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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)
Akita	39°43.5'N	140°08.0'E	29.5°N	205.9°	" (I)
Kokubunji	35°42.4'N	139°29.3'E	25.5°N	205.8°	" (I)
Yamagawa	31°12.1'N	130°37.1'E	20.4°N	198.3°	" (I)
Okinawa	26°16.9'N	127°48.4'E	15.3°N	196.0°	" (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°	" (P)

A. IONOSPHERE

Ionospheric observations are carried out at the above five 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 descriptive letter 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 1-4, 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 transmission 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 normal *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 100, 200 and 500 MHz are carried out at Hiraiso. The observation equipment consists of two parabolic antennas, one with 10-meter diameter for 100 and 200 MHz measurements and one with 6-meter diameter for 500 MHz measurements, each being equipped with a pair of crossed doublet antennas as a primary radiator, and three appropriate receivers. Each pair of the crossed doublet antennas is used as a polarimeter. 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 at the base-level are tabulated separately for 200 and 500 MHz measurements. Here, the base-level intensity is defined as the intensity recorded during the time when no radio emission burst is taking place. 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 Hiraiso 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.

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 660 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 in 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	influenced 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.

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 per hour from JJY (Japan Standard Wave) station. The conditions are denoted as follows:

N	normal,
U	unstable,
W	disturbed.

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

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 ($\triangle\phi$) 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 flare, solar radio burst, and geomagnetic crochet 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. 1990

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

DAY \ HOUR	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
1	38	36	37	41	43	37	40	64	88	107	105	124	106	103	97	101	86	64	48	64	37	38		
2		46	48	43	46		44	64	93	110	125	125	110	121	110	98	82	68	44	42	34	A	30	
3		51	42	40	40	32	39	68	92	102	109	N	117	112	98	103	84	64	52	42	55	38	46	
4	41	41	37	39	40	41	40	66	100	110	122	123	123	113	110	111	90	N	45	38	36	35	38	36
5	37		40		39	38	47	66	108	107	134	119	124	115	106	103	88	65	57	56	51	A	38	36
6	34	31	31		35	40	45	62	87	111	122	137	120	111	101	105	72	69	52	44	38	31	37	34
7	34	34	38	38		32	42	78	102	124		111	110	110	108	98	85	73	60	43	43			32
8	36	31	31	30	30	30	30	92	90	107	119	115	108	107	90	90	87	74	42	47	42	34	N	32
9	34	31	32	35	34	31	32	60	82	111	125	120	122	108	108	87	86	78	60	39	37	38	31	30
10	38	42	48	39	39	40	42	66	100	110	135	127	121	104	100	102	91	66	57	38	38	36	38	30
11	38	37	42	38	38	38	41	62	88	104	110	114	120	108	106	110	90	68	63	52	27	28	32	34
12	32	35	34	32	37	38	35	64	86	112	120	113	105	101	93	90	65	63	56	51	44		34	31
13	31	36	32	32	31	31	36	66	88	103	118	120	125	122	114	96	96	78	63	58	44	36	38	40
14	42	38	38	38	38	40	40	68	86	108	125	118	117	110	111	104	97	67	51	39	45	38	31	31
15	25	32	28	29	30	37	25	54	86	102	121	114	106	101	103	89	79	66	42	42	34	26	32	31
16	N	30	34	31	31	36	24	54	78	94	118	111	101	110	107	88	80	60	43	39	38	31	27	A
17	37	38	A	43	40	39	30	80	83	101	98	96	95	103	101	86	78	58	42	44	A	N	26	26
18	27		25	27	29	35	46	48	71	73	110	100	102	101	91	94	68	39	37	34	A	35	A	39
19	35	37	32	31	A	36	36	80	80	86	100	92	97	92	92	78	62	55	30	32	23	20	27	A
20	A	30	A	32	30	32	A	52	78	88	90	103	90	83	87	84	73	57	38	36	A	25	N	25
21	32	30	31	30	26	40		55	71	99	97	101	98	104	102	90	67	59	43	32	28	26	31	A
22	A	31	31	36	37	40	29	54	71	105	101	124	83	99	96	79	74	54	42	40	34	32	35	32
23	30	34	38	37	33	42	33	50	78	90	91	110	107	101	86	79	66	62	51	37	N	31	38	36
24	70	51		30		52	34	65	83	97	117	118	92	95	88	90	90	52	60	41	28	A	A	30
25	A	34	31	31	35	32	N	51		98	122	133	108	114	103	103	90	66	54	44	40	40	40	40
26	46	48	47	36	40	40	38	56	78	92	115	125	116	101	95	97	83	62	55	51	40	34	36	37
27	33		34	38	37	38	43	54	85	96	100	122	114	107	90	96	73	66	36	36	40	26	36	35
28	34	A	40	42	42	36		50	78	93	107	118	105	106	103	108	76	52	57		36			36
29			29	30		35	N	51	86	90	101	118	111	91	97	93	88	62	44			31	28	25
30	36	34	37	31	37	36	31	62	91	96	117	120	118	106	111	92	65	54	54	41	38		31	28
31	35	33	34	40	40	38	31	N	102	126	124	111	111	103	104	106	78	63	63	45	32	34	24	36
	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
CNT	24	26	28	29	27	30	26	30	30	31	30	30	31	31	31	31	31	30	31	29	26	23	24	25
MED	35	34	34	36	37	38	37	62	86	102	117	118	110	106	101	96	82	64	51	42	36	34	33	32
U Q	38	38	39	39	40	40	42	66	91	110	122	123	118	110	107	103	88	67	57	46	42	36	38	36
L Q	32	31	31	31	31	35	31	54	78	94	101	111	102	101	93	89	73	58	42	38	34	28	30	30

COMMUNICATIONS RESEARCH LABORATORY, JAPAN

HOURLY VALUES OF FES AT WAKKANAI

DEC. 1990

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	28	G	G	G	28	G	G	G	G	G	38	G	G	G	G	38	G	G	G	G	G		G
2		G	G	G	G	G	G	G	G	G	G	G	G	G	G	36	G	G	G	G	G	45	24	
3	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	40	G	G	G	
4	G	G	G	G	G	G	G	G	G	G	G	45	G	G	G	58	44	G	G	G	G	G	G	G
5	G	G	26		G	G	G	G	33	36	58	39	G	G	G	G	28	28	31	G	30	31	G	G
6	G	G	28	G	28	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G
7	G	G	G	G		G	G	G	G	G		G	G	G	G	38	27	G	G	G	G	G		G
8	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	26	32	29	G	G	G	G
9	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	36	G	G	G	28	27	G	27	G
10	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	30	G	28
11	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G
12	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	28	G	G	G	G		G	G
13	G	G	G	G	G	G	G	G	57	G	G	G	G	G	G	32	G	G	G	G	G	G	G	27
14	29	27	25	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	59	G	G	G
15	G	G	G	G	G	G	G	G	G	G	G	G	G	G	37	G	G	G	G	G	29	G	G	G
16	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	30	28	26	32
17	29	32	46	55	G	G	G	G	G	G	41	46	G	G	G	G	G	G	G	G	33	G	G	G
18	G		G	G	G	G	G	G	G	G	G	G	G	54	47	32	G	G	30	G	33	36	59	58
19	45	33	25	30	32	G	G	36	G	G	G	G	G	G	G	G	G	27	G	G	G	27	26	49
20	29	30	28	G	28	26	31	32	34	G	G	G	G	G	G	G	G	32	G	34	36	G	G	27
21	G	G	G	G	25	G		11	34	G	G	G	G	G	G	G	G	G	G	G	G	G	25	29
22	30	G	29	28	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	N	G	G	G	G	G	G	G	G	G	G	G	G	G	27	33
24	G	G	G	28	G	G	G	G	G	G	G	44	42	41	G	G	G	G	G	G	G	28	44	G
25	29	G	26	G	G	G	G	G		G	G	G	G	G	G	G	G	G	27	G	G	G	G	G
26	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	30	41
27	29		28	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G
28	G	32	29	25	G	28		G	G	G	46	46	G	G	G	G	48	G	G	G	28			G
29		G	G	G		G	G	G	G	G	G	G	G	G	G	G	G	G	G	G		G	G	G
30	G	G	G	G	G	G	G	G	G	G	G	G	G	G	38	G	G	G	G	G	G		G	G
31	27	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	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	31	30	29	31	29	31	29	31	30	31	31	31	31	31	31	31	31	31	30	28	28	29
MED	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G
U Q	28	G	26	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	28	14	25	27
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 F MIN AT WAKKANAI

DEC.1990

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

D \ H	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
1	16	18	16	15	15	18	16	20	30	30	33	23	34	34	22	20	22	18	20	20	17	16		N
2		16	22	22	18	24	14	20	26	29	21	32	33	35	18	21	17	21	17	20	20	18	18	
3	27	23	24	17	17	23	15	21	24	34	34	22	33	33	18	26	18	16		18	22	21	17	
4	18	16	17	18	15	15	15	20	17	21	28	22	23	23	23	17	18	16	17	17	18	16	18	22
5	17	70	16		22	15	22	18	17	17	20	21	20		18	17	17	17	17	28	16	24	15	16
6	21	18	17	21	16	16	21	20	17	20	22	22	23	18	21	23	17	15	16	18	16	20	17	18
7	17	15	16	16		17	15	20	18	22		23	26	34	28	21	18	15	16	17	21	22		18
8	18	17	15	16	17	17	16	20	27	21	24	23	35	35	20	23	17	16	17	17	16	17	21	18
9	17	16	17	16	16	17	15	18	27	21	34	34	34	23	20	17	18	15	15	16	16	15	20	20
10	18	17	17	17	15	15	16	20	32	33	36	34	36	39	38	32	20	18	17	17	15	16	16	18
11	16	15	15	16	15	16	15	18	28	32	28	36	34	35	33	18	18	17	15	15	16	17	16	17
12	16	15	15	15	17	16	15	18	23	33	21	22	24	36	23	20	18	16	15	16	16		16	15
13	16	15	15	15	15	15	16	17	16	20	22	34	21	23	29	18	18	16	16	15	16	16	15	16
14	18	17	16	16	15	16	15	17	20	22	23	36	22	33	35	26	20	18	15	17	18	17	15	18
15	18	16	17	15	16	16	17	18	20	30	39	35	24	21	23	28	18	16	16	17	18	18	18	18
16	22	15	15	17	18	18	16	20	24	32	36	23	34	23	34	26	18	16	15	15	16	15	20	18
17	17	16	16	16	17	15	18	18	26	18	22	23	36	24	29	20	18	16	17	16	15	18	20	16
18	17		18	17	15	16	15	20	23	18	18	36	24	23	18	18	17	17	17	16	16	16	18	16
19	15	17	17	15	17	15	17	16	17	20	35	24	34	35	32	18	20	16	20	18	17	21	16	18
20	16	17	15	16	16	17	17	16	18	18	32	24	21	23	18	23	20	18	15	17	15	N	20	18
21	16	16	16	20	17	16		16	18	23	22	21	24	21	29	18	17	15	16	15	17	18	16	21
22	16	17	17	17	16	15	15	17	30	22	33	35	38	34	29	26	17	15	16	16	15	16	20	17
23	22	16	15	16	15	16	16	16	28	26	22	34	34	23	22	24	17	16	14	16	20	16	18	17
24	16	16	18	17	21	15	16	20	17	18	23	22	23	22	20	32	17	16	17	17	16	20	17	17
25	20	15	14	15	15	17	N	17		20	21	22	34	22	29	23	18	16	20	18	16	21	18	16
26	18	16	17	15	16	17	17	18	26	34	39	44	36	40	36	34	20	20	15	15	16	16	18	18
27	17		15	18	16	17	17	17	24	33	35	35	38	36	29	29	18	17	18	17	16	18	16	15
28	20	17	16	14	14	23		16	24	21	24	27	22	35	32	24	18	16			16			20
29		N	15	23		15	16	17	24	32	35	26	27	21	20	24	18	17	15	N		15	24	17
30	15	20	16	15	17	18	16	16	26	30	27	34	36	36	29	21	20	16	15	18	18		N	18
31	N	17	16	16	15	17	18	18	24	30	33	36	38	38	21	28	18	17	15	17	17	15	15	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	28	28	31	30	29	31	28	31	30	31	30	31	31	30	31	31	31	31	29	29	30	27	27	28
MED	17	16	16	16	16	16	16	18	24	22	28	26	33	33	23	23	18	16	16	17	16	17	18	18
U Q	18	17	17	17	17	17	17	20	26	32	34	35	35	35	29	26	18	17	17	18	18	20	20	18
L Q	16	16	15	15	15	15	15	17	18	20	22	22	23	23	20	18	17	16	15	16	16	16	16	16

HOURLY VALUES OF FOF2 AT AKITA

DEC. 1990

LAT. 39.7N LON. 140.1E SWEEP 1MHz TO 25MHz AUTOMATIC SCALING

D \ H	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
1	31	31	32	34	32	32	38	78	94	94	110	111	115		100	96	94	63	55	43	35	32	33	34
2	43	41	37	46	45	46	43	75	72	108	124	118	120	106	118	105	91	67	55	43	34	31	31	
3	A	37	41	46	32	38	43	80	93	110	105	110	114	116	103	87	87	78	52	40	42	37	32	38
4	43	38	39	58	50	51	41	74	91	107	132	130	117	117	108	115	102	81	50	39	51	40	38	38
5	36	43	43	40	40	38	41	77	105	117	132	120	111	120	104	106	99	80	64	58	58	41	31	31
6	A	31	32	33	35	35	37	74	86	116	127	133	121	120	105	104	97	67	54	43	42	38	A	
7	36	32	42	38		32	40	78	102	115	126	118	106	108	110	110	86	66	73	58	42	31	34	32
8	31	A	31	34	31	31	31	77	97	111	103	113	108	106	105	90	90	70	64	26	50	32	34	34
9	31	28	32	31	31	36	36	73	89	110	118	116	118	114	112	107	91	84	61	30	25	35	38	A
10	39	38	39	43		38	44	68	101	122	134	131	114	114	108	103	94	52	50	46	45	37	34	24
11	35	38	32	33	36	28	35	67	89	106	118	116	114	116	116	111	103	64	58	64	31	24	34	32
12	32	34	30	31	37	34	40	62	84	104	131	114	116	108	90	88	82	67	54	51	44		32	34
13	32	32	32	31	31	32	39	66	88		131	113	117	120	111	104	93	86	54	52	44	38	41	A
14	43	A	42	39	37	39	42	83	98	104	127	118	113	118	110	107	97	75	32	46	43	23	32	A
15	32	A	34	32	32	37	28	65	86	104	104	119	112	115	107	86	86	68	55	42	38	34		32
16	28	32		32	30	36	40	60	31	86	113	115	115	112		91	80		53	48	40	36		30
17		34	34			43			80	101	115	116	98	103	90	92	85	66	52	46	26	N	25	
18	N	28	31	28		34	23	52		83	117	111	104	91	90	90	79	A	39	26	34		32	A
19	A	30	38					62		88		94		98		90	79	52	56	32	30	N	N	26
20	25		31	30	32	32	31	58	73	90	82	106	94	92	82	80	78	49	A	34	28	A		25
21	31	29	22	28	32	40	24	52	70	90	115	122	101	96	100	97	77	51	51	49	32	25	28	28
22	30	A	A	35	32	42	38	52	78	84	114	112	120	110	104	96	86	52	50	40	34	28	26	28
23		31	31	30	33	26	35	61	80	85	102	114	106	102	90	84	68	51	60	52	38	31	34	36
24	A	51	33	A	38	38	38	46	75	88	118	126	86	88	101	97	90	66	56	50	35	31	34	34
25	A	A	31	32	32	45	30	51	86	102	108	122	112	108	109	102	90	68	53	51	52	34	34	
26	38	37	38	38	39	39	37	51	80	90	106	132	118	107	95	87	91	69	52	52	48	32	30	33
27	A	37	A	A	34	36	32	52	86	89	112	118	120	109	92	86	88	52	44	37	38	A	33	35
28	37	A	A	44	38	34	28	62	90	98	108	120	116	101	99	88	88	66	53	N	52	A	A	25
29	31	32	34		36	31	A	62	86	88	99	110	115	102	90	90	80	66	51	46	26	58	32	31
30	30	51	50	50	37	32	36	64	87	88	117		118	117	107	102	80	66	51	51	33	A	31	
31	30	30	32	38	36	34	34	59	86	106	127	123	110	102	106	90	90	77	64	48	31	28	22	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	22	24	27	26	26	30	28	30	29	30	30	30	30	30	29	31	31	29	30	30	31	23	25	22
MED	32	33	33	34	34	36	37	63	86	102	116	117	114	108	104	96	88	66	54	46	38	32	32	32
U Q	37	38	39	40	37	39	40	74	92	108	127	122	117	116	108	104	93	72	56	51	44	37	34	34
L Q	31	31	31	31	32	32	31	58	80	88	108	113	108	102	93	88	80	57	51	40	32	31	31	28

COMMUNICATIONS RESEARCH LABORATORY, JAPAN

HOURLY VALUES OF fES AT AKITA

DEC. 1990

LAT. 39.7N LON. 140.1E 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	30	34	29	30	G	38	G	G	G	58		49	44	38	38	50	39	26	G	G	G
2	G	G	G	G	G	G	30	G	G	G	49	G	41	40	37	38	33	32	27	G	G	G	G	
3	32	G	G	G	G	G	G	46	G	G	G	G	G	40	37	G	G	G	26	G	G	29	28	G
4	G	G	G	G	G	G	G	G	G	38	45	50	58	G	G	34	G	G	G	24	G	26	27	G
5	G	G	G	G	G	G	G	G	36	47	48	78	G	G	G	G	36	G	G	G	G	G	G	26
6	26	29	G	G	G	G	G	G	36	38	40	G	G	40	37	G	30	29	31	28	26	G	25	G
7	G	G	G	G		G	G	G	G	40	42	45	50	53	G	G	G	G	26	26	G	26	G	G
8	G	24	G	G	G	G	29	G	G	38	40	G	41	G	G	35	G	G	G	26	G	G	G	G
9	G	G	G	G	30	G	G	28	33	39	57	53	61	59	G	G	G	G	27	G	30	30	G	36
10	G	G	G	G		G	G	27	48	G	G	G	G	G	G	G	30	27	G	G	G	G	G	G
11	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	28	24	28	G	G	G
12	G	G	G	G	G	G	G	G	34	42	43	43	44	G	37	G	G	G	G	G	G		G	G
13	G	G	G	G	G	G	24	G	34		40	G	G	42	G	G	G	G	G	G	G	G	23	29
14	G	38	26	G	G	G	G	G	34	58	42	41	G	40	47	59	G	41	36	29	G	26	33	39
15	G	27	G	G	G	G	G	33	G	38	G	45	40	40	44	G	40	50	G	28	28	G		G
16	G	G		G	G	G	G	G	32	37	G	G	44	40		G	28		G	G	26	G		G
17		33	32			G			36	40	42	47	45	G	G	G	G	G	G	32	29	G	G	
18	G	G	G	G		G	G	G		40	41	51	54	45	73	51	41	71	33	33	34		27	32
19	32	51	40					G		49		G		39		G	32	G	G	G	G	G	G	G
20	G		G	25	G	G	G	G	G	36	39	40	G	42	46	40	51	45	30	29	32	32		G
21	G	G	G	G	G	G	G	G	32	36	G	51	41	G	G	38	29	G	G	G	G	G	G	G
22	G	29	32	26	G	G	G	G	G	G	42	49	44	G	40	43	50	32	28	59	G	32	28	G
23	G	G	G	G	G	G	G	G	G	G	42	46	40	44	50	G	G	G	G	G	G	G	G	33
24	40	44	35	28	G	G	32	28	G	G	G	41	53	44	37	34	G	G	G	40	24	G	G	G
25	33	32	29	G	G	G	G	31	32	40	45	G	G	G	G	G	31	36	27	G	G	G	G	G
26	G	G	G	G	26	G	G	G	G	G	G	G	44	G	G	34	37	G	G	G	G	G	G	G
27	30	32	41	41	30	28	G	G	G	G	50	42	42	42	39	G	G	G	G	G	31	33	G	G
28	24	29	32	29	G	27	43	G	G	36	41	43	50	49	58	35	G	33	50	44	36	36	27	28
29	G	24	24	129	28	G	35	G	G	G	39	G	G	42	40	G	32	G	26	G	G	G	G	G
30	G	G	G	G	G	G	G	G	G	40	G		G	G	43	37	50	30	G	33	31	22	G	
31	G	G	G	G	G	G	G	G	G	37	G	G	42	G	G	G	37	37	28	G	G	G	G	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	30	30	30	29	26	30	29	30	29	30	30	30	30	30	29	31	31	30	31	31	31	29	28	28
MED	G	G	G	G	G	G	G	G	G	37	40	40	41	40	37	G	29	G	G	G	G	G	G	G
U Q	G	29	26	13	G	G	12	G	34	40	42	46	45	42	43	37	37	33	28	29	28	26	24	13
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 AKITA

