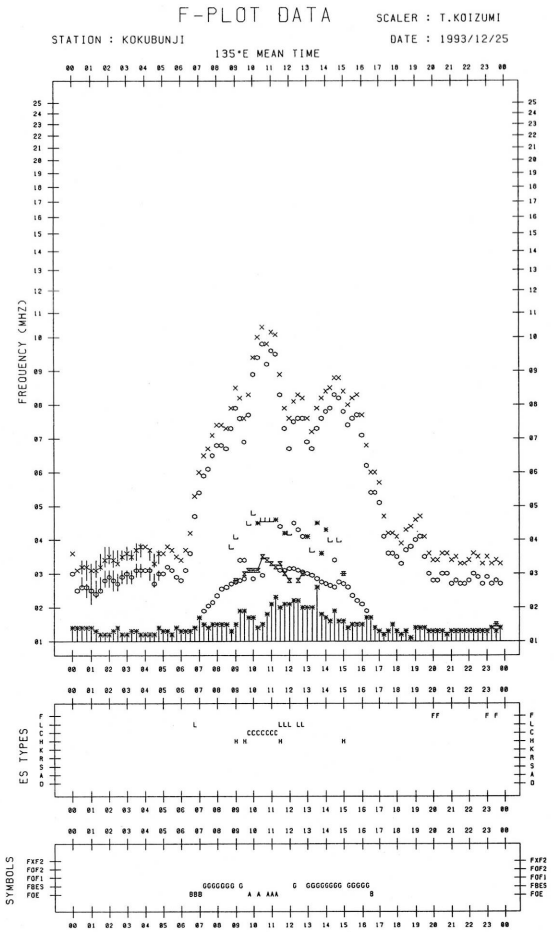
STATION : KOKUBUNJI
DATE : 1993/12/20
135°E MEAN TIME
FREQUENCY (MHZ)
ES TYPES
SYMBOLS

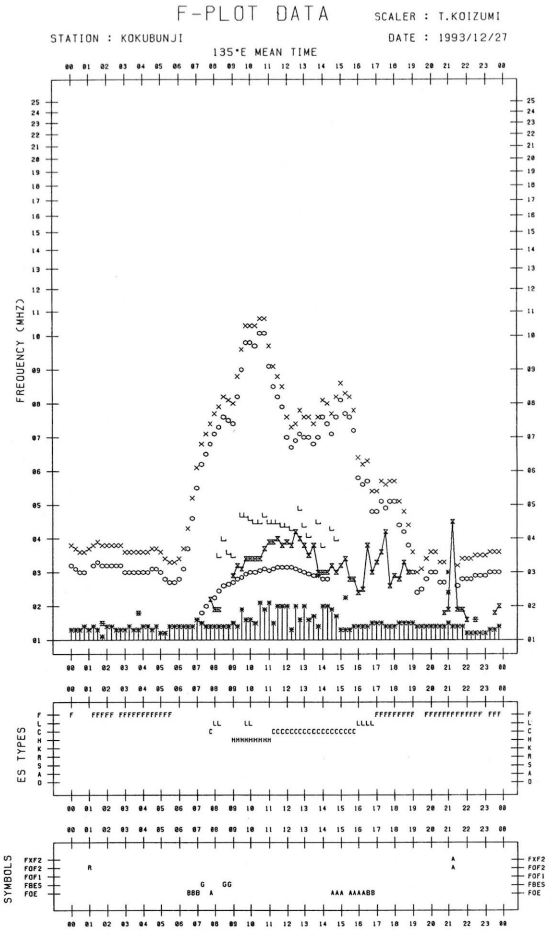

F-PLOT DATA
SCALER : T.KOIZUMI
STATION : KOKUBUNJI
DATE : 1993/12/21
135°E MEAN TIME
FREQUENCY (MHZ)
ES TYPES
SYMBOLS
FXF2
FOF2
FOF1
FBES
FOE

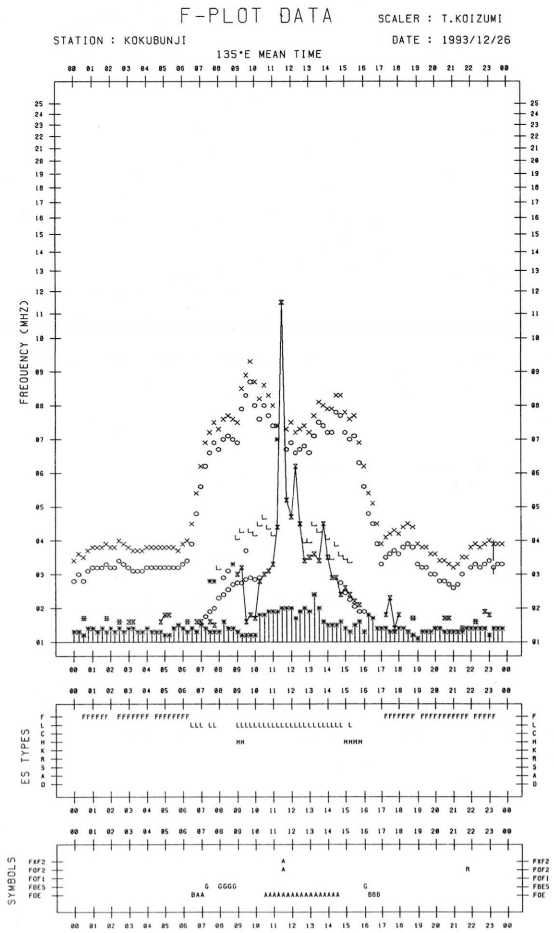

F-PLOT DATA
SCALER : T.KOIZUMI
STATION : KOKUBUNJI
DATE : 1993/12/23
135°E MEAN TIME
FREQUENCY (MHZ)
ES TYPES
SYMBOLS
FXF2
FOF2
FOF1
FBES
FOE