DEC. 1990

LAT. 39.7N LON. 140.1E SWEEP 1MHz TO 25MHz AUTOMATIC SCALING

D \ H	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
1	16	15	16	15	15	15	15	15	15	16	23	23	17		15	16	15	16	16	16	15	16	16	16
2	16	15	16	15	15	15	15	21	15		20	18	17	16	17	16	16	16	16	17	15	18	16	
3	15	16	15	15	15	15	15	15	17	16	16	16	18	18	16	17	20		16	15	15	15	16	16
4	15	15	15	16	15	16	16	22	16	17	18	22	21	18	17	16	21	15	15	16	16	15	16	15
5	16	16	15	15	16	16	15	21	15	17	16	17	18	16	16	27	22	15	15	16	15	15	17	16
6	16	15	17	17	15	16	15	20	17	16	18	20	20	18	17	16	18	16	16	16	16	16	16	16
7	15	15	15	15		15	15	20	16	17	20	21	20	20	17	17	21	16	17	15	15	15	17	15
8	17	16	15	15	15	15	15	15	16	17	20	20	20	20	17	15	22	16	16	15	15	15	15	15
9	16	17	15	17	16	15	15	21	15	16	17	17	18	22	20	16	21	15	15	15	16	15	15	15
10	15	15	15	16		15	15	16	16	16	18	18	20	22	18	18	16	16	15	15	16	17	15	17
11	16	15	15	15	15	16	15	21	17	21	23	36	23	23	34	20	15	16	15	17	15	23	22	20
12	17	15	17	17	15	15	15	15	16	16	18	21	21	28	18	16	22	15	15	15	15		16	15
13	16	15	16	16	17	15	17	18	16		18	21	21	18	17	16	20	16	16	16	17	16	16	15
14	15	15	15	15	17	15	16	20	16	17	20	20	20	17	16	16	22	16	16	16	15	16	15	15
15	15	16	15	15	18	15	15	20	16	16	18	18	18	20	16	18	21	15	15	16	18	15		17
16	16	16		15	15	17	16	16	16	16	21	23	21	23		17	21		17	16	16	16		15
17		15	15			15			15	18	18	20	20	20	18	16	16	15	15	16	15	15	N	
18	17	16	16	16		15	15	18		17	21	33	21	20	21	16	17	15	17	15	15		16	15
19	17	15	15					18		18		23		21		16	15	17	15	15	15	N	17	16
20	15		15	15	15	16	15	20	16	16	18	20	18	20	17	16	15	15	15	16	16	16		18
21	16	15	16	16	15	15	15	20	15	15	16	20	20	21	17	17	16	18	15	15	15	20	16	17
22	16	15	15	16	15	16	17	18	16	18	18	20	18	22	16	15	15	15	16	15	16	15	16	16
23	18	16	15	15	15	15	16	18	20	22	20	18	18	18	17	16	20	16	15	15	15	20	18	15
24	15	15	15	16	15	15	15	15	15	16	23	20	18	18	17	17	22	15	15	15	15	15	15	20
25	15	15	15	15	15	16	16	15	15	16	18	18	18	17	15	27	16	15	16	15	15	18	16	16
26	15	16	15	15	15	16	15	20	26	33	35	39	28	35	23	20	16	15	17	16	15	15	16	16
27	16	15	15	15	15	16	16	18	16	20	18	20	20	18	20	17	18	16	15	15	16	15	16	15
28	15	16	15	15	15	16	15	16	16	16	18	20	20	18	17	16	17	16	15	15	15	15	15	16
29	15	16	15		16	15	15	18	16	18	17	20	20	20	17	16	16	15	15	15	15	18	16	16
30	17	15	15	16	15	16	15	17	17	18	21		24	22	23	18	20	15	16	15	15	17	17	
31	17	16	15	15	15	16	16	18	17	18	21	22	17	21	21	15	16	15	15	16	18	17	18	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	30	30	30	28	26	30	29	30	29	29	30	30	30	30	29	31	31	29	31	31	31	28	27	28
MED	16	15	15	15	15	15	15	18	16	17	18	20	20	20	17	16	18	15	15	15	15	16	16	16
U Q	16	16	15	16	15	16	16	20	16	18	21	22	21	22	19	17	21	16	16	16	16	17	17	16
L Q	15	15	15	15	15	15	15	16	15	16	18	18	18	18	16	16	16	15	15	15	15	15	16	15

COMMUNICATIONS RESEARCH LABORATORY, JAPAN

HOURLY VALUES OF FOF2 AT KOKUBUNJI

DEC. 1990

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	32	31	28	30	31	32	44	81	101	100	110	116	113	106	110	88	94	77	55	A	A	34	A	37
2	36	36	32	36	35	41	46	82	104	107	113	120	115	121	120	119	104	79	56	52	47	42	36	35
3	37	35	43	42	31	30	41	83	104	106	109	104	116	122	116	94	94	83	70	48	42	46	A	38
4	36	38	38	36	43	35	45	81	104	113	124	128	128	123	123	118	110	94	57	42	53	54	42	45
5	41	38	38	35	39	38	43	84	118	120	119	117	111	131	118	109	106	91	77	74	73	56	37	25
6	24	31	30	27	35	34	42	72	105	119	137	134	124	125	121	104	98	78	72	54	53	52	36	42
7	38	32	36	37	31	28	40	87	118	124	128	132	122	112	113	117	104	78	77	61	48	46	40	36
8	32	36	31	31	34	32	37	71	103	118	115	108	110	108	108	112	103	80	64	65	53	42	38	34
9	36	30	32	31	34	36	38	85	102	108	116	116	107	119	120	112	103	90	73	60	47	48	43	38
10	A	38	36	38		36	46	77	100	134	131	132	125	124	118	113	102	78	57	52	56	49	36	37
11	37	36	34	38	32		31	78	106	104	110	112	111	118	118	110	106	72	64	71	A	32	38	38
12	36	34	38	35	36	37	38	73	100	108	126	114	115	116	108	101	87	74	64	60	63	48	36	49
13	38	32	32	31	32	28	36	65	106	108	125	116	119	124	110	105	104	95	65	50	50	52	40	44
14	41	37	43	38	36	38	43	85	106	118	120	121	126	122	123	114	102	86	71	61	51	46	36	34
15	A	A	28	32	30	31	32	75	97	104	117	120	121	113	108	104	97	74	60	58	50	54	38	34
16	31	32	32	40	32	32	44	68	74	101	115	130	128	111	102	105	88	64	58	50	45	36	30	34
17	32	A	A	35	36	28	28	66	92	107	126	125	113	115	114	118	93	82	68	56	50	33		26
18	N	28	28	32	39	28	30	64	79	100	106	124	115	100	97	91	88	64	42	42	53	34	29	A
19	A	36	38	37	30	34	32	65	93	100	110	103	112	113	97	97	89	68	50	45	39	A	28	28
20	31	28	33	36	34	34	32	67	89	82	104	94	111	96	87	81	86	68	47	42	44	42	38	A
21	33	31	28	31	31	41	27	62	82	84	121	136	117	108	100	106	86	77	62	55	41	36	25	31
22	32	32	A	36	35	32	37	63	81	84	111	132	115	131	120	108	92	73	57	54	A	40	A	31
23	31	31	32	31	31	30	32	66	89	85	92	116	104	102	109	103	78	59	64	51	43	A	37	A
24	35	A	36	38	30	30	34	73	90	91	100	116	122	100	101	105	104	81	72	61	39	34	32	35
25	34	A	35	35	28	22	36	54	82	110	118	120	123	114	117	111	101	82	56		51	46	37	35
26	38	46	36	37	35	37	36	66	79	95	117	118	122			93		86	54	53	54	43	35	31
27	32	A	36	42	36	30	31	74	90	102	115	112	125	118	100	94	84	78	60	40	38	38	38	40
28	38	38	42	A	36	26	N	64	90	104	104	118	110	102	104	108	114	93	66	66	66	50	A	A
29	32	32	30	35	36	28	29	64	96	94	96	106	111	108	98	94		74	56	53	50	39	31	32
30	36	32	37	43	28	27	31	71	85	101	121	122	130	126	115	106	89	77	62	58	44	34	30	32
31	38	29	40	43	31	31	32	65	110	104	124	130	126	122	101	100	91	83	70	53	42	32	36	36
	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
CNT	27	26	29	30	30	30	30	31	31	31	31	31	31	30	30	31	29	31	31	29	28	29	26	27
MED	36	32	35	36	34	32	36	71	97	104	116	118	116	116	110	105	97	78	62	54	50	42	36	35
U Q	38	36	38	38	36	36	42	81	104	110	124	128	124	122	118	112	104	83	70	60	53	48	38	38
L Q	32	31	31	32	31	28	32	65	89	100	110	114	111	108	101	97	88	74	56	50	43	35	32	32

HOURLY VALUES OF FES AT KOKUBUNJI

DEC. 1990

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	23	G	37	G	G	G	G	G	39	35	61	60	60	60	60	G	26	25
2	25	G	G	G	G	G	G	G	34	G	53	47	43	G	48	38	49	38	56	G	G	G	G	G
3	G	G	G	28	G	G	G	30	G	G	G	G	44	46	50	37	G	G	G	32	34	34	58	G
4	G	G	G	G	G	G	G	32	36	38	G	G	G	G	40	58	30	G	30	30	35	29	G	G
5	G	G	G	G	G	G	G	28	38	49	47	50	G	G	40	G	30	G	G	25	24	G	G	G
6	G	G	G	G	G	G	G	G	34	44	41	44	43	42	G	58	41	37	24	26	G	30	G	G
7	G	G	G	G	G	G	G	G	G	44	47	50	57	40	41	G	G	28	G	G	G	G	G	G
8	G	G	G	G	G	G	G	31	G	44	40	43	44	42	G	G	33	33	G	29	25	G	G	G
9	G	G	G	G	G	G	28	28	40	38	42	G	54	57	61	40	31	37	52	32	32	30	30	50
10	37	G	G	G		G	G	28	G	G	G	G	60	G	G	37	28	37	30	23	G	G	G	G
11	G	G	G	G	G		G	31	37	G	47	47	G	45	G	G	36	27	24	G	38	G	G	G
12	G	G	G	G	G	G	G	29	34	44	43	49	51	G	G	40	29	26	G	G	G	G	G	G
13	G	G	G	G	G	G	G	29	36	43	60	G	43	G	G	G	G	G	G	G	G	G	G	24
14	26	27	26	33	25	G	G	G	G	G	44	57	G	52	61	G	G	33	27	27	30	26	G	G
15	29	29	G	G	30	G	G	58	36	42	47	44	G	G	44	36	36	32	32	29	29	26	24	24
16	23	G	23	G	G	G	G	28	34	G	G	50	G	43	G	38	30	G	G	G	G	G	G	G
17	G	30	30	G	G	G	G	G	G	41	43	58	47	42	44	35	G	30	G	27	G	G		G
18	G	G	G	G	G	G	G	G	G	38	48	44	45	54	70	38	44	32	41	32	30	30	24	51
19	37	36	30	35	46	27	G	G	G	44	50	50	43	40	G	G	48	40	31	28	G	38	G	G
20	G	28	25	G	G	G	26	29	G	G	G	G	G	49	44	44	36	33	G	26	28	24	G	29
21	G	G	G	G	G	G	G	G	33	G	G	G	G	G	G	G	36	23	G	G	G	G	G	G
22	G	G	28	24	31	G	G	G	G	G	47	46	51	44	61	41	45	26	G	G	30	49	49	34
23	G	G	G	G	G	G	G	G	G	G	G	49	45	41	48	35	G	30	29	24	G	27	G	34
24	26	32	28	G	26	25	G	32	G	40	G	48	58	G	42	42	46	30	36	40	G	24	G	28
25	G	27	G	G	G	G	G	28	58	44	46	G	G	G	G	G	31	24	G		G	G	G	G
26	G	G	G	G	G	G	G	G	G	G	G	G	44			45		G	G	G	G	G	G	G
27	G	45	30	32	29	31	26	27	G	37	40	53	45	42	44	44	58	32	42	G	G	26	G	G
28	23	G	G	57	G	G	G	28	G	37	43	44	44	42	G	38	69	62	56	32	28	30	28	29
29	26	G	G	25	28	G	G	G	34	37	40	G	48	G	41	G		27	26	26	24	G	G	G
30	G	G	G	G	G	G	G	G	G	37	44	41	42	G	40	G	44	37	31	G	G	G	G	G
31	G	G	G	G	G	G	G	G	33	37	40	42	56	G	G	G	32	G	G	G	G	G	G	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	31	31	31	31	30	30	31	31	31	31	31	31	31	30	30	31	29	31	31	30	31	31	30	31
MED	G	G	G	G	G	G	G	27	G	37	42	44	44	40	40	36	33	30	24	26	G	G	G	G
U Q	23	27	23	G	G	G	G	29	36	43	47	49	48	43	44	40	44	37	32	29	30	29	G	25
L Q	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	28	23	G	G	G	G	G	G

COMMUNICATIONS RESEARCH LABORATORY, JAPAN

HOURLY VALUES OF FMIN AT KOKUBUNJI

DEC. 1990

LAT. 35.7N LON. 139.5E 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	15	15	16	15	16	16	22	15	16	35	38	15	17	16	17	16	15	15	15	15	15	16	15
2	15	15	15	15	15	16	16	21	16	15	20	17	20	17	15	15	15	14	16	15	15	16	16	15
3	15	15	15	14	14	16	15	16	15	15	16	16	16	17	16	15	15	15	15	14	16	15	15	15
4	15	15	15	15	14	15	15	15	15	15	18	20	18	17	16	15	23	15	15	14	15	15	15	15
5	15	15	15	15	15	15	15	15	17	16	18	18	18	16	16	16	18	14	15	15	15	15	16	16
6	18	16	16	17	16	15	15	15	17	17	16	20	24	17	15	15	16	15	16	15	15	14	15	16
7	16	16	15	15	15	17	16	16	15	16	18	18	18	21	18	15	14	16	15	15	16	15	15	16
8	16	16	15	15	15	15	15	17	16	17	18	17	17	18	20	16	16	15	14	15	15	15	17	17
9	15	17	15	15	16	15	15	15	16	17	18	21	18	21	17	17	15	15	14	15	15	15	16	15
10	15	15	16	15		14	15	15	15	16	18	21	17	16	15	15	15	14	16	16	15	15	15	15
11	16	14	16	14	15		17	17	16	18	21	28	26	23	23	18	15	14	17	15	15	15	16	15
12	16	16	15	15	16	15	15	15	15	18	17	18	21	48	20	18	16	16	15	16	15	16	16	15
13	16	15	15	15	17	15	15	16	17	16	18	23	21	20	17	20	15	15	15	15	15	16	15	15
14	15	16	15	15	15	17	16	22	16	16	17	18	20	21	16	15	23	15	15	15	14	16	16	17
15	16	15	16	16	15	15	16	17	15	16	16	20	18	15	16	17	15	14	14	15	15	16	15	16
16	16	15	16	15	14	16	15	15	14	16	17	16	18	18	18	16	16	15	14	15	15	15	17	17
17	16	16	14	15	14	15	15	15	15	16	18	20	17	21	17	17	16	15	15	14	15	16		20
18	17	16	15	15	15	15	15	15	16	15	16	29	24	18	18	16	14	15	15	14	15	15	16	15
19	15	15	15	14	15	15	15	20	15	16	18	26	24	21	20	15	17	14	14	16	15	15	20	15
20	15	16	14	15	15	15	16	17	16	15	16	17	17	17	21	15	14	15	15	16	15	16	16	16
21	15	16	16	16	15	15	15	16	15	16	17	20	18	21	17	15	15	15	15	15	15	15	17	15
22	15	15	15	15	15	15	15	16	16	16	18	23	17	20	17	15	15	15	16	15	15	15	16	15
23	15	17	16	15	14	16	15	18	20	20	18	20	18	21	16	15	15	15	15	15	15	17	17	15
24	15	15	14	17	15	15	15	14	15	15	20	20	21	18	17	16	16	15	15	15	15	16	17	15
25	16	14	15	15	16	N	15	15	16	18	20	20	20	17	16	15	15	15	15		14	15	15	16
26	16	15	15	15	16	15	15	15	29	33	39	37	32			18		15	16	16	15	15	16	15
27	16	14	14	14	15	15	16	17	16	16	16	16	15	16	16	16	15	14	15	17	17	15	16	16
28	15	15	17	15	15	18	20	20	16	16	16	16	20	17	16	15	15	15	15	15	15	15	15	16
29	15	15	16	15	16	17	17	17	16	16	18	18	17	17	18	16		15	15	15	16	16	15	15
30	16	15	17	16	14	15	15	20	16	17	17	21	22	20	20	16	15	14	15	15	15	16	16	16
31	16	15	15	15	14	15	16	18	16	17	18	18	18	20	20	18	16	15	14	15	14	15	15	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	30	29	31	31	31	31	31	31	31	30	30	31	29	31	31	30	31	31	30	31
MED	16	15	15	15	15	15	15	16	16	16	18	20	18	18	17	16	15	15	15	15	15	15	16	15
U Q	16	16	16	15	15	16	16	18	16	17	18	21	21	21	18	17	16	15	15	15	15	16	16	16
L Q	15	15	15	15	15	15	15	15	15	16	17	18	17	17	16	15	15	14	15	15	15	15	15	15