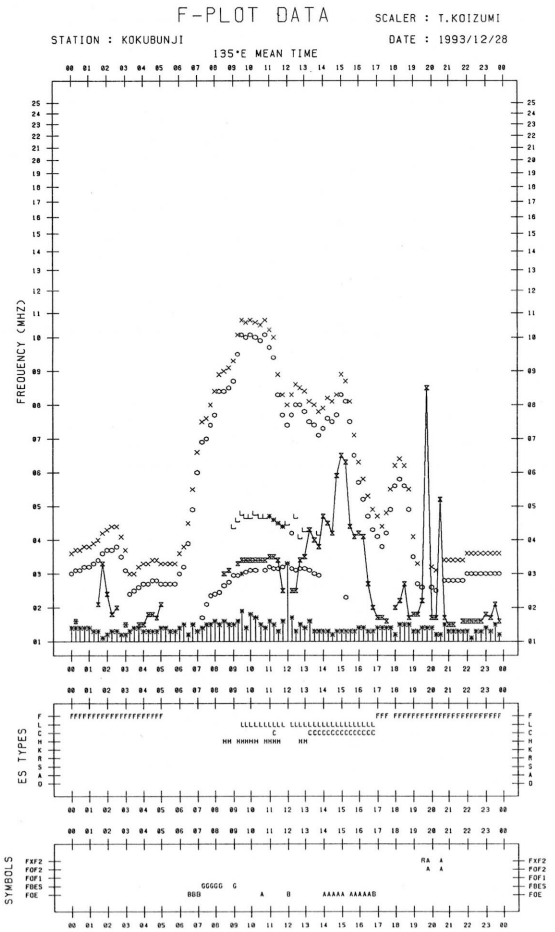

F-PLOT DATA
SCALER : T.KOIZUMI
STATION : KOKUBUNJI
DATE : 1993/12/22
135°E MEAN TIME
FREQUENCY (MHZ)
ES TYPES
SYMBOLS
FXF2
FOF2
FOF1
FBES
FOE

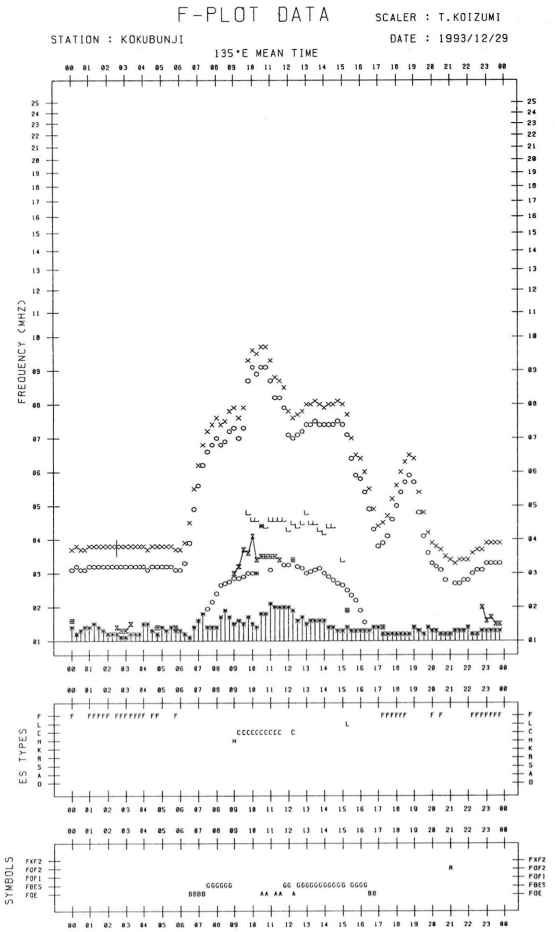

F-PLOT DATA
SCALER : T.KOIZUMI
STATION : KOKUBUNJI
DATE : 1993/12/24
135°E MEAN TIME
FREQUENCY (MHZ)
ES TYPES
SYMBOLS
FXF2
FOF2
FOF1
FBES
FOE

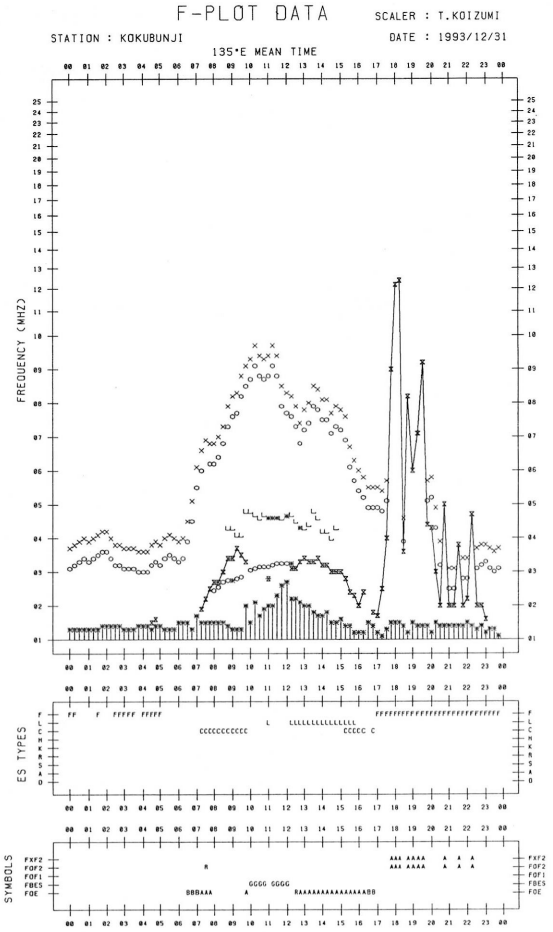

F-PLOT DATA
SCALER : T.KOIZUMI
STATION : KOKUBUNJI
DATE : 1993/12/25
135°E MEAN TIME
FREQUENCY (MHZ)
ES TYPES
SYMBOLS

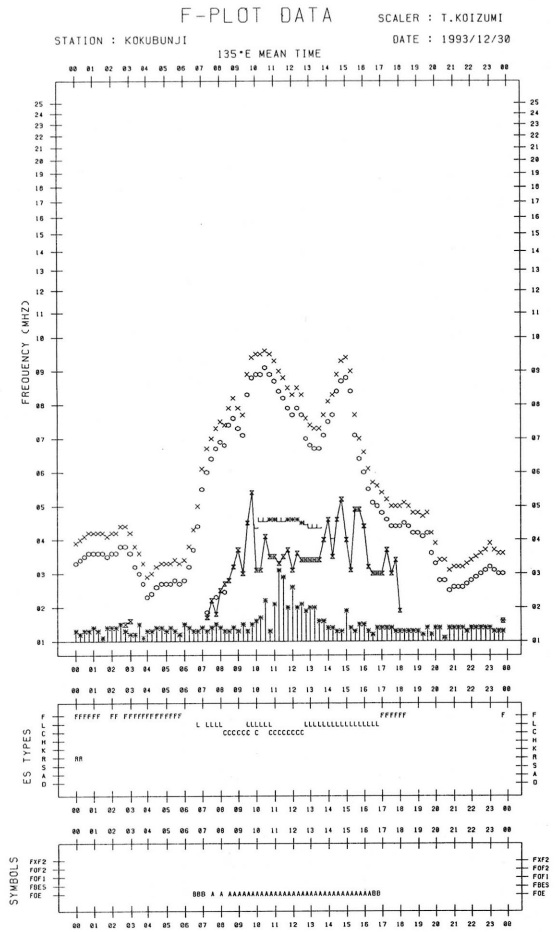

F-PLOT DATA
SCALER : T.KOIZUMI
STATION : KOKUBUNJI
DATE : 1993/12/27
135°E MEAN TIME
FREQUENCY (MHZ)
ES TYPES
SYMBOLS


F-PLOT DATA
SCALER : T.KOIZUMI
STATION : KOKUBUNJI
DATE : 1993/12/26
135°E MEAN TIME
FREQUENCY (MHZ)
ES TYPES
SYMBOLS


F-PLOT DATA
SCALER : T.KOIZUMI
STATION : KOKUBUNJI
DATE : 1993/12/28
135°E MEAN TIME
FREQUENCY (MHZ)
ES TYPES
SYMBOLS


F-PLOT DATA
SCALER : T.KOIZUMI
STATION : KOKUBUNJI
DATE : 1993/12/29
135°E MEAN TIME
FREQUENCY (MHZ)
ES TYPES
SYMBOLS
FXF2
FOF2
FOF1
FBES
FOE


F-PLOT DATA
SCALER : T.KOIZUMI
STATION : KOKUBUNJI
DATE : 1993/12/31
135°E MEAN TIME
FREQUENCY (MHZ)
ES TYPES
SYMBOLS
FXF2
FOF2
FOF1
FBES
FOE


F-PLOT DATA
SCALER : T.KOIZUMI
STATION : KOKUBUNJI
DATE : 1993/12/30
135°E MEAN TIME
FREQUENCY (MHZ)
ES TYPES
SYMBOLS
FXF2
FOF2
FOF1
FBES
FOE

B. Solar Radio Emission

B1. Daily Data at Hiraiso

200 MHz

Not available until system improvement is completed.