HOURLY VALUES OF FOF2 AT YAMAGAWA

DEC. 1990

LAT. 31.2N LON. 130.6E 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	57	58	54	38	42	33	54	76	104	116	107	112	118	132	142	110	101	101	81	A	59	49	53	48
2	37	71	35	33	43	70	31	57	109	89	113	124	129	131	120	138	130	111	88	74	78	66	53	66
3	36	42	41	40	37	22	37	58	98	107	114	110	114	134	130	121	118	109	88	76	68	68	59	68
4	44	70	38	30		36	38			119	126	125	124	123		123	128	108	97	75	82		62	52
5	52	43	66	65	38	46	34	64	121	131	116								122	110	107	87	65	63
6	36	66	50	62	64	68	42	69	110	124	135	126	126	132	137	126	118	110	89	86	88	82	64	58
7	64	58	48	46	53	64	37	68	116	111	122	121	132	127	130	138	124	126	106	87	88	79	77	62
8	59	51	51	46	36	51	32	63	101	126	124	124	108	116	124	129	126	125	104	90	86	78	61	58
9	79	65	61	38	43	70	40	72	106	121	127	122	116	120	132		138	127	118	89	85	78	67	53
10	53	47	58	35	36	36	35	72	111	127	130	126	127	128	130	133	131	113	102	83	83	84	65	54
11	54	50	59	35	41	56	26	52	96	111	122	122	122	125	126	128	116	107	63	84	84	88	63	130
12	71	58	53	26	40	46	56	54	103	118	114		126	127	114		110	100	78	81		85	62	61
13	61	71	68	36	51	46	71	52	101	122	134	124	127	120	129	111	120	118	107	80	67	76	68	63
14	60	54	49	42	41	32	36	53	114	130	120	127	130	128	135	136	128	132	138	110	96	86	65	43
15	36		56		30			50	97	106	107	112	124	122	117	120	122	114	86	92	77	70	63	70
16	56	59	30	64	34	25	28	53	89	112	121	116	127	121	108	126	116	93	68	71	77	58	48	46
17	66	56	51	56	34	A	46	52	101	121		127	131	138	146	138	137	123	112	80	87	79	50	58
18	41	40	56	47	48	38		52	84	97	115	110	121	109	112	104	113	99	66	55	67	51	A	66
19	51		51	36	42	32	46	50	101	131	134	122	140	144	147	130	137	113	88	66	52	67	56	40
20	71	70	70	39	65	51	30	52	105	104	90	104	124	111	110	103	100	108	83	61	76	64	70	52
21	42	37	45	30	43	68	34	48	74	81	112	135	123	118	114	126	118	111	86	83	75	66	51	66
22	46	36	32	46	56	30	36	54	84	98	104	122	129	150	165	151	146	129	88	80	82	78	33	50
23	71	42	66	34	42	68	71	50	88	86	104	106	107	108	121	117	107	91	76	66	77	66	54	63
24	A	A	46	32	31	36	64	51	81	102	109	106	112	127	128	120	124	118	85	78	78	54	60	69
25	71	38	40	35	49	71	54	54	73	102	108	112	111	110	109	105	105	108	90	65	48	57	52	
26	69	42	38	31	35	30		53	75	105	104	117	124	121	114	115	108	107	87	79	84	64	58	49
27		51	28	33	30	46	N	50	92	108	111	111	121	122	118	116	113	109	104	84	71	72	52	68
28	51	32	58	55	56		50	50	88	101	112	106	111	107	106	115	112	120	94	85	87	103	84	42
29	52	43	37	33	42	36	26	44	94	102	97	104	122	108	109	108	100	106	89	61	77	74	38	70
30	56	36	44	57	43		28	46	82	98	122	116	130	140	120	116	108	91	87	66	57	63	41	70
31	69	46	54	57	50	35	66	52	88	113	110	134	134	120	112	99	107	100	84	74	70	52	71	66
	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	28	31	30	30	27	27	30	30	31	30	29	30	30	29	28	30	30	31	30	30	30	30	30
MED	56	50	51	38	42	46	37	52	98	111	114	121	124	122	121	120	118	110	88	80	78	71	60	62
U Q	67	58	58	47	49	64	54	58	105	121	122	124	129	131	131	129	128	118	104	85	85	79	65	66
L Q	45	42	40	33	36	33	32	50	88	102	108	110	118	118	113	113	108	106	84	71	70	64	52	52

COMMUNICATIONS RESEARCH LABORATORY, JAPAN

HOURLY VALUES OF FES AT YAMAGAWA

DEC. 1990

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	G	G	G	G	G	G	G	G	G	G	G	G	G	46	46	44	48	44	69	94	33	G	G	G
2	G	G	G	G	G	G	G	G	G	39	G	51	59	G	G	G	G	G	G	G	G	G	G	G
3	G	G	G	26	G	G	G	G	G	G	G	G	G	46	49	55	G	G	G	G	26	G	G	G
4	G	G	27	24		G	G			G	41	G	G	G		G	G	G	G	G	29		G	G
5	G	G	G	G	G	G	G	G	33	42	42								G	G	G	G	G	G
6	G	G	G	G	G	G	G	G	32	G	43	47	46	44	41	46	39	28	G	G	24	25	G	G
7	G	G	G	G	G	G	G	G	G	G	46	51	48	G	50	41	G	G	G	G	G	G	G	G
8	G	G	G	G	G	G	G	G	G	38	46	50	50	50	59	48	40	30	25	26	G	G	G	G
9	30	G	27	G	G	G	G	G	G	41	45	G	46	G	43		54	40	G	G	G	G	26	G
10	G	G	G	G	G	G	G	G	G	G	G	G	G	48	G	42	G	G	G	G	G	G	G	G
11	G	G	G	G	G	G	G	G	48	G	46	65	51	G	50	G	44	29	11	G	G	G	24	G
12	G	G	G	G	G	G	G	26	G	40	42		50	50	42		58	44	32	24		G	G	G
13	G	G	G	G	G	G	G	G	G	40	46	55	59	48	43	40	G	G	G	29	53	23	G	G
14	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	26	G	G	G	G
15	G	G	G		G			G	G	G	G	48	50	G	44	45	39	34	G	37	24	G	24	G
16	G	G	G	G	G	G	G	G	G	G	G	42	G	G	G	G	40	38	G	G	G	G	G	G
17	G	G	G	G	32	24	G	G	G	G		46	54	46	44	G	G	G	24	G	25	28	G	G
18	G	G	G	G	G	G		24	34	G	42	43	47	42	49	48	43	G	26	G	G	34	34	25
19	G	28	26	G	G	G	G	G	G	G	G	G	G	G	G	G	G	37	59	34	32	G	G	G
20	G	G	G	G	G	G	G	G	G	G	G	42	48	56	51	47	40	G	31	G	G	24	G	G
21	G	G	G	G	G	G	G	G	G	G	G	G	G	137	48	G	G	G	G	G	G	34	G	G
22	G	G	G	G	G	G	G	G	G	G	41	50	62	74	50	48	54	G	G	27	G	G	G	G
23	G	G	G	G	G	G	G	G	G	G	G	G	50	46	49	60	34	44	G	G	G	G	G	G
24	32	39	G	23	G	G	25	G	G	G	44	G	51	62	41	44	43	43	34	25	G	G	G	G
25	G	G	28	G	G	G	G	32	34	41	58	48	62	44	G	G	G	G	26	23	G	G	G	
26	G	G	G	G	G	G		G	G	G	G	G	54	62	65	G	G	G	G	G	G	G	G	G
27		G	G	G	G	30	26	28	G	G	G	45	45	45	58	57	43	40	28	G	G	G	G	G
28	G	G	G	G	G	G	G	G	G	36	40	43	48	44	45	43	34	31	32	26	32	G	29	G
29	G	G	G	G	G	G	G	G	G	36	41	G	G	G	41	G	G	G	G	25	G	G	G	G
30	G	G	G	G	G		G	G	G	40	43	G	45	43	51	54	G	35	31	33	24	G	G	G
31	G	G	G	G	G	G	G	G	G	G	G	G	44	G	50	G	G	G	G	G	G	G	G	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	30	31	31	30	30	29	28	30	30	31	30	29	30	30	29	28	30	30	31	31	30	30	31	30
MED	G	G	G	G	G	G	G	G	G	G	40	42	48	44	45	42	18	G	G	G	G	G	G	G
U Q	G	G	G	G	G	G	G	G	G	38	43	48	51	48	50	47	43	37	28	26	24	G	G	G
L Q	G	G	G	G	G	G	G	G	G	G	G	G	G	G	41	G	G	G	G	G	G	G	G	G

COMMUNICATIONS RESEARCH LABORATORY, JAPAN

HOURLY VALUES OF FMIN AT YAMAGAWA

DEC. 1990

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	15	15	15	15	15	15	15	18	16	16	36	35	35	22	22	20	17	15	15	15	15	15	15	15
2	15	15	15	15	15	15	15	17	16	16	21	23	21	16	18	18	16	21	15	15	15	15	15	15
3	15	15	15	15	15	16	15	16	17	15	17	17	20	27	16	18	15	18	15	15	15	15	15	15
4	15	15	15	15		15	15			17	21	36	24	22		17	17	17	15	15	15		15	15
5	15	15	15	15	15	15	16	17	15	16	18								15	15	15	15	15	15
6	15	15	15	15	15	15	15	18	16	16	18	24	32	29	20	16	16	15	15	15	15	15	15	15
7	15	15	15	15	15	15	15	18	15	16	20	27	39	39	32	18	16	15	15	15	15	16	15	15
8	15	15	15	15	15	15	15	17	16	18	20	36	24	36	22	17	18	15	16	15	15	15	15	15
9	15	15	15	15	15	15	15	18	16	17	21	24	23	40	24		16	16	15	15	15	15	15	15
10	15	15	15	15	15	15	15	18	28	16	20	23	38	26	24	23	16	16	15	15	15	15	15	15
11	15	15	15	15	15	15	15	17	16	20	23	24	38	39	24	38	18	16	15	15	15	15	15	15
12	15	15	15	15	15	15	15	15	16	17	23		28	40	24		17	15	15	15		15	15	15
13	15	15	15	15	15	15	15	17	16	18	22	38	28	35	22	22	16	21	15	15	15	15	16	15
14	15	15	15	15	15	15	15	17	18	16	16	20	23	39	36	22	17	15	15	16	15	15	15	15
15	15	16	15		15			16	16	18	22	34	27	38	28	22	17	15	15	15	15	15	15	15
16	15	15	15	15	15	15	15	15	15	21	20	28	40	38	26	33	16	15	15	15	15	15	15	15
17	15	15	15	15	15	15	17	16	15	18		26	23	23	24	24	18	15	15	15	16	15	15	15
18	15	16	15	15	15	15		16	16	17	18	36	33	27	20	20	17	21	15	15	15	15	15	15
19	15	15	16	15	14	15	17	16	15	16	20	38	40	39	39	35	16	16	15	15	15	15	15	15
20	15	15	15	15	15	15	15	16	15	16	22	23	23	35	33	20	15	15	15	15	16	15	15	15
21	18	15	15	15	15	15	16	15	16	16	20	24	39	38	20	15	15	15	15	15	15	15	15	15
22	15	15	15	16	16	15	N	16	15	17	16	35	23	34	26	22	16	22	15	15	15	15	15	15
23	16	15	15	15	15	15	15	15	16	20	22	35	26	29	24	17	17	15	15	15	15	15	15	16
24	15	15	15	15	15	15	16	15	16	16	23	23	34	28	22	18	16	15	15	15	15	15	15	15
25	15	16	15	15	15	15	15	15	20	17	20	24	22	21	17	16	15	16	15	15	15	15	15	
26	15	15	15	15	15	15		15	20	17	18	22	33	24	21	17	17	22	16	15	15	15	15	15
27		15	15	15	15	15	15	15	26	15	15	21	18	32	17	18	17	16	15	15	15	15	15	15
28	15	15	16	15	15	16	N	15	16	17	17	22	21	21	22	16	15	15	15	16	15	15	15	15
29	15	15	15	15	15	15	16	15	15	17	18	22	29	24	34	18	15	15	15	15	15	15	15	15
30	16	15	15	15	15		15	15	16	16	21	21	20	23	21	20	16	15	14	15	15	15	15	15
31	15	15	15	15	15	15	15	15	16	16	18	23	21	24	21	24	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	30	31	31	30	30	29	26	30	30	31	30	29	30	30	29	28	30	30	31	31	30	30	31	30
MED	15	15	15	15	15	15	15	16	16	17	20	24	26	29	22	19	16	15	15	15	15	15	15	15
U Q	15	15	15	15	15	15	15	17	16	17	22	35	34	38	26	22	17	16	15	15	15	15	15	15
L Q	15	15	15	15	15	15	15	15	15	16	18	22	23	24	20	17	16	15	15	15	15	15	15	15

COMMUNICATIONS RESEARCH LABORATORY, JAPAN

HOURLY VALUES OF FOF2 AT OKINAWA

DEC. 1990

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	87	85	78	62	63	66	54	83	124	133	131	110	124	144	156	146	119	119	110	88	84	86	76	52
2	52	53	35	45	52	37	29	55	107	130	128	138	136	135	136	151	145	158	146	119	108	108	86	65
3	53	55	66	53	42	31	38	66	96	111	122	120	121	128	137	137	136	118	108	102	103	87	89	77
4	67	66	61	52	52	33	38	80	108	108	128	117	128	138	130	140	130	130	134	124	128	110	90	78
5	62	58	34	43	45	30	31	71	120	126	120	119	137	146	146	166	162	171	174	166	166	146	127	88
6	84	80	77	88	82	78	62	86	132	152	136	128	134	143	155	161	155	146	146	141	169	146	120	90
7	66	58	66	72	51	53	52	85	107	128	142	130	144	157	164	163	166	170	170	145	161	163	145	110
8	88	84	83	84	76	60	42	67	90	124	135	118		131	143	146	160	158	146	130	120	121	99	84
9	65	53	53	55	53	32	35	74	108	126	136	131	121	141	156	168	166	173	170	170	161	145	108	85
10	86	76	66	61	48	44	42	66	125	138	138	130	135	157	162	170	166	160	164	146	147	146	108	90
11	76	66	64	59	45	32		62	88	111	134	122	121	133	136	141	138	141	128		141	129	88	84
12	72	62	66	56	51	43	37	54	104	131	132	126	137	135	137	124	126	126	110	108	110	140	121	84
13	66	62	56	44	44	53	54	72	106	135	144	140	129	135	134	136	136	143	136	110	103	104	107	83
14	67	66	66	54	54	N	28	63	108	144	138	136	153	145	161	168	162	176	176	164	146	146	145	86
15	77	67	54	53	51	N	N	54	104	108	120	105	120	138	137	143	146	145	134	139	126	108	90	88
16	62	52	52	50	63	34		50	90	111	139	131	126	142	145	146	138	108	90	86	89	85	78	60
17	43	55	58	49	51	33	N	42	88	137	146	143	164	160	168	165	168	175	145	143	137	141	128	86
18	80	77	85	82	87	45	28	52	87	120	133	118	124	120	120	121	108	112	86	64	70	80	52	33
19	60	60	52	34	45	28	N	43	91	137	162	160	164	165	164	161	164	164	145	105	102	106	108	77
20	62	63	73	65	63	47	37	56	102	108	105	112	130	135	135	138	117	121	119	108	73	105	87	77
21	38	42	43	40	54	37	26	42	88	97	105	118	120	118	120	143	155	159	141	109	103	121	84	36
22	45	32	52	48	52	37	N	43	87	118	126	119	155	177	182	179	162	169	161	121	111	108	88	63
23	51	66	75	59	59	46	29	42	90	103	108	94	106	120	140	137	142	121	104	81	82	84	73	52
24	37	31	43	44	54	32	31	42	82	103	112	108	118	145	167		161	161	146	138	130	107	90	90
25	52	58	77	66	42	38	52	54	88	105	112	102	108	118	109	112	118	120	120	89	97	86	74	60
26	36	53	52	32	36	42	31	48	82	114	120	108	117	133	134	131	133	131	136	108	105	89	90	73
27		46	48	49	37	34	26	42	101	122	126	119	120	132	131	136	147	146	163	162	145	130	106	81
28	52	62	53	76	46	38	38	53	101	122	131	111	105	121	129	139	142	143	155	66	164	165	162	110
29	110	84	63	64	54	45	26	54	90	104	110	104	108	122	121	120	109	107	107	88	88	104	90	61
30	52	58	54	43	40	24	28	52	90	110	138	135	145	156	154	161	145	120	91	89	69	86	90	57
31	52	56	66	62	62		37	52	89	122	136	126	142	144	128	108	121	108	92	85	90	88	60	54
	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
CNT	30	31	31	31	31	28	25	31	31	31	31	31	30	31	31	30	31	31	31	30	31	31	31	31
MED	62	60	61	54	52	38	37	54	96	122	131	119	127	138	137	143	145	143	136	110	110	108	90	78
U Q	76	66	66	64	59	45	42	67	107	131	138	131	137	145	156	161	162	161	155	141	145	141	108	86
L Q	52	53	52	45	45	32	28	48	88	108	120	111	120	131	131	136	130	120	110	89	90	88	86	60

HOURLY VALUES OF FES AT OKINAWA

DEC. 1990

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	27	G	G	G	G	G	G	G	42	50	59	51	50	G	53	48	54	40	26	45	45	28	G
2	G	G	G	G	G	G	G	G	G	G	66	52	57	56	48	41	G	G	G	G	G	G	G	G
3	G	G	G	G	G	G	G	G	58	G	44	G	G	49	45	42	40	31	G	G	G	28	32	G
4	G	G	G	G	24	G	G	30	33	G	79	92	G	G	G	41	G	G	G	G	G	G	G	G
5	G	G	G	G	G	G	G	G	32	44	48	68	56	45	91	59	48	41	34	32	27	G	G	G
6	G	23	G	G	G	G	G	G	33	39	43	45	48	59	56	45	39	30	G	32	29	G	G	G
7	G	G	G	G	G	G	G	G	37	38	G	48	52	50	46	44	37	G	G	33	G	G	G	G
8	G	G	G	G	G	G	G	G	G	G	G	52		52	G	48	43	37	40	26	29	25	G	G
9	G	30	24	G	G	G	G	G	G	45	46	50	48	G	G	48	50	39	26	25	G	G	G	G
10	G	G	G	G	G	G	G	24	G	39	56	43	44	G	G	G	G	G	G	G	G	G	37	24
11	G	G	G	G	G	G		G	G	39	41	44	53	50	G	42	G	G	26		G	G	G	G
12	G	G	G	G	G	G	G	25	34	38	40	43	56	G	44	42	38	G	25	G	G	G	G	G
13	G	G	G	G	G	G	G	G	35	G	G	G	64	52	66	48	58	38	G	26	G	G	G	G
14	G	G	28	G	G	24	G	G	G	39	G	47	G	44	44	G	G	30	G	44	38	G	G	G
15	G	G	G	G	G	G	G	G	G	G	41	49	50	57	43	52	38	32	G	G	G	G	32	G
16	G	G	G	G	G	G		G	G	G	G	G	50	49	42	G	36	G	G	G	G	G	G	G
17	G	G	G	G	G	G	G	G	G	38	64	G	44	48	G	G	G	G	25	G	36	33	G	26
18	G	G	G	G	G	G	G	G	G	G	44	G	77	58	51	51	40	G	31	26	G	G	G	G
19	26	G	G	G	28	G	G	G	G	37	41	G	G	G	G	40	82	30	71	38	36	32	G	G
20	G	G	G	G	G	G	G	G	32	37	G	G	49	48	72	51	43	43	G	G	G	23	G	G
21	G	G	G	G	G	G	G	G	G	G	G	42	59	53	49	G	G	33	G	G	G	G	G	G
22	G	G	G	G	G	G	G	G	G	G	42	44	56	G	G	45	43	41	28	24	27	29	28	G
23	G	G	23	G	G	G	G	G	32	38	44	56	58	59	47	55	45	57	38	33	G	G	G	G
24	G	G	G	G	G	G	G	G	G	42	45	56	64	58	49		55	40	37	32	G	G	33	24
25	G	G	G	G	G	G	G	G	G	38	40	66	64	66	61	64	46	40	37	G	G	G	25	23
26	G	G	G	G	G	G	G	G	G	G	41	G	64	66	58	64	66	33	29	36	30	24	G	G
27		G	G	G	G	G	G	G	G	G	43	44	48	49	45	50	38	32	29	26	28	32	24	G
28	G	G	G	G	G	G	G	G	G	38	42	45	64	52	61	57	50	39	32	32	29	27	38	34
29	28	G	G	G	G	G	G	G	32	41	44	47	45	44	43	67	41	40	30	G	G	G	G	G
30	G	G	G	G	G	G	G	G	38	38	44	43	68	44	44	42	69	39	G	G	G	24	28	G
31	G	G	G	G	G		G	G	G	37	G	42	G	G	79	41	G	40	29	G	G	G	G	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	30	31	31	31	31	30	29	31	31	31	31	31	30	31	31	30	31	31	31	30	31	31	31	31
MED	G	G	G	G	G	G	G	G	G	38	42	44	52	49	45	45	40	33	26	24	G	G	G	G
U Q	G	G	G	G	G	G	G	G	32	39	45	52	59	56	56	52	48	40	32	32	29	25	28	G
L Q	G	G	G	G	G	G	G	G	G	G	G	G	45	44	G	41	G	G	G	G	G	G	G	G