B. Solar Radio Emission

B1. Daily Data at Hiraiso

500 MHz

Hiraiso December 1993

Single-frequency total flux observations at 500 MHz

Flux density: 10^{-22}Wm^{-2}Hz^{-1}

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

B. Solar Radio Emission

B2. Outstanding Occurrences at Hiraiso

Hiraiso December 1993

Single-frequency observations

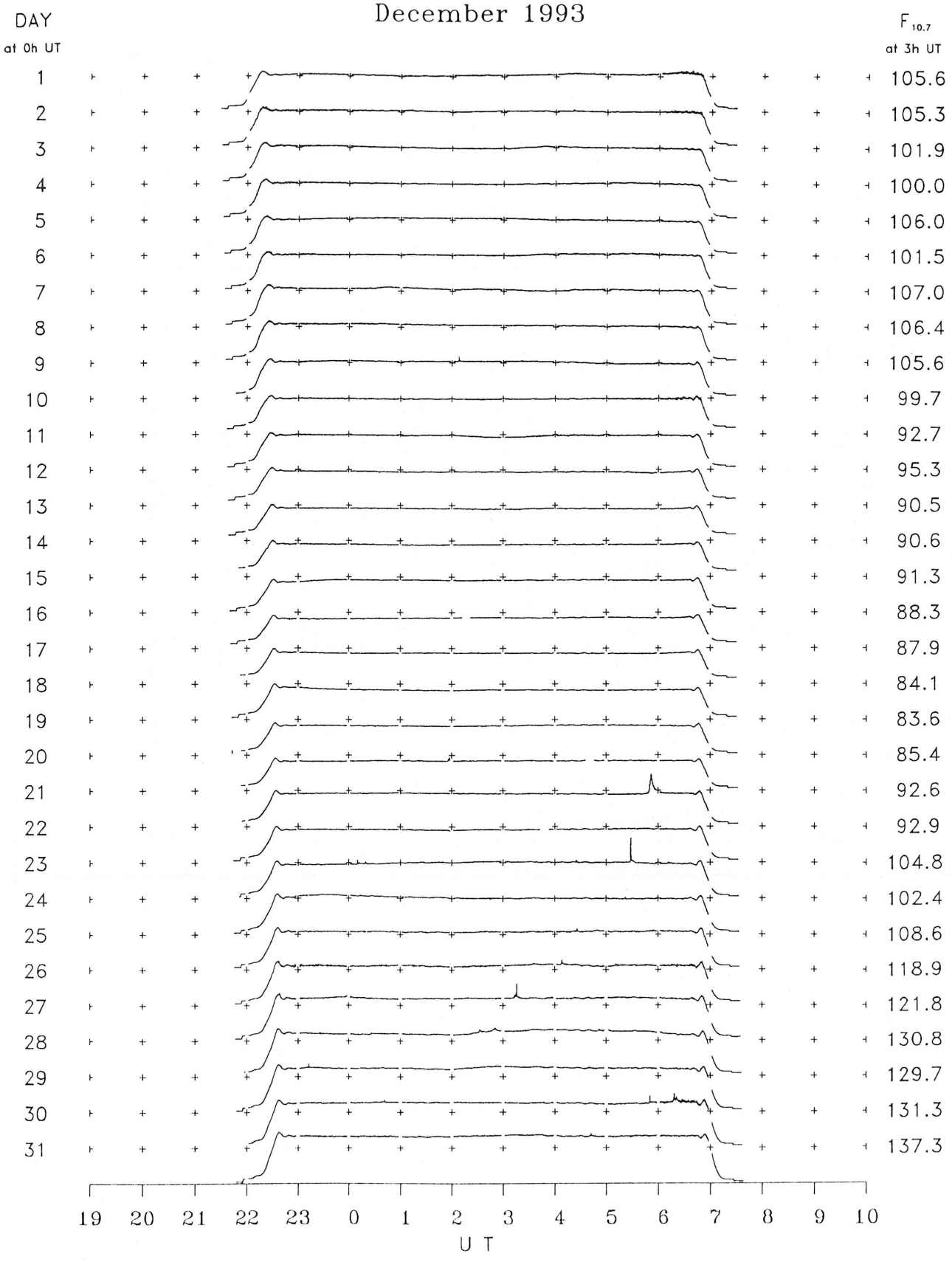
Normal observing period: 2145 - 0730 U.T. (sunrise to sunset)

DEC. 1993	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
9	2800	1 S	0208.0	0208.4	2.0	17	8	0
17	500	8 S	0601.8	0602.1	0.4	7	-	0
20	2800	45 C	0156.0	0157.2	2.0	14	7	0
21	500	4 S/F	0547.0	0549.6	5.0	7	5	0
	2800	3 S	0548.5	0551.6	11.0	60	27	0
23	500	42 SER	0010.1	0011.1	3.0	370	-	0
	2800	8 S	0010.5	0010.6	0.5	12	8	WL
	500	46 C	0018.8	0019.9	1.5	82	30	WR
	2800	3 S	0528.2	0528.6	1.5	65	48	0
	500	46 C	0528.5	0528.7	3.0	320	60	WR
24	2800	1 S	0521.8	0522.2	1.0	4	-	0
25	2800	1 S	0426.0	0426.1	1.5	6	-	0
26	2800	1 S	0408.3	0408.8	1.0	13	8	0
	500	42 SER	0546.5	0546.9	2.0	20	-	0
	500	46 C	2356.0	2357.4	4.0	260	40	0
27	500	46 C	0313.0	0315.0	6.0	120	20	0
	2800	40 F	0313.0	0316.3	6.0	43	-	0
	500	42 SER	0348.0	0349.5	4.0	100	-	0
	500	8 S	0517.0	0517.3	0.7	185	-	0
	500	42 SER	2312.2	2312.7	7.5	12	-	0
28	2800	20 GRF	0024.6	0025.5	25	4	2	0
	2800	1 S	0232.2	0233.0	3.0	12	7	0
	2800	45 C	0248.0	0250.7	9.0	15	10	0
	500	42 SER	2312.2	2312.7	7.5	12	-	0
	2800	8 S	2312.5	2312.6	0.2	14	-	0
29	500	8 S	2214.3	2214.6	0.6	15	-	0
30	2800	45 C	0618.0	0618.6	6.0	24	10	0
31	500	42 SER	0048.0	0049.7	2.5	40	-	0
	500	1 S	0331.8	0332.6	1.5	10	-	0
	2800	1 S	0441.0	0442.7	1.0	7	-	0
	500	42 SER	0442.0	0443.1	4.0	30	-	0

B. Solar Radio Emission

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

December 1993



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 1993 FREQUENCY 15 MHZ BANDWIDTH 80 HZ RECEIVING ANTENNA ROD 4.5 M

MEASURED AT HIRAISO

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

C. RADIO PROPAGATION

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

DEC 1993 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
1	2	5	14	7	9	6	-1	ES -24	ES -24	ES -24	ES -24	ES -24	ES -24	ES -24	ES -24	ES -24	ES -24	ES -24	ES -24	ES -24	6	13	12	8
2	7	10	12	12	14	-1	ES -24	ES -24	ES -24	ES -24	ES -24	ES -24	ES -24	ES -24	ES -24	ES -24	ES -24	ES -24	ES -24	ES -24	-6	14	11	10
3	13	14	14	18	19	0	7	0	8	10	12	ES -24	ES -24	ES -24	ES -24	ES -24	ES -24	ES -24	ES -24	ES -24	7	16	13	10
4	-3	11	8	21	11	11	20	ES -24	ES -24	ES -24	ES -24	ES -24	ES -24	ES -24	ES -24	ES -24	ES -24	ES -24	3	ES -24	10	12	13	10
5	11	13	13	16	16	13	6	ES -24	ES -24	ES -24	ES -24	ES -24	ES -24	ES -24	ES -24	ES -24	ES -24	ES -24	ES -24	ES -24	2	13	14	13
6	11	10	12	16	13	ES -1	ES -24	ES -24	ES -24	ES -24	ES -24	ES -24	ES -24	ES -24	ES -24	ES -24	ES -24	ES -24	ES -24	ES -24	4	10	17	13
7	10	12	13	16	16	ES -24	-1	ES -24	ES -24	ES -24	ES -24	ES -24	ES -24	ES -24	ES -24	ES -24	ES -24	ES -24	ES -24	ES -24	12	16	10	14
8	13	12	14	17	22	19	17	15	18	6	ES -24	ES -24	ES -24	ES -24	ES -24	ES -24	ES -24	ES -24	ES -24	ES -24	11	12	16	11
9	13	13	19	13	13	5	ES -24	ES -24	ES -24	ES -24	ES -24	ES -24	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	6	17	11	7
10	8	12	9	12	13	3	-4	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	6	11	25	16
11	10	14	19	18	17	3	-4	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	4	13	22	11
12	14	13	15	18	13	12	-2	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	9	9	12	11
13	14	13	15	8	8	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	13	13	12	13
14	18	C	C	C	C	C	C	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	11	13	14	12
15	6	15	10	21	20	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	13	22	24
16	7	7	12	7	11	ES -28	ES -28	ES -28	ES -28	ES -28	ES -28	ES -28	ES -27	ES -27	ES -27	ES -27	ES -27	ES -27	ES -27	ES -27	14	7	9	8
17	8	8	6	15	10	-2	-10	ES -28	ES -28	ES -28	ES -28	ES -28	ES -28	ES -28	ES -28	ES -28	ES -28	ES -28	ES -28	ES -28	5	0	10	3
18	7	7	8	12	7	-13	-19	ES -28	ES -28	ES -28	ES -28	ES -28	ES -28	ES -28	ES -28	ES -28	ES -28	ES -28	ES -28	ES -28	-4	7	6	2
19	11	8	8	13	8	-13	ES -28	-19	ES -28	ES -28	ES -28	ES -28	ES -28	ES -28	ES -28	ES -28	ES -28	ES -28	ES -28	ES -28	-5	0	0	6
20	11	7	8	13	10	ES -13	ES -13	ES -28	ES -28	ES -28	ES -28	ES -28	ES -28	ES -28	ES -28	ES -28	ES -28	ES -28	ES -28	ES -28	2	0	7	8
21	8	12	11	7	16	-13	-3	ES -28	ES -28	ES -28	ES -28	ES -28	ES -28	ES -28	ES -28	ES -28	ES -28	ES -28	ES -28	ES -28	18	2	6	8
22	8	7	7	12	8	0	7	-8	ES -28	ES -28	ES -28	ES -28	ES -28	ES -28	ES -28	ES -28	ES -28	ES -28	ES -28	ES -28	4	15	11	3
23	7	8	5	9	9	2	-3	6	ES -28	ES -28	ES -28	ES -28	ES -27	ES -27	ES -27	ES -27	ES -27	ES -27	ES -27	ES -27	4	3	8	8
24	4	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C
25	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C
26	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C
27	1	7	7	1	6	-4	1	-14	-10	ES -29	ES -29	ES -29	ES -29	ES -29	ES -29	ES -29	ES -29	ES -29	ES -29	ES -29	-8	-1	10	10
28	6	5	5	10	13	-3	-9	ES -29	ES -29	ES -29	ES -29	ES -29	ES -29	ES -29	ES -29	ES -29	ES -29	ES -29	ES -29	ES -29	-15	8	-1	5
29	2	6	6	7	11	-15	6	-14	-14	-20	ES -29	ES -29	ES -29	ES -29	ES -29	ES -29	ES -29	ES -29	ES -29	ES -29	-4	6	7	2
30	6	3	6	6	7	-20	7	-3	ES -29	ES -29	ES -29	ES -29	ES -29	ES -29	ES -29	ES -29	ES -29	ES -29	ES -29	ES -29	-5	11	6	4
31	2	5	3	8	3	-8	3	3	-2	-5	8	-10	ES -28	ES -28	ES -28	ES -28	ES -28	ES -28	-5	ES -28	2	8	7	6
CNT	29	27	27	27	27	27	27	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28
MED	8	10	10	12	11	US -2	-3	ES -24	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	4	11	11	9
UD	14	14	15	18	19	12	7	3	-2	-5	ES -24	ES -24	ES -24	ES -24	ES -24	ES -24	ES -24	ES -24	ES -24	ES -24	13	16	22	14
LD	2	5	5	7	7	ES -25	ES -25	ES -28	ES -28	ES -29	ES -29	ES -29	ES -29	ES -29	ES -29	ES -29	ES -29	ES -29	ES -29	ES -29	-8	0	6	3