COMMUNICATIONS RESEARCH LABORATORY, JAPAN

HOURLY VALUES OF FMIN AT OKINAWA

DEC. 1990

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

D \ H	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
1	15	14	16	15	15	15	15	17	15	15	33	28	24	23	22	24	17	15	14	15	15	15	15	15
2	15	14	15	15	15	15	15	17	16	16	20	23	22	22	20	14	16	15	15	14	15	15	15	15
3	15	15	15	14	15	15	15	18	15	15	17	17	21	17	23	18	17	14	15	15	15	15	15	15
4	15	15	15	15	14	15	15	17	15	18	18	36	26	22	18	22	17	16	14	15	15	14	15	15
5	15	15	15	15	15	16	15	17	16	17	20	22	26	22	24	21	15	15	15	15	15	15	15	15
6	15	15	15	15	14	15	15	18	15	18	22	26	27	23	26	23	17	14	15	15	15	15	16	15
7	15	17	15	15	15	15	15	18	14	18	23	21	26	27	24	23	18	15	15	15	15	15	15	15
8	15	15	15	15	15	15	15	18	16	18	23	24		27	23	22	18	16	15	14	15	16	15	15
9	15	15	15	15	16	15	15	16	16	18	23	26	27	27	24	24	16	15	15	14	15	15	15	15
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11	15	15	15	15	15	15		17	16	18	23	26	26	26	26	22	14	16	15		15	15	15	15
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13	15	15	15	15	14	15	15	17	15	18	23	26	26	30	26	24	17	16	15	15	15	15	15	15
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16	15	15	15	15	15	15		17	15	15	23	23	23	26	26	23	15	15	15	15	15	15	15	15
17	15	15	15	15	15	15	N	15	16	15	18	24	24	26	23	23	22	15	15	15	15	15	15	15
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23	15	15	16	15	15	15	15	15	16	20	20	20	24	23	23	22	16	15	14	15	15	15	15	15
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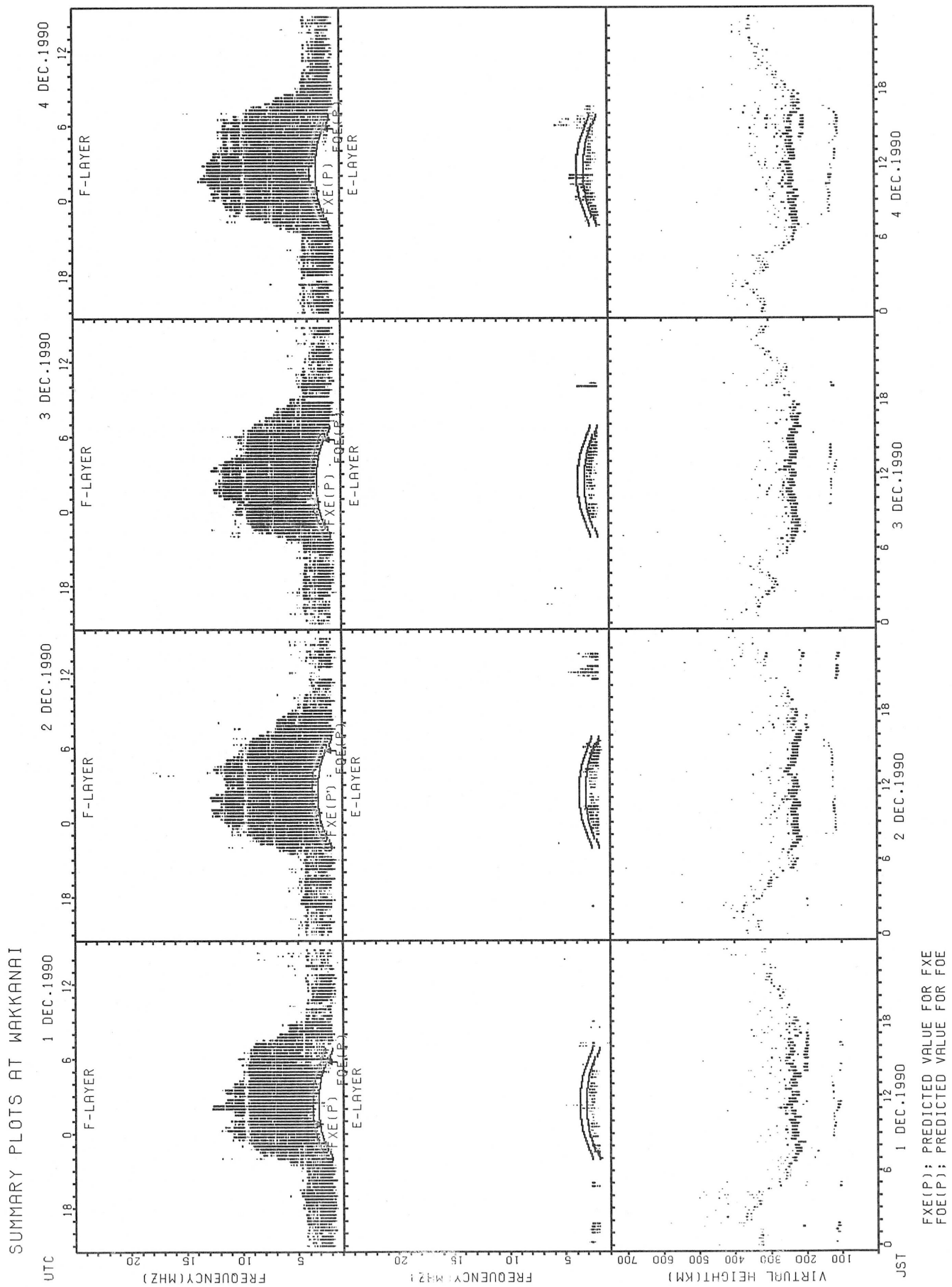
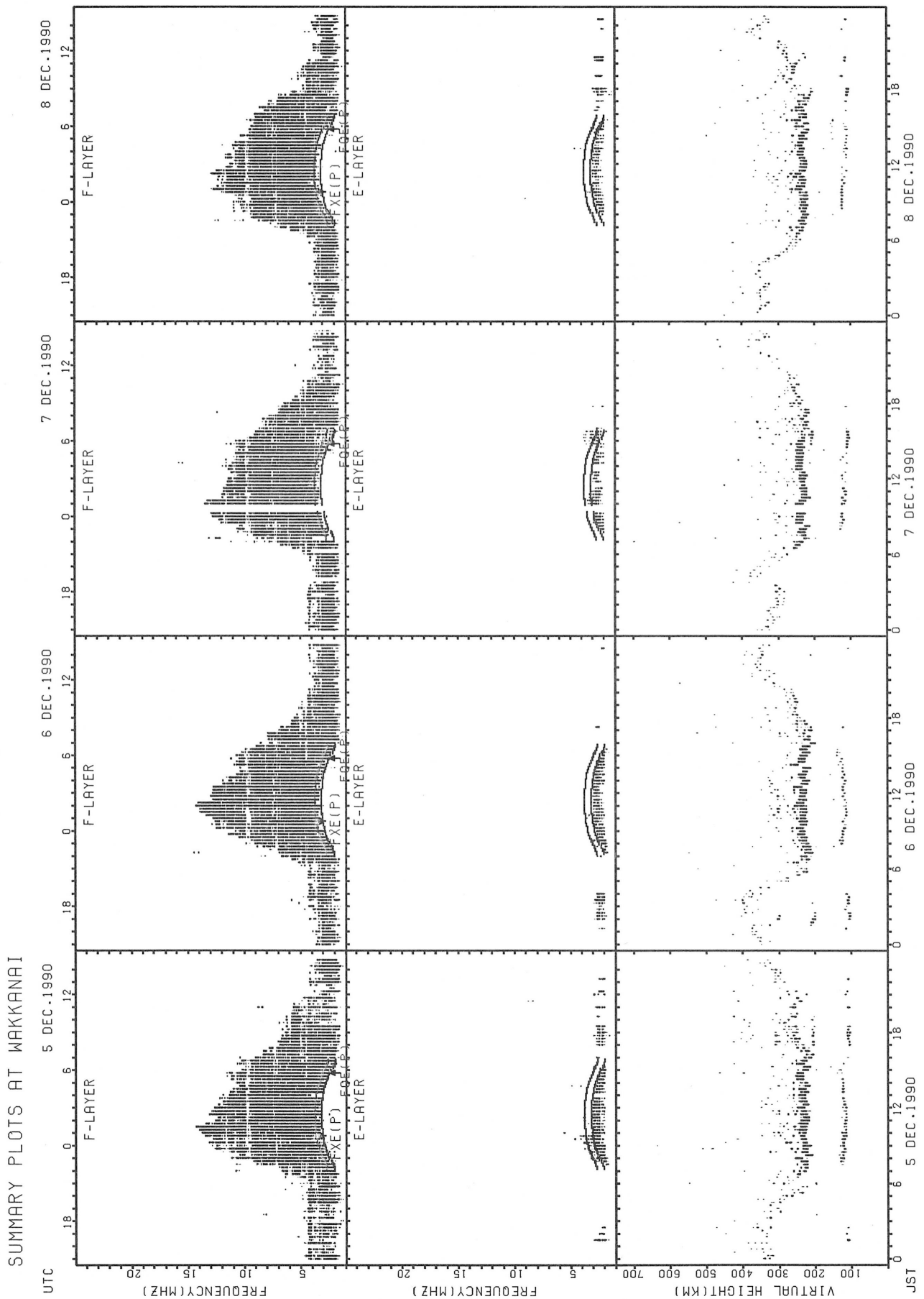
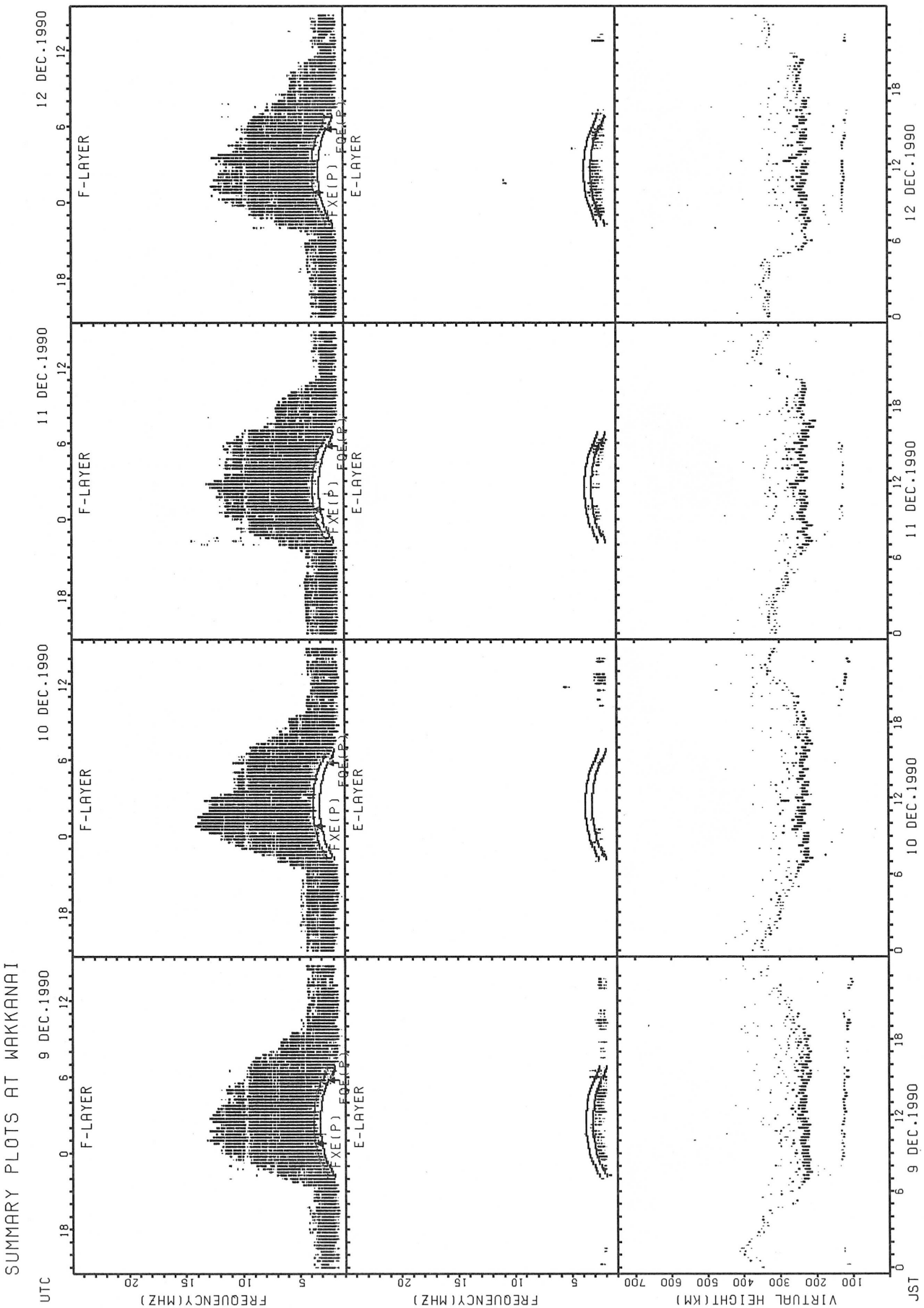
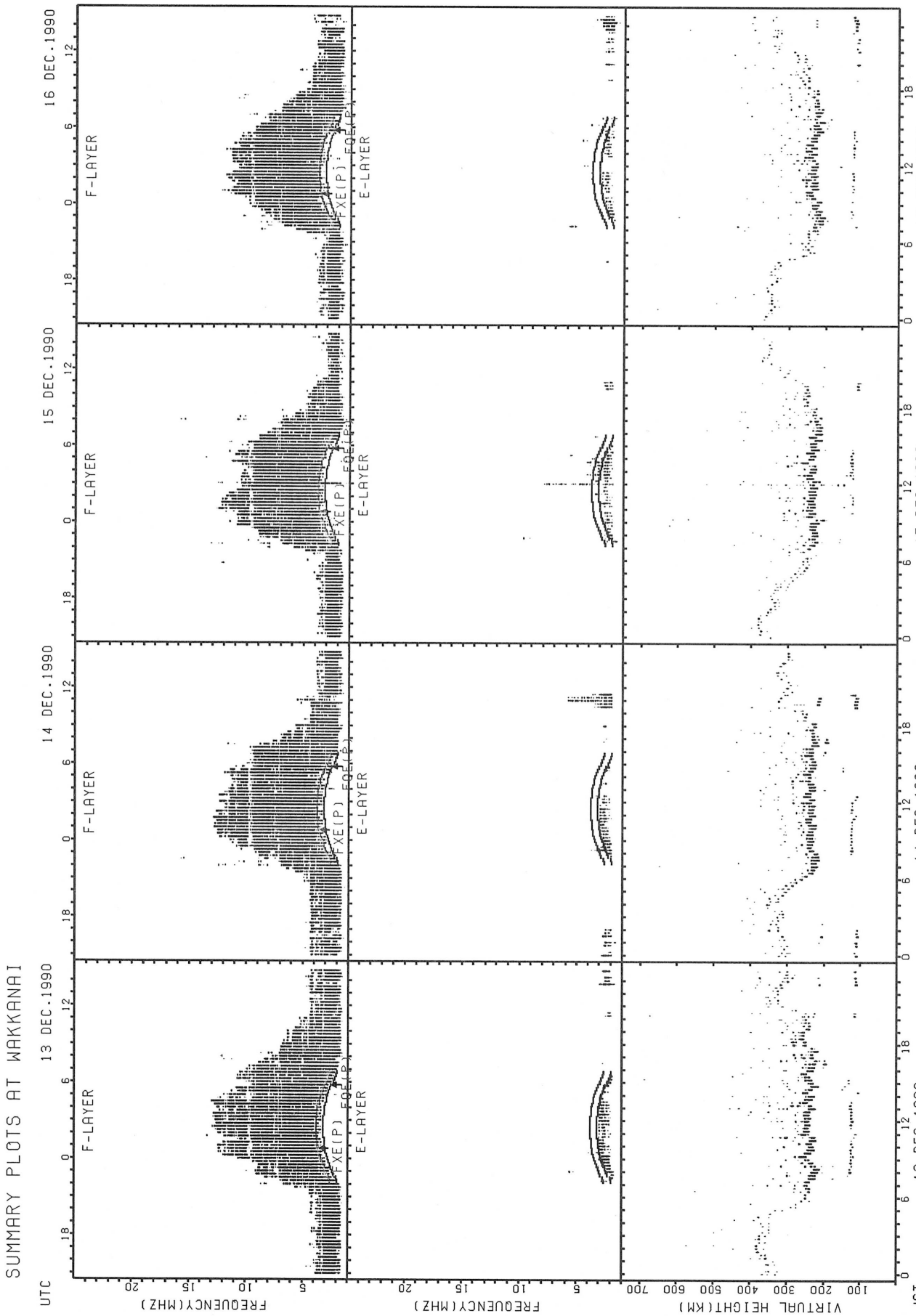
26	15	16	15	15	15	15	15	16	15	15	18	20	26	22	21	18	15	15	15	14	15	15	15	15
27		15	15	15	14	15	15	15	16	15	15	18	17	18	18	16	15	15	14	15	15	15	15	15
28	15	15	15	15	15	14	15	15	15	15	20	24	22	22	22	16	15	14	14	15	15	14	15	15
29	15	15	15	15	15	15	15	15	15	15	16	16	18	21	22	15	15	15	15	15	15	15	15	15
30	15	15	15	15	14	15	15	15	15	16	16	18	21	23	24	20	16	15	15	15	15	15	15	15
31	15	15	15	15	15		15	15	16	17	27	21	24	23	22	18	15	14	14	14	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	30	31	31	31	31	30	28	31	31	31	31	31	30	31	31	30	31	31	31	30	31	31	31	31
MED	15	15	15	15	15	15	15	16	15	16	20	23	24	23	23	22	16	15	15	15	15	15	15	15
U Q	15	15	15	15	15	15	15	17	16	18	23	26	26	26	26	23	17	15	15	15	15	15	15	15
L Q	15	15	15	15	14	15	15	15	15	15	18	21	22	22	22	18	15	15	15	15	15	15	15	15