C. Radio Propagation

C2. Radio Propagation Quality Figures at Hiraiso

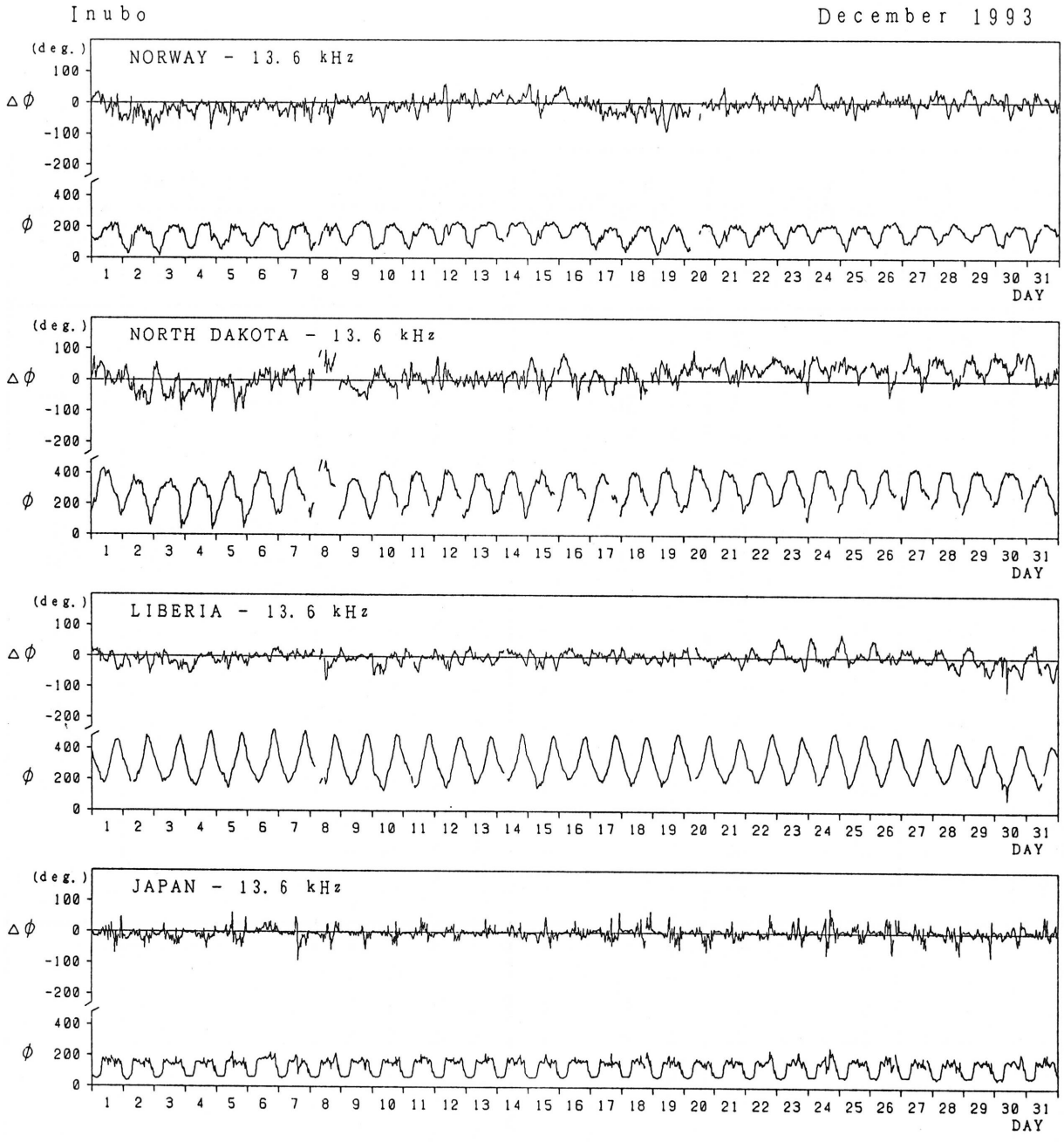
Hiraiso

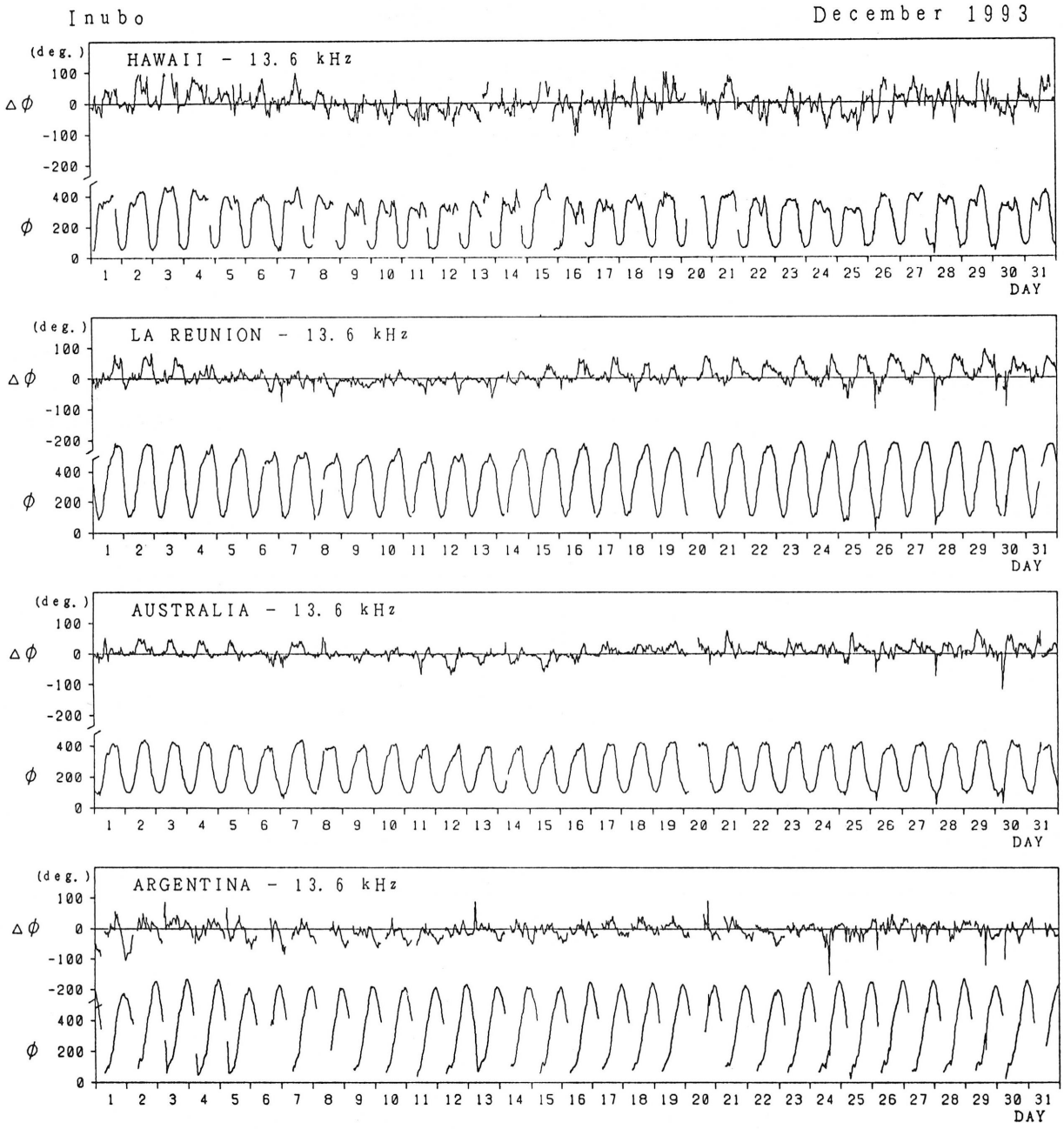
Time in U.T.

DEC. 1993	Whole Day Figure	W W V 00 06 12 18 / 06 12 18 24	W W V H 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	2U - - 5U	4 - - 4	N N N N	6.6	----	135
2	4o U	4U - - 4U	4 - - 4	N N N N	----	----	
3	4+ U	4U - - 4U	4 5U - 4	N N N N	----	24	SG
4	3+ U	3U - - 3U	4 - - 4	N N N N			
5	4- U	4U - - 3U	4 - - 4	N N N N			
6	4- U	4U - - 3U	4 - - 4	N N N N			
7	4+ U	5U - - 4U	4 - - 4	N N N N	1201	----	106
8	5- U	5U - - 5U	4 5U - 4	N N N N	----	20	SSC
9	4+ U	5U - - 5U	4 - - 4	N N N N			
10	4+ U	4U - - 5U	4 - - 4	N N N N			
11	4o U	3U - - 5U	4 - - 4	N N N N			