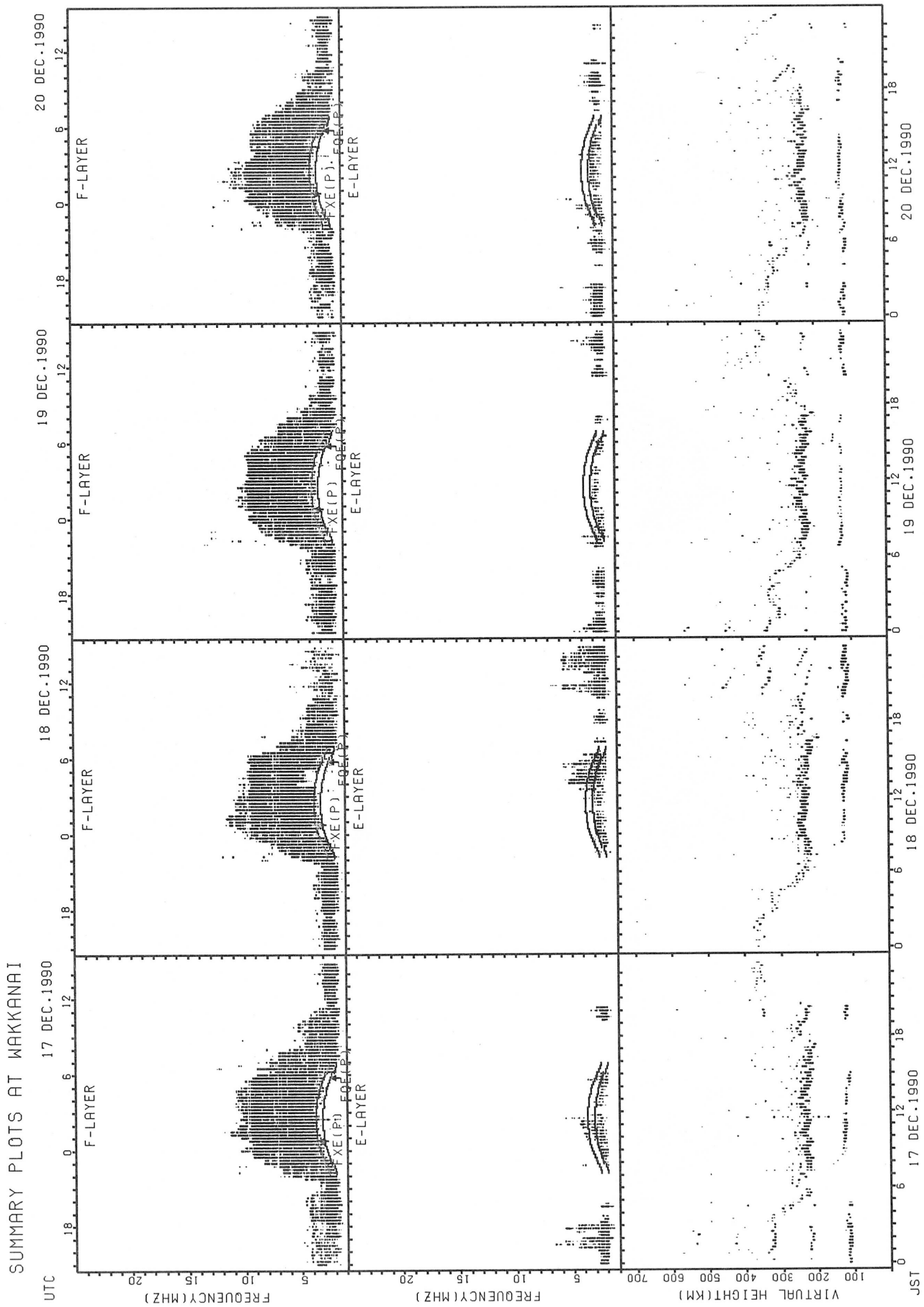
COMMUNICATIONS RESEARCH LABORATORY, JAPAN

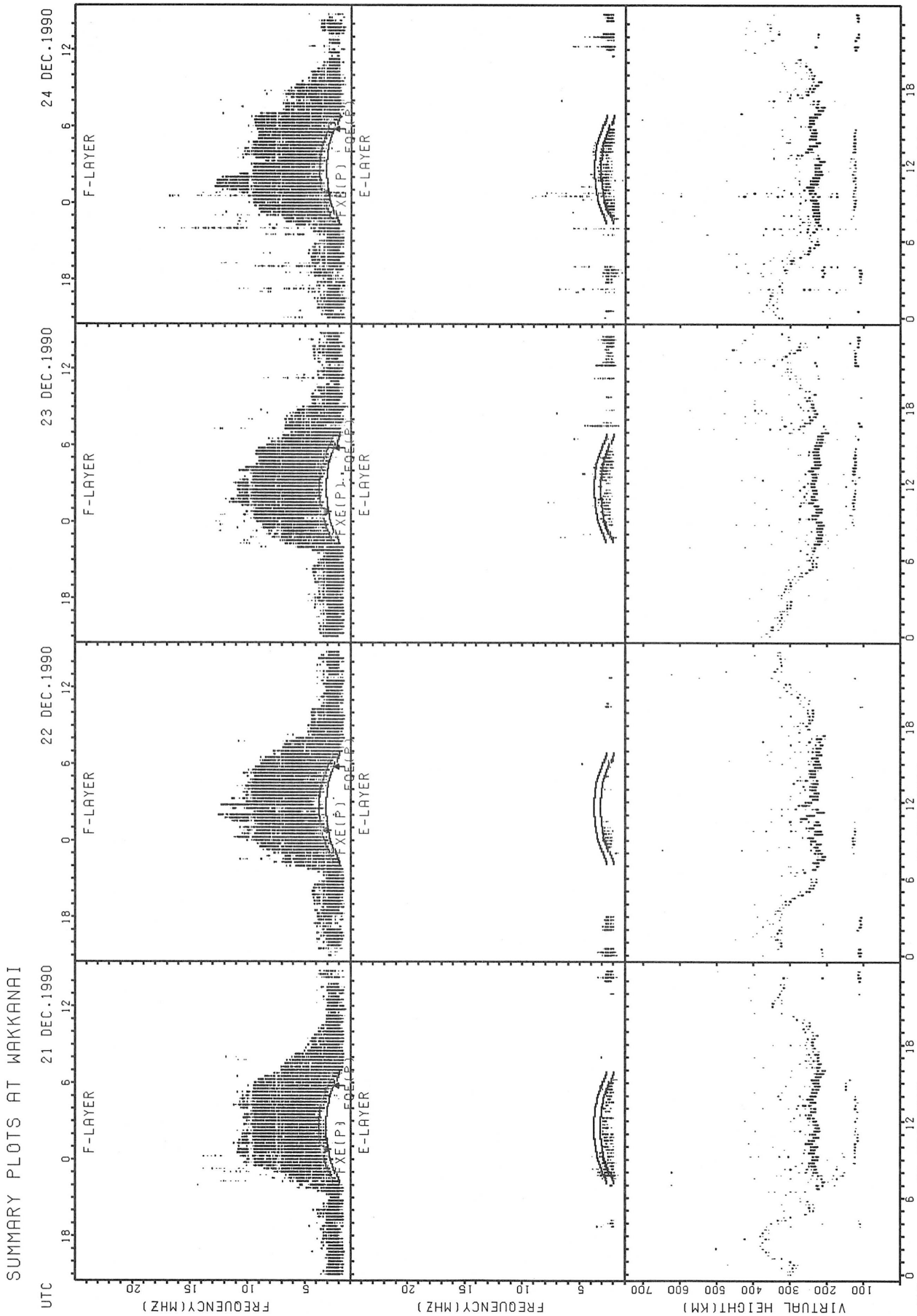

SUMMARY PLOTS AT WAKKANAI
UTC
JST
1 DEC.1990
2 DEC.1990
3 DEC.1990
4 DEC.1990
F-LAYER
E-LAYER
FXE(P)
FOE(P)
FREQUENCY(MHZ)
VIRTUAL HEIGHT(KM)
FXE(P): PREDICTED VALUE FOR FXE
FOE(P): PREDICTED VALUE FOR FOE

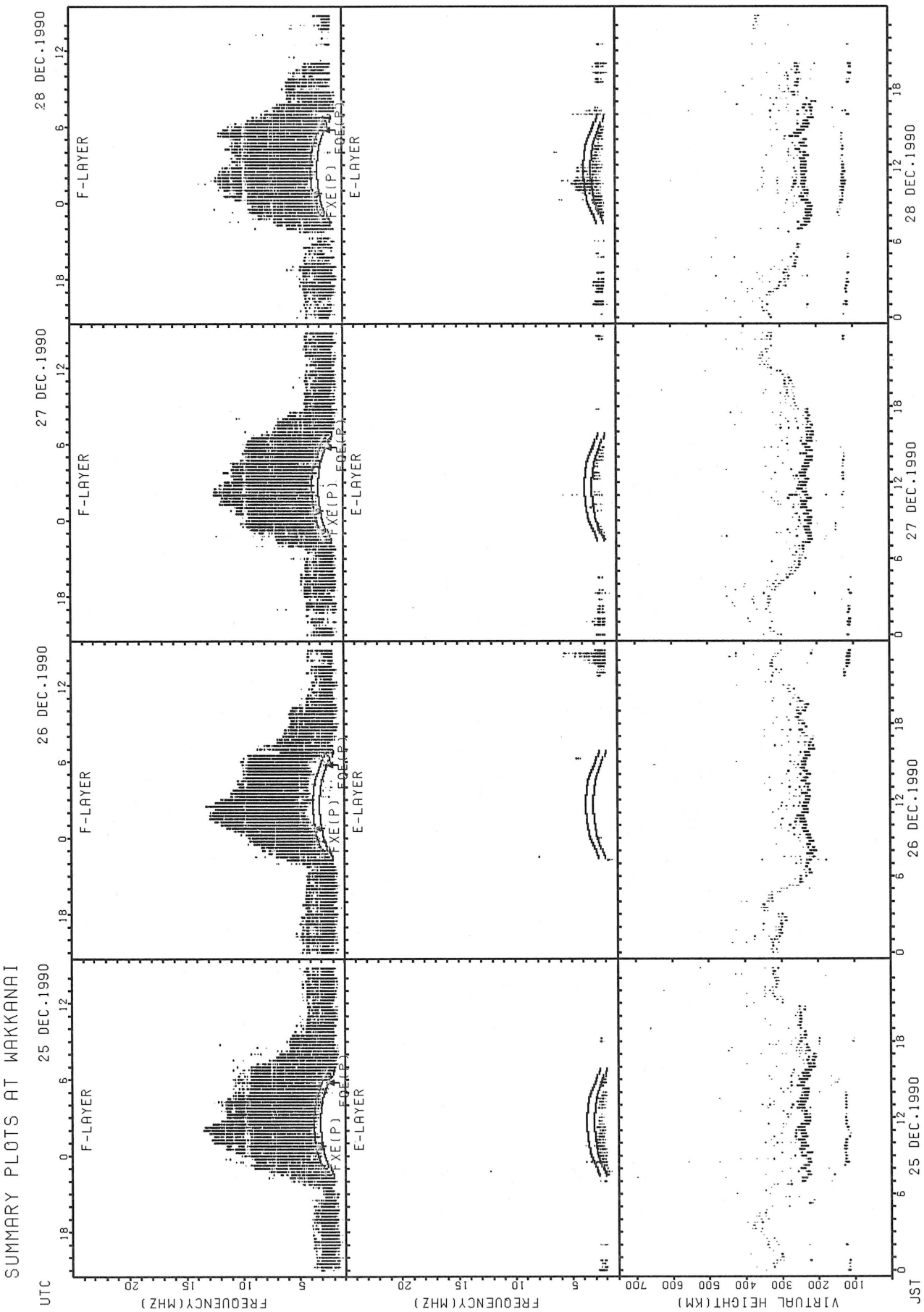

SUMMARY PLOTS AT WAKKANAI
UTC
JST
5 DEC.1990
6 DEC.1990
7 DEC.1990
8 DEC.1990
F-LAYER
E-LAYER
FXE(P)
FOE(P)
FREQUENCY(MHZ)
VIRTUAL HEIGHT(KM)
FXE(P): PREDICTED VALUE FOR FXE
FOE(P): PREDICTED VALUE FOR FOE


SUMMARY PLOTS AT WAKKANAI
UTC
9 DEC.1990
10 DEC.1990
11 DEC.1990
12 DEC.1990
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

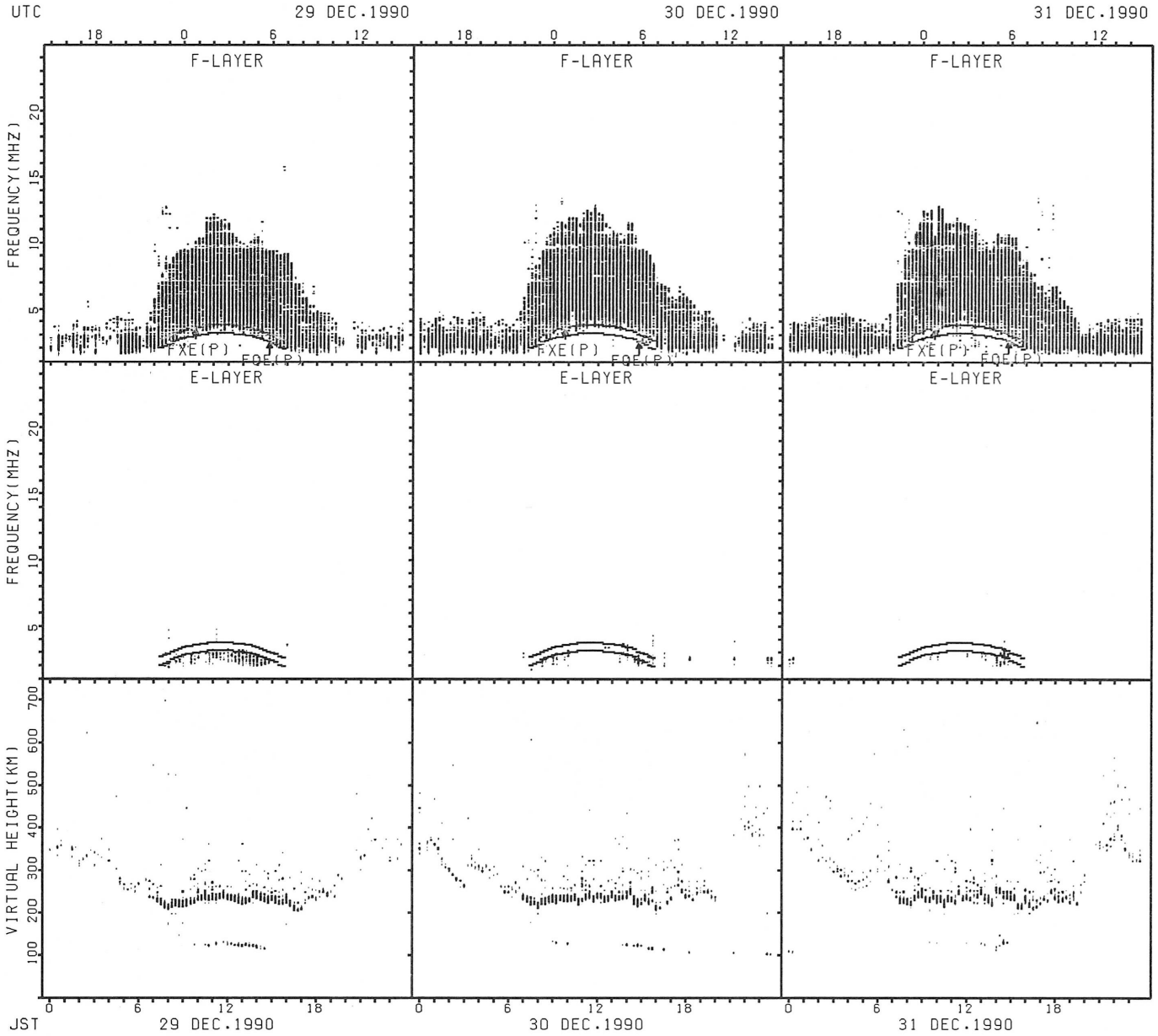

SUMMARY PLOTS AT WAKKANAI
UTC
JST
13 DEC.1990
14 DEC.1990
15 DEC.1990
16 DEC.1990
F-LAYER
E-LAYER
FXE(P)
FOE(P)
FREQUENCY(MHZ)
VIRTUAL HEIGHT(KM)
FXE(P): PREDICTED VALUE FOR FXE
FOE(P): PREDICTED VALUE FOR FOE


SUMMARY PLOTS AT WAKKANAI
17 DEC.1990
18 DEC.1990
19 DEC.1990
20 DEC.1990
UTC
JST
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

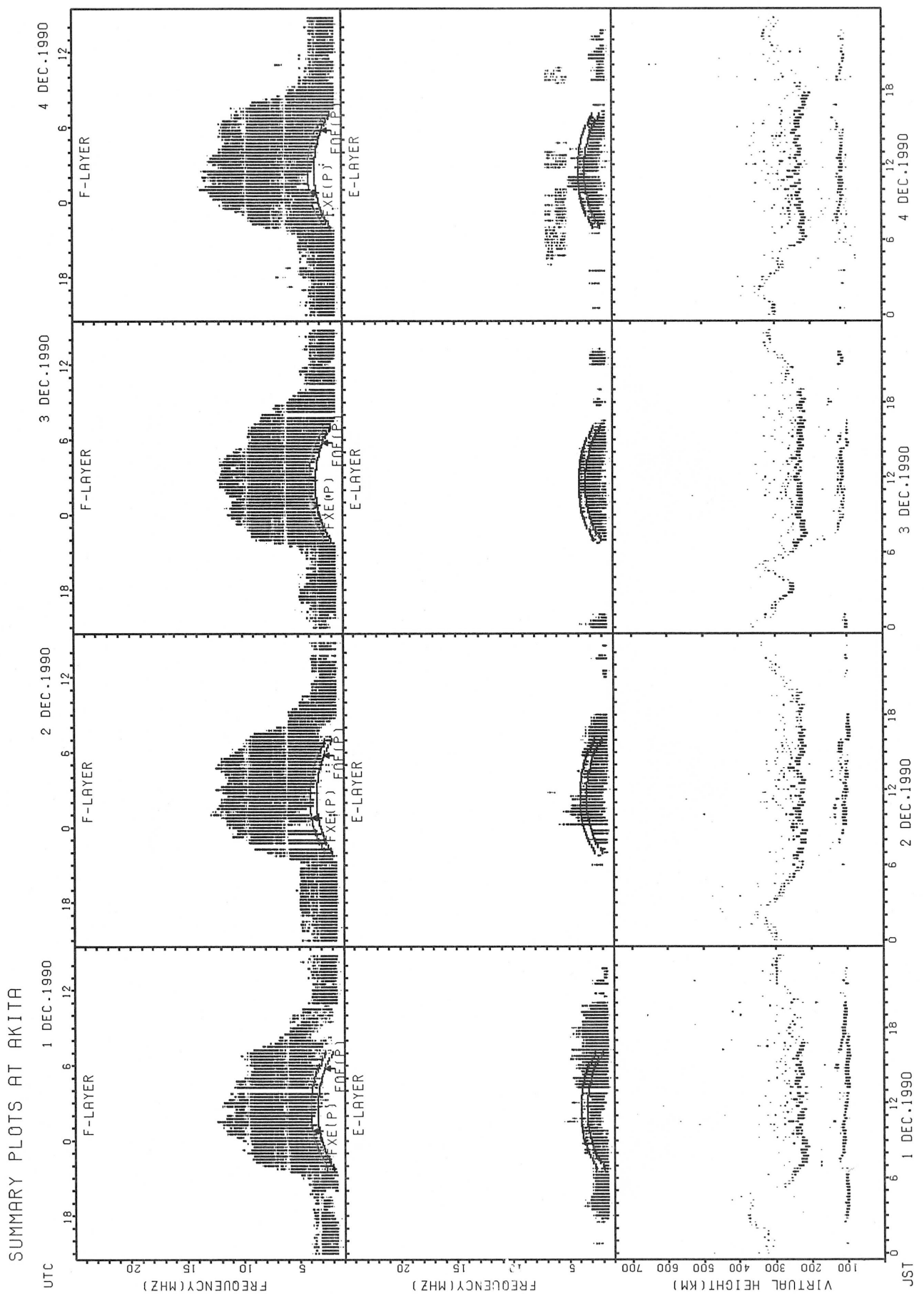

SUMMARY PLOTS AT WAKKANAI
UTC
21 DEC.1990
22 DEC.1990
23 DEC.1990
24 DEC.1990
F-LAYER
E-LAYER
FXE(P)
FOE(P)
FREQUENCY(MHZ)
VIRTUAL HEIGHT(KM)
JST
FXE(P): PREDICTED VALUE FOR FXE
FOE(P): PREDICTED VALUE FOR FOE

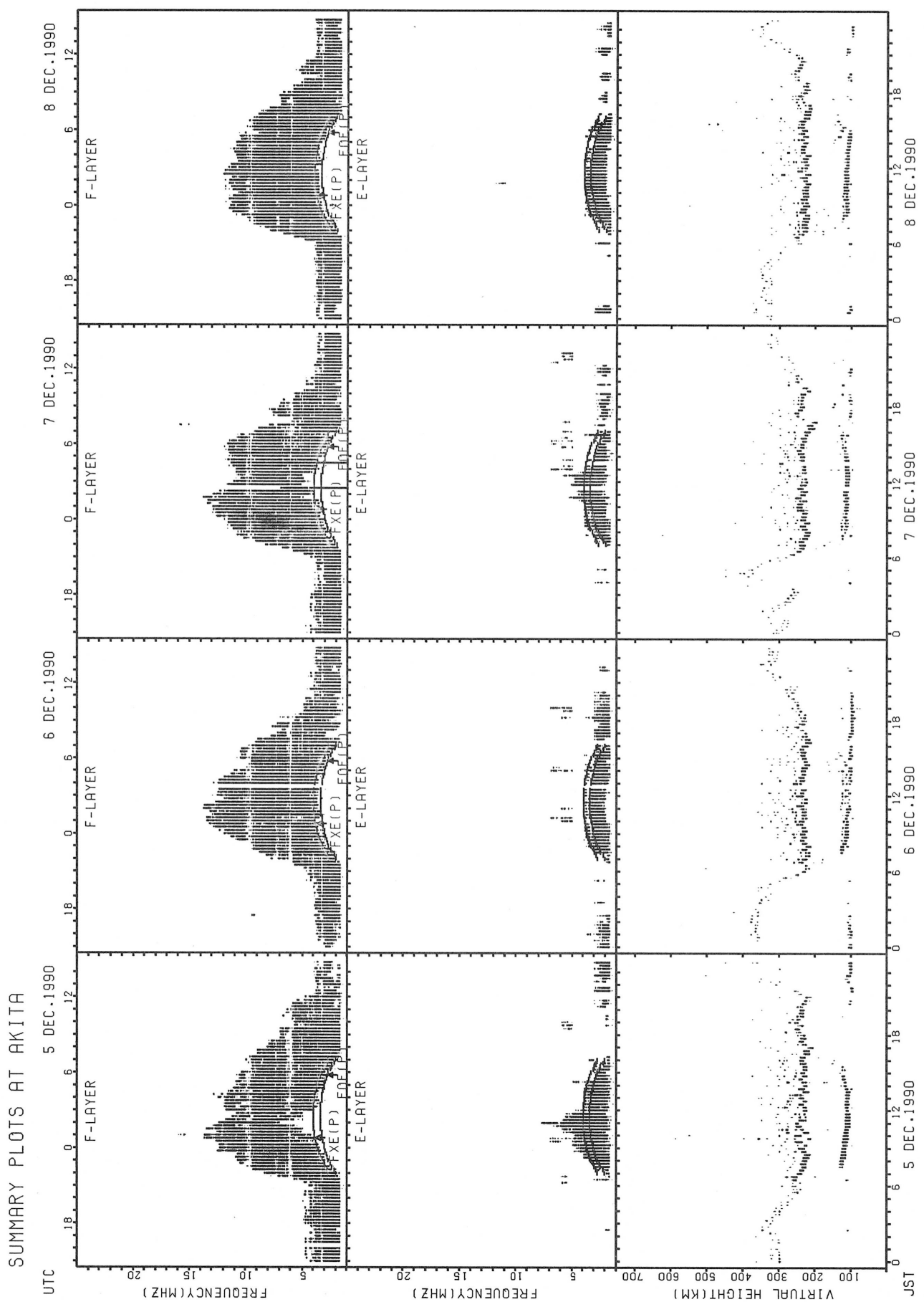

SUMMARY PLOTS AT WAKKANAI
UTC
25 DEC.1990
26 DEC.1990
27 DEC.1990
28 DEC.1990
F-LAYER
E-LAYER
FXE(P)
FOE(P)
FREQUENCY(MHZ)
VIRTUAL HEIGHT(KM)
JST
FXE(P): PREDICTED VALUE FOR FXE
FOE(P): PREDICTED VALUE FOR FOE

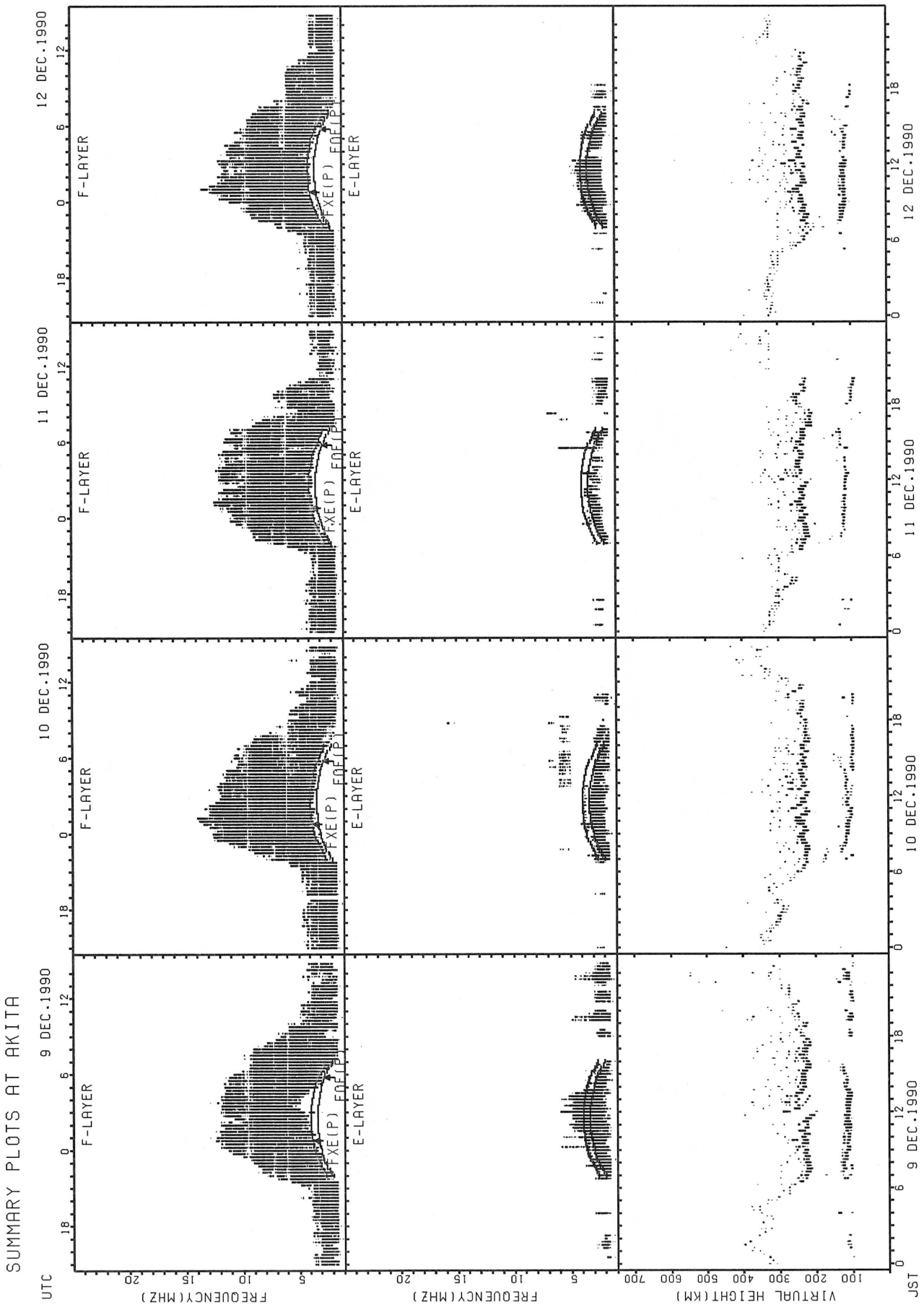
SUMMARY PLOTS AT WAKKANAI



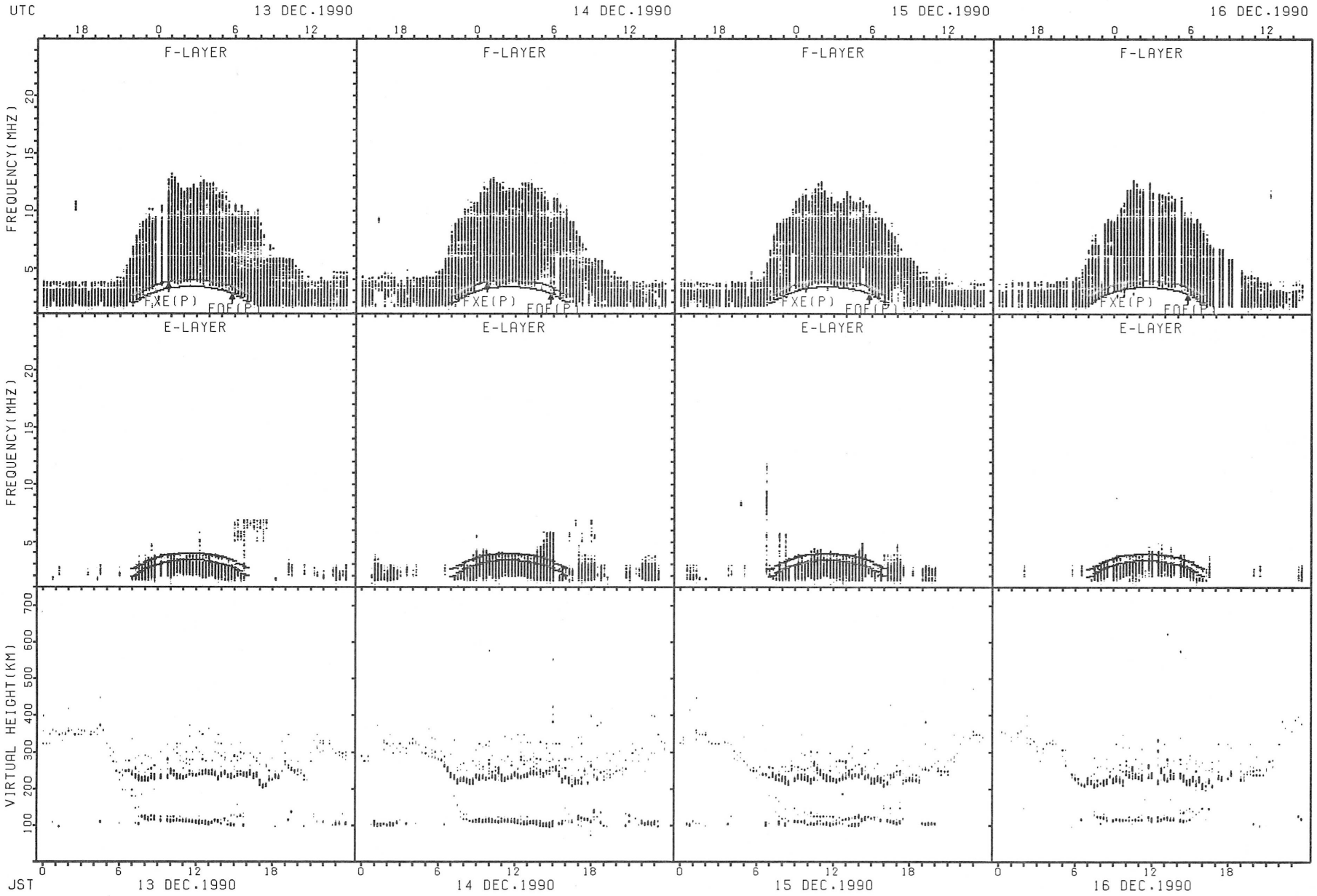
FXE(P): PREDICTED VALUE FOR FXE
FOE(P): PREDICTED VALUE FOR FOE


SUMMARY PLOTS AT AKITA
UTC
1 DEC.1990
2 DEC.1990
3 DEC.1990
4 DEC.1990
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

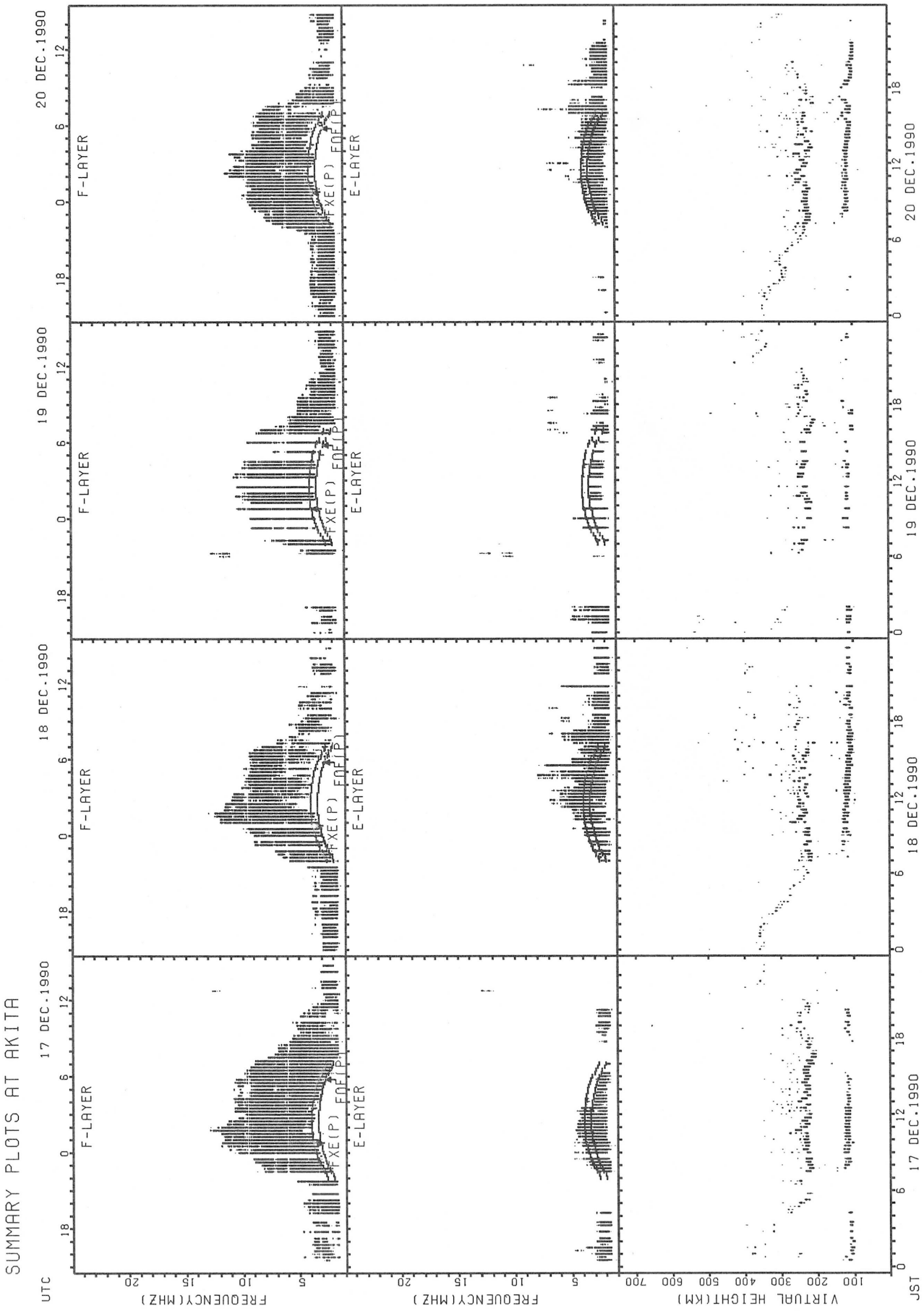

SUMMARY PLOTS AT AKITA
UTC
5 DEC.1990
6 DEC.1990
7 DEC.1990
8 DEC.1990
F-LAYER
E-LAYER
FXE(P)
FOE(P)
FREQUENCY(MHZ)
VIRTUAL HEIGHT(KM)
JST
FXE(P): PREDICTED VALUE FOR FXE
FOE(P): PREDICTED VALUE FOR FOE