12	4o U	3U - - 5U	4 - - 4	N N N N			
13	4- U	4U - - 3U	4 - - 4	N N N N			
14	3o U	C - - 2U	C - - 4	N N N N			
15	3+ U	2U - - 4U	4 - - 4	N N N N			
16	3+ U	2U - - 4U	3 - - 4	N N N N			
17	4o U	4U - - 4U	4 - - 4	N N N N			
18	3+ U	3U - - 3U	4 - - 3	N N N N			125
19	3+ U	2U - - 4U	4 - - 3	N N N N			SSC
20	4+ U	5U - - 4U	4 - - 4	N N N N			
21	4o U	5U - - 3U	4 - - 4	N N N N			
22	4o U	4U - - 4U	4 4U - 4	N N N N			
23	4o U	4U - - 4U	4 - - 4	N N N N			
24	C	C C C C	C C C C	N N N N			
25	C	C C C C	C C C C	N N N N			
26	C	C C C C	C C C C	N N N N			
27	4+ U	4U - - 4U	4 5U - 4	N N N N			
28	4- U	4U - - 4U	4 - - 3	N N N N			
29	4o U	3U 5U 5U 4U	4 5U - 3	N N N N			
30	4- U	4U - - 3U	4 5U - 3	N N N N			
31	4- U	4U - - 3U	3 5U - 4	N N N N			