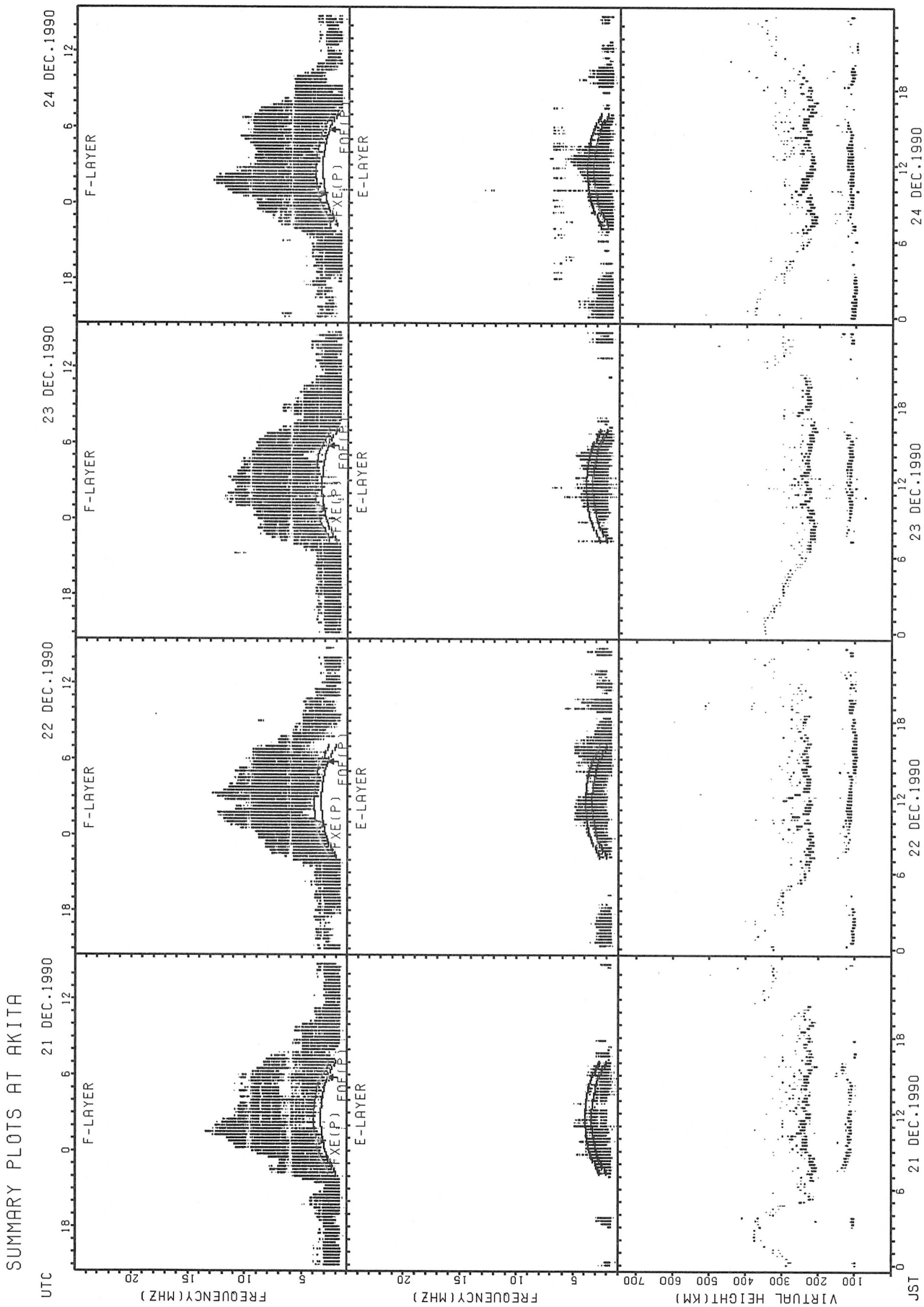

SUMMARY PLOTS AT AKITA
UTC
9 DEC.1990
10 DEC.1990
11 DEC.1990
12 DEC.1990
F-LAYER
E-LAYER
FXE(P)
FOE(P)
FREQUENCY(MHZ)
VIRTUAL HEIGHT(KM)
JST
FXE(P): PREDICTED VALUE FOR FXE
FOE(P): PREDICTED VALUE FOR FOE

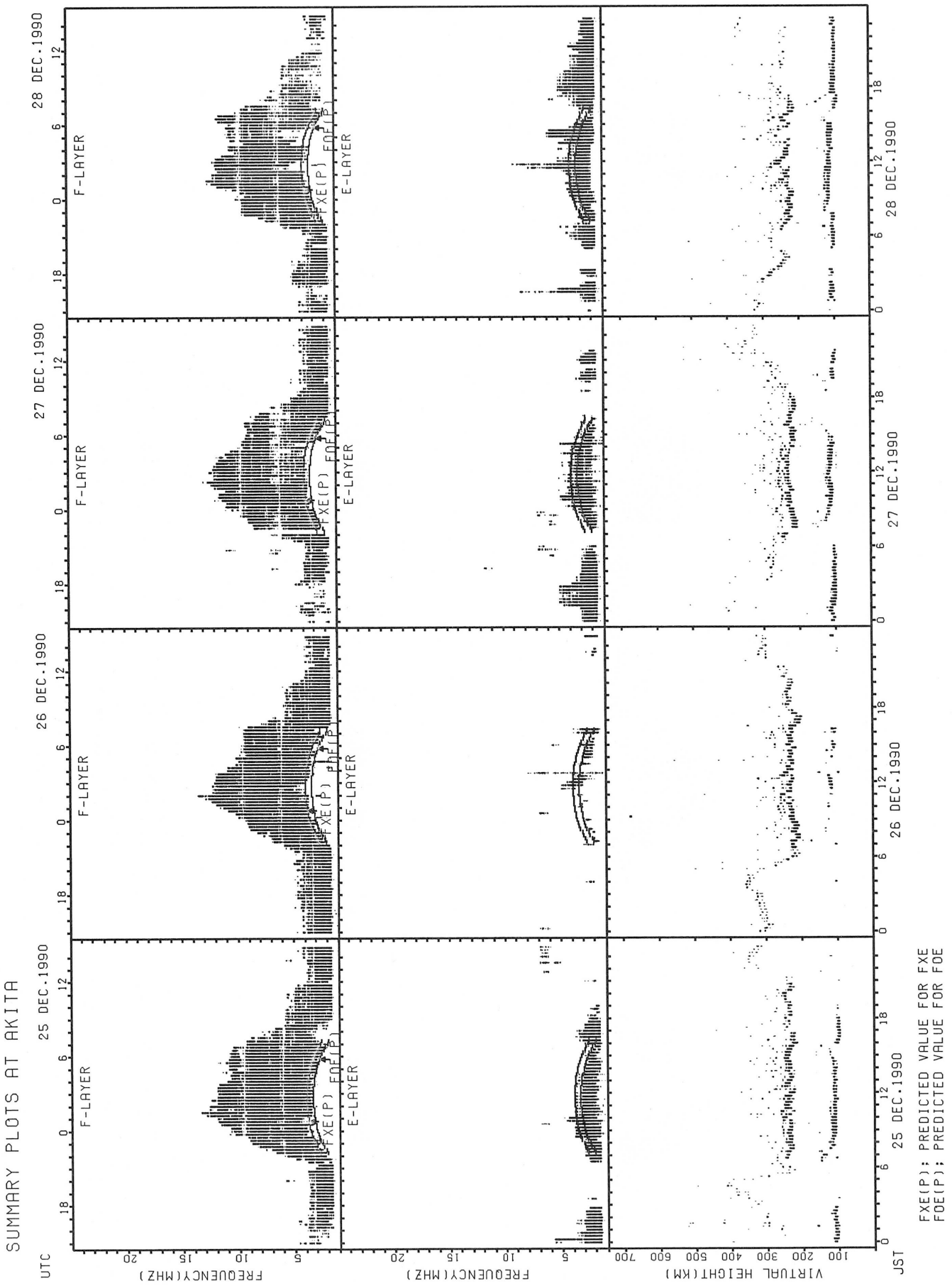
SUMMARY PLOTS AT AKITA



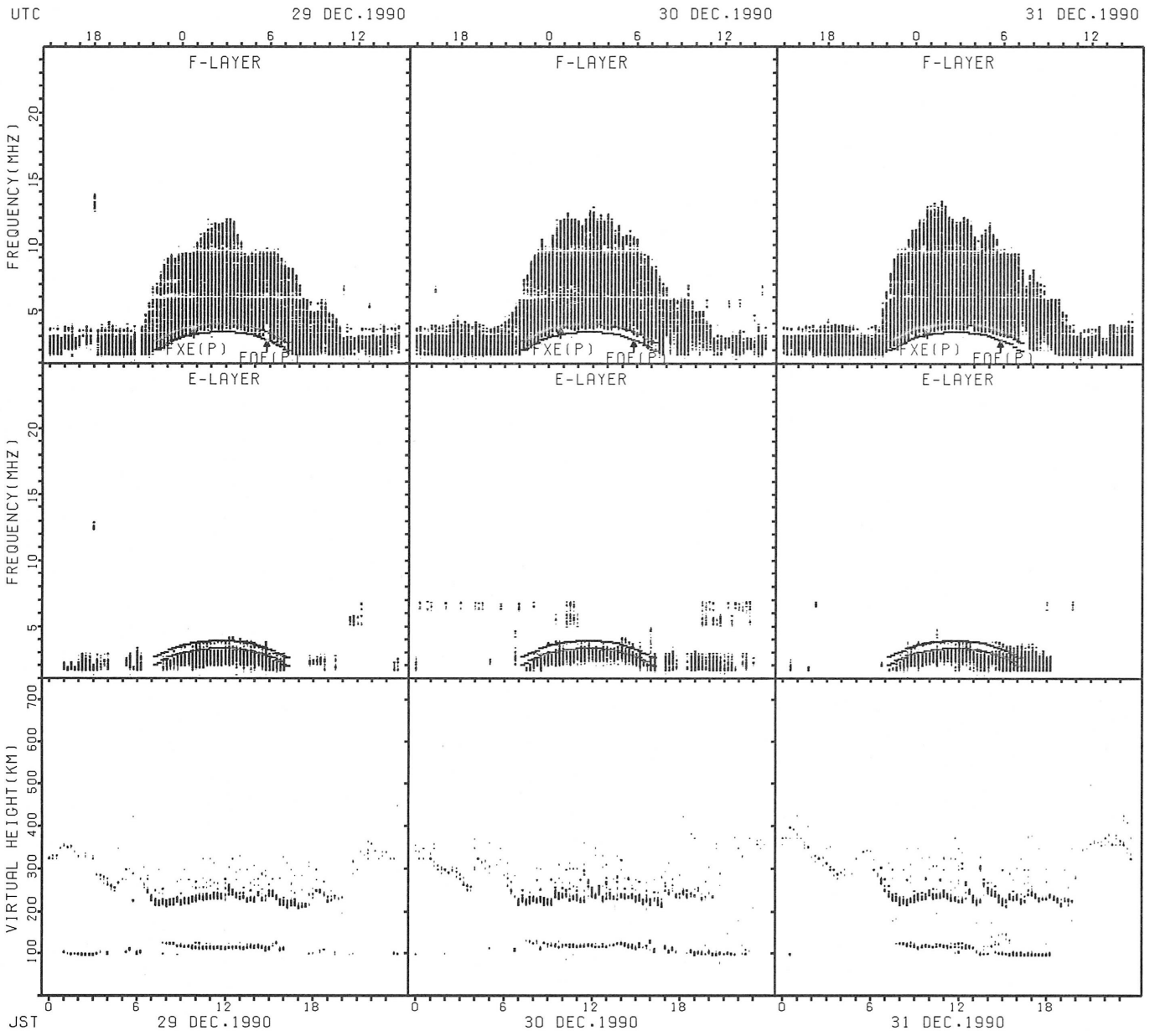
FXE(P): PREDICTED VALUE FOR FXE
FOE(P): PREDICTED VALUE FOR FOE


SUMMARY PLOTS AT AKITA
UTC
17 DEC.1990
18 DEC.1990
19 DEC.1990
20 DEC.1990
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

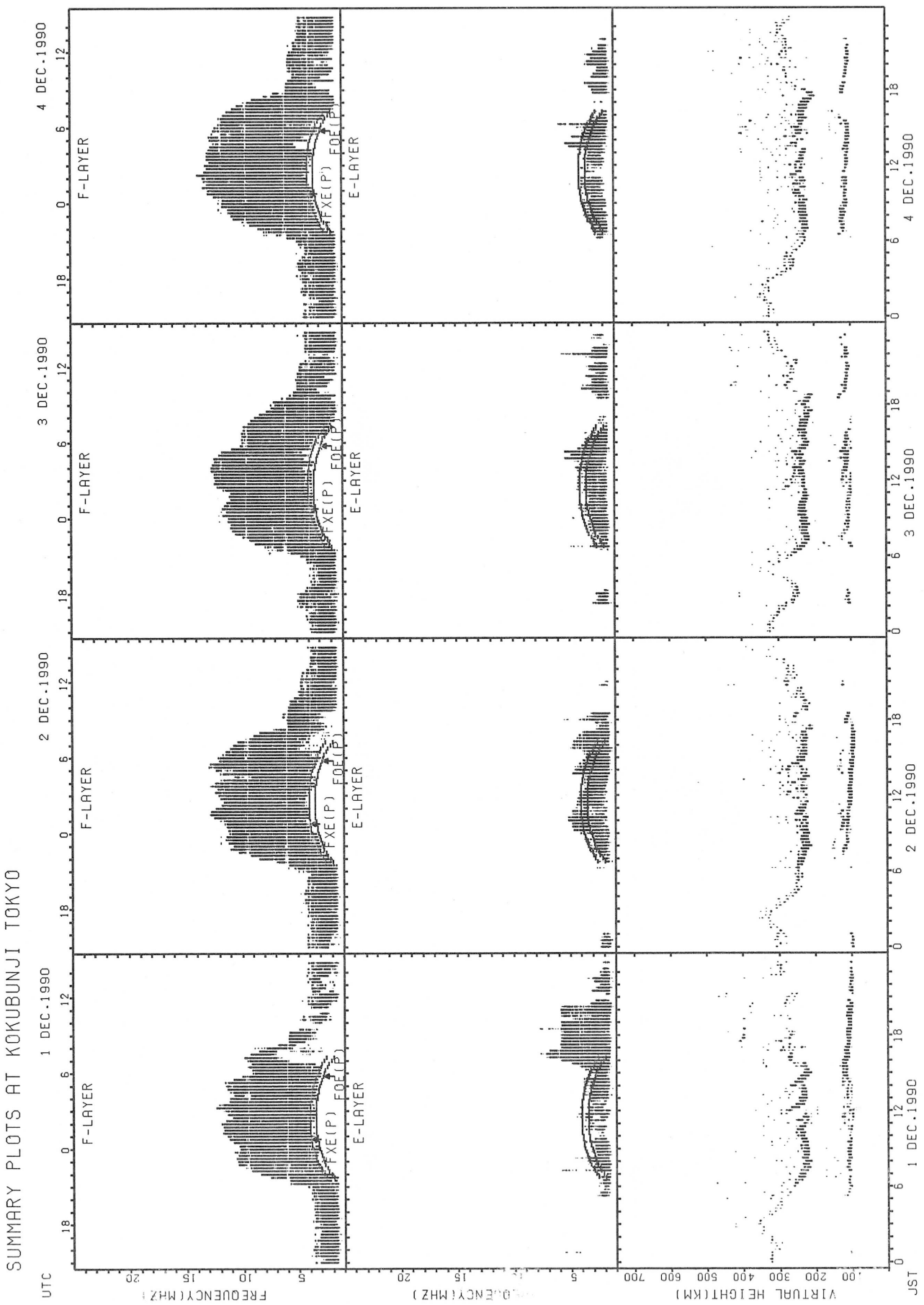

SUMMARY PLOTS AT AKITA
UTC
21 DEC.1990
22 DEC.1990
23 DEC.1990
24 DEC.1990
F-LAYER
E-LAYER
FXE(P) FOE(P)
FREQUENCY(MHZ)
VIRTUAL HEIGHT(KM)
JST
FXE(P): PREDICTED VALUE FOR FXE
FOE(P): PREDICTED VALUE FOR FOE

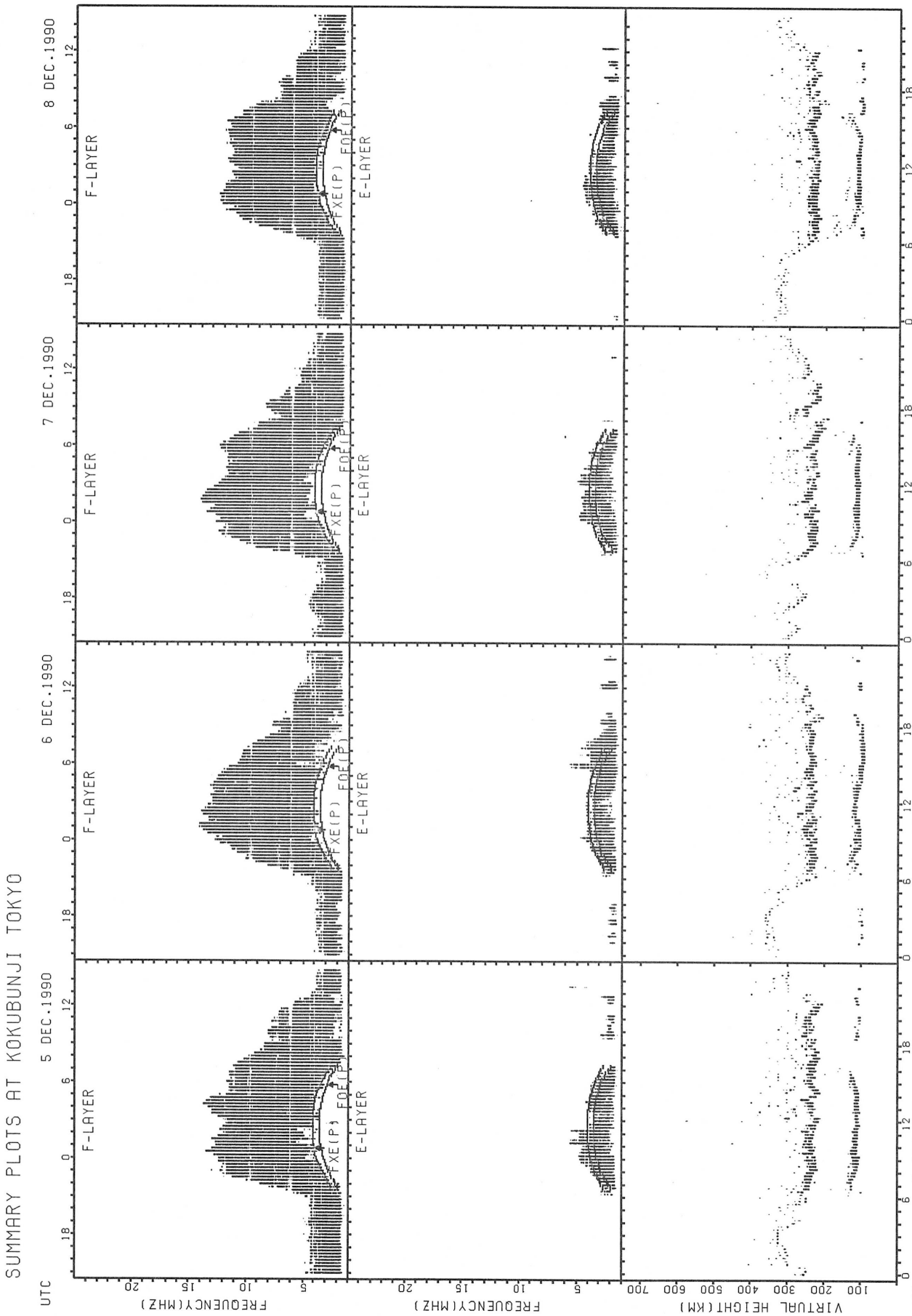

SUMMARY PLOTS AT AKITA
UTC
25 DEC.1990
26 DEC.1990
27 DEC.1990
28 DEC.1990
F-LAYER
E-LAYER
FXE(P)
FOE(P)
FREQUENCY(MHZ)
VIRTUAL HEIGHT(KM)
JST
FXE(P); PREDICTED VALUE FOR FXE
FOE(P); PREDICTED VALUE FOR FOE