C. Radio Propagation

C3. Phase Variation in OMEGA Radio Waves at Inubo





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. 1993	S W F								Correspondence	
	Drop-out Intensities(dB)					Start	Dur.	Type	Imp.	Solar * Flare	Solar Burst
	CO	HA	AUS	MOS	BBC						
7		x	6			0041	20	2 SL	1-	x	C
7		x	12			0210	45	2 SL	1	x	C
25			10			0424	15	2 SL	1-	x	C
25			7			0442	16	2 SL	1-	x	C
25					8	0708	18	2 SL	1-	x	C
26			30			0409	33	2 SL	2+	x	C
28			13			0245	19	2 SL	1	x	C
30			8			0152	48	2 SL	1-	x	C
30			13			0548	25	2 SL	1	x	C

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. 1993	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
1			35	26	13		0200	0235D	0209
1			15	12	5		0235E	0256D	0246
1	9		43	43			0415	0522	0423
1			15	9			0701	0727	0710
1		13					1416	1458	1431
4				7			0120	0130	0126
5		44	25				1031	1121	1041
6		15					1719	1808	1726
6				30	87	–	2040	2122	2050
7				4	5		0017	0034D	0024
7	26	18	28	47	39	28	0033E	0148	0053
7	20	12	78	49	36	20	0211	0324	0224
7			14	16			0417	0512	0428
8	13		9	11	6		0149	0211	0155
20			16	12	11		0155	0227	0205
21				7	7		0022	0054D	0034
21				11	7		0054E	0110	0058
21			7				0520	0529	0524
22			10				0935	1000	0939
23				10*	7		0011	0051	0025
23	13		–	29	8		0529	0625	0534
23			28				0902	0927	0908
23				18	16		2254	0013	2312
24		23	32				0855	0924	0904
24		24	14				0946	1039	1009
24		37	14				1214	1251	1222
24		16					1347	1413	1351
24		47					1453	1623	1514
25				8*	8*		0106	0151	0111
25			9	4			0329	0357	0337
25		25	54*	47*	26*	21	0424	0525D	0432
25		16					0444E	0515	0454
25		12	44	44	14		0525E	0635	0535
25		29	40	28			0702	0737D	0718
25		40	61*	22			0737E	0836D	0743
25		29	72				0836E	0904	0842
25		19					1135	1206	1147
25		23					1450	1536	1458
25					7	–	2309	2345	2314
26				9	9		0027	0052	0034

Inubo

Dec.	S			P		A			
1993	Phase Advance (degrees)						Time (U.T.)		
Date	Ω/N	Ω/L	Ω/LR	Ω/AU	Ω/H	Ω/ND	Start	End	Maximum
26	25	41	148	101	77	26	0402	0540D	0420
26	8		32	19	6		0540E	0611D	0549
26			23	12			0611E	0642D	0622
26			20	7			0642E	0718D	0651
26			44	15			0718E	0845D	0732
26		32	40				0845E	0905	0851
26		25	25				0913E	0940D	0920
26		24*	15				0940E	1009	0952
26		34	21				1036	1108	1045
26	–	28	12				1127	1208	1140
26	–	19					1508	1532	1520
26	–	18	–				1551	1606	1556
26				13	15		2239	2309	2243
27			10	6			0315	0342	0318
27			10	5			0353	0418	0358
27		30	35				0911	0952D	0918
27		22	16				0953	1033	1000
28	27	32	120	88	81	21	0231	0440	0257
28	5	15	14	12			0533	0606	0539
28			7				0651	0713	0655
28		16	14				0900	0928	0914
28		24	10				1210	1249	1220
28		24					1654	1726	1702
28				46	38		2246	0026	2306
29	8	9	25	14	14	17	0216	0302	0224
29			9	5			0545	0621	0550
29		39					1535	1642	1547
29			11	44	40	29	2256	0010	2312
30	16	19	102	66	55	34	0150	0310D	0207
30			14	12	16	14	0313E	0346D	0321
30			10	6	11		0346E	0402	0349
30			8	5		7	0528	0542D	0532
30	39	59	198	122	25	34	0542E	0702	0556
30		99	103				0915	1017	0924
30		14					1612	1630	1616
30		17					1711	1736	1715
30				26	14		2118	2155	2127
31				15	15	16	0046	0111	0051
31			12	12	8		0223	0249	0234
31		14	42	35	20		0417	0442D	0423

Inubo

Dec. 1993	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
31	13	13	40	37	23		0442E	0508D	0450
31			24	22			0528E	0602	0538
31			27*	—			0623	0716	0639

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