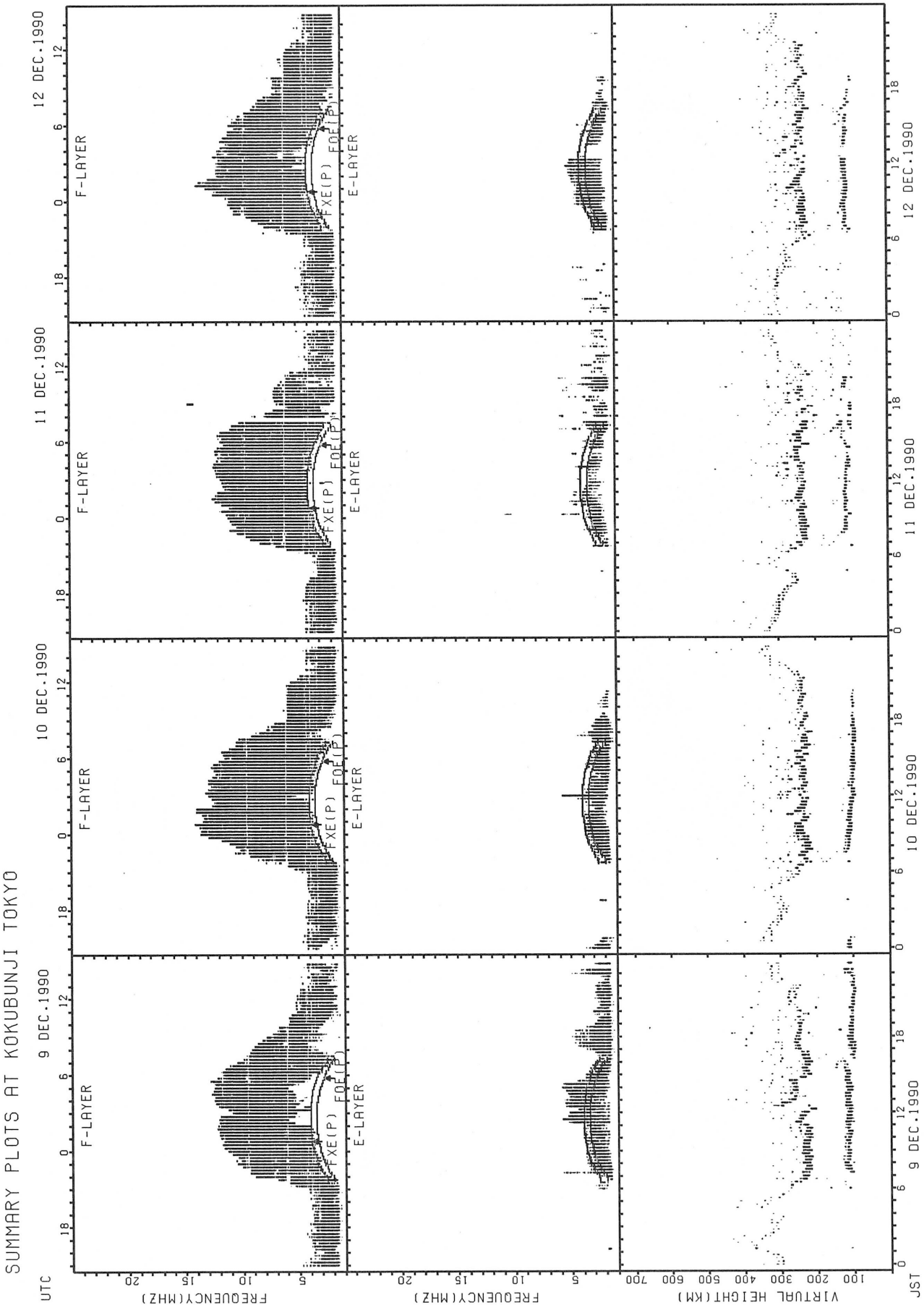
SUMMARY PLOTS AT AKITA



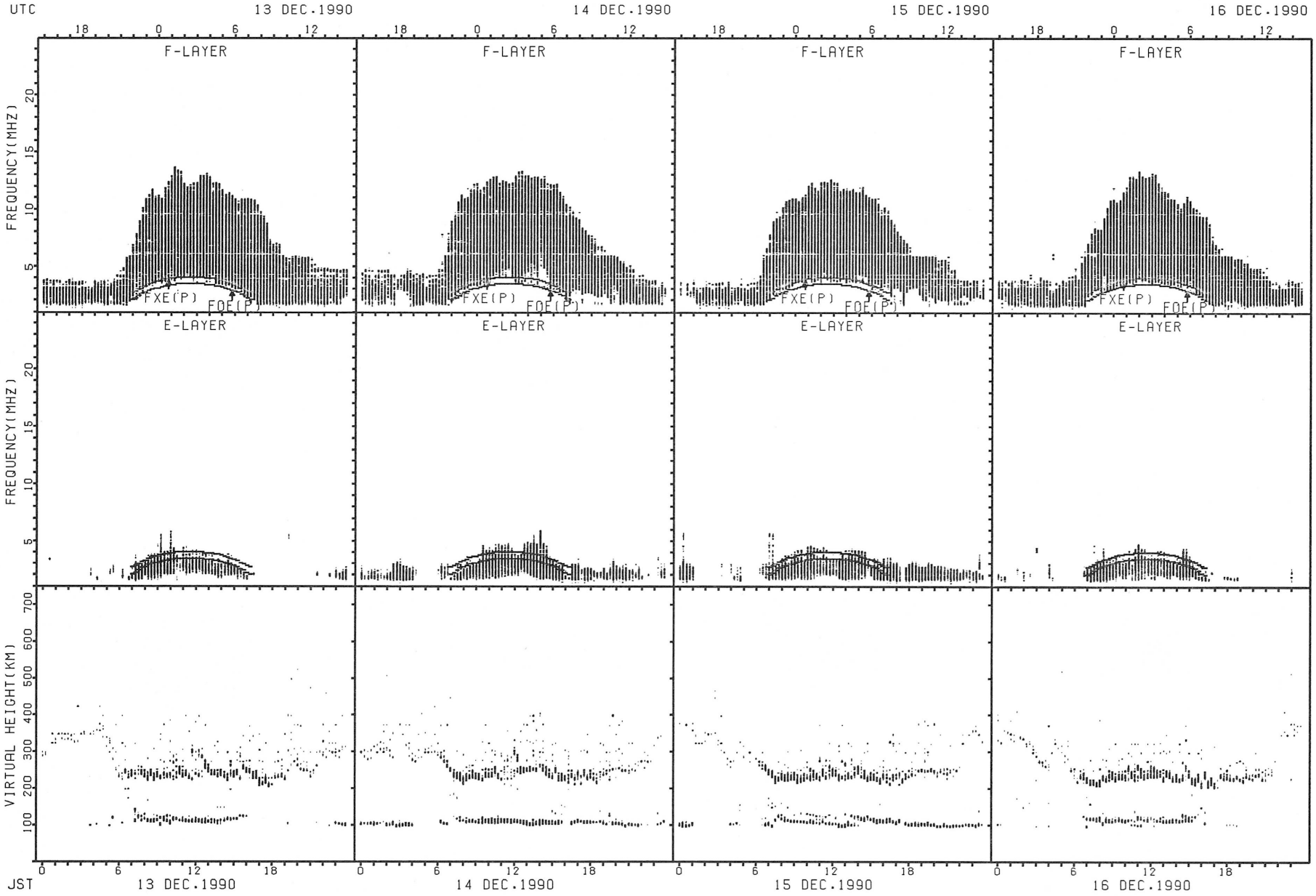
FXE(P): PREDICTED VALUE FOR FXE
FOE(P): PREDICTED VALUE FOR FOE


SUMMARY PLOTS AT KOKUBUNJI TOKYO
UTC
JST
1 DEC.1990
2 DEC.1990
3 DEC.1990
4 DEC.1990
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

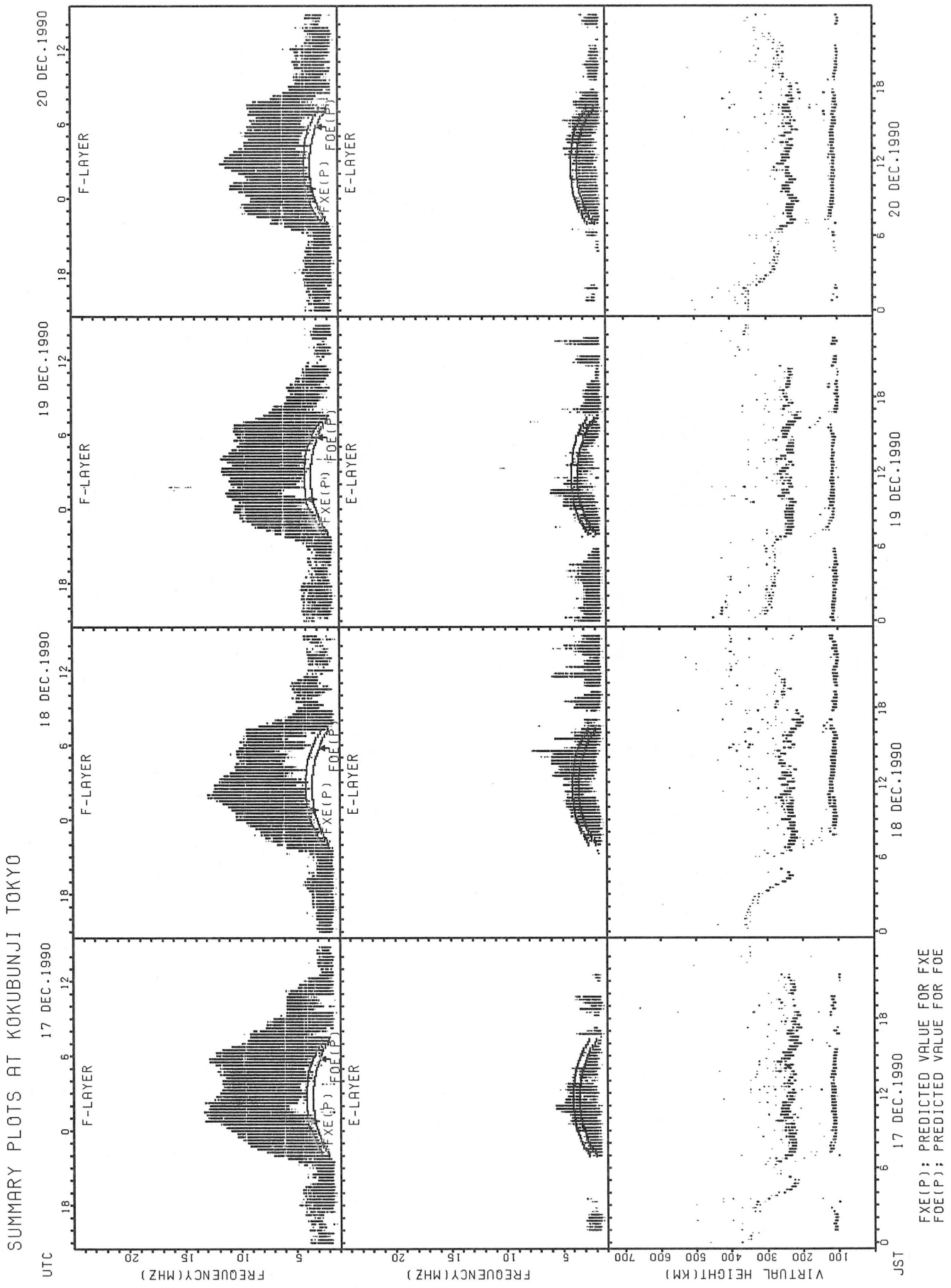

SUMMARY PLOTS AT KOKUBUNJI TOKYO
UTC
JST
5 DEC.1990
6 DEC.1990
7 DEC.1990
8 DEC.1990
F-LAYER
E-LAYER
FXE(P)
FOE(P)
FREQUENCY(MHZ)
VIRTUAL HEIGHT(KM)
FXE(P); PREDICTED VALUE FOR FXE
FOE(P); PREDICTED VALUE FOR FOE


SUMMARY PLOTS AT KOKUBUNJI TOKYO
UTC
9 DEC.1990
10 DEC.1990
11 DEC.1990
12 DEC.1990
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

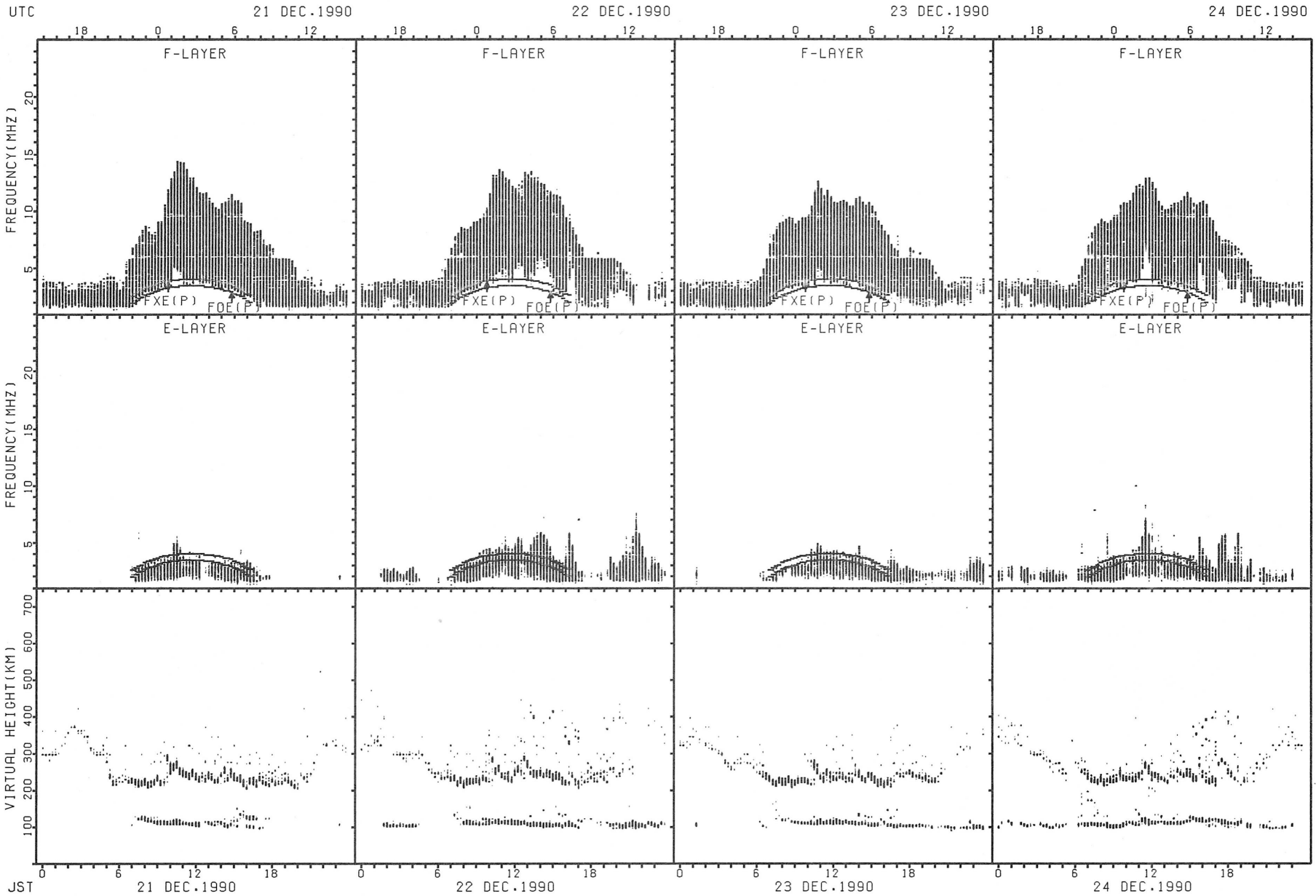
SUMMARY PLOTS AT KOKUBUNJI TOKYO



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

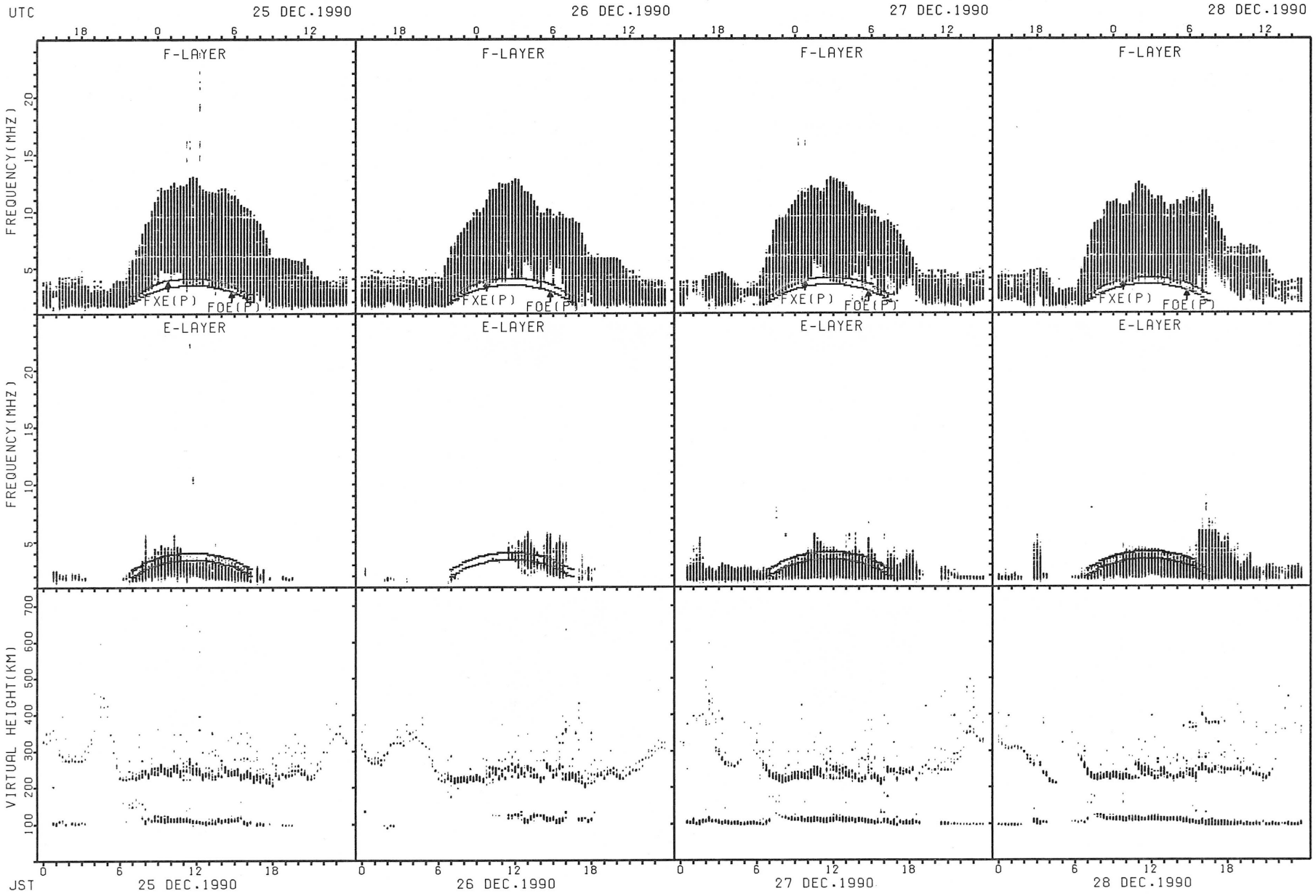

SUMMARY PLOTS AT KOKUBUNJI TOKYO
UTC
JST
17 DEC.1990
18 DEC.1990
19 DEC.1990
20 DEC.1990
F-LAYER
E-LAYER
FXE(P) FOE(P)
FREQUENCY(MHZ)
VIRTUAL HEIGHT(KM)
FXE(P): PREDICTED VALUE FOR FXE
FOE(P): PREDICTED VALUE FOR FOE

SUMMARY PLOTS AT KOKUBUNJI TOKYO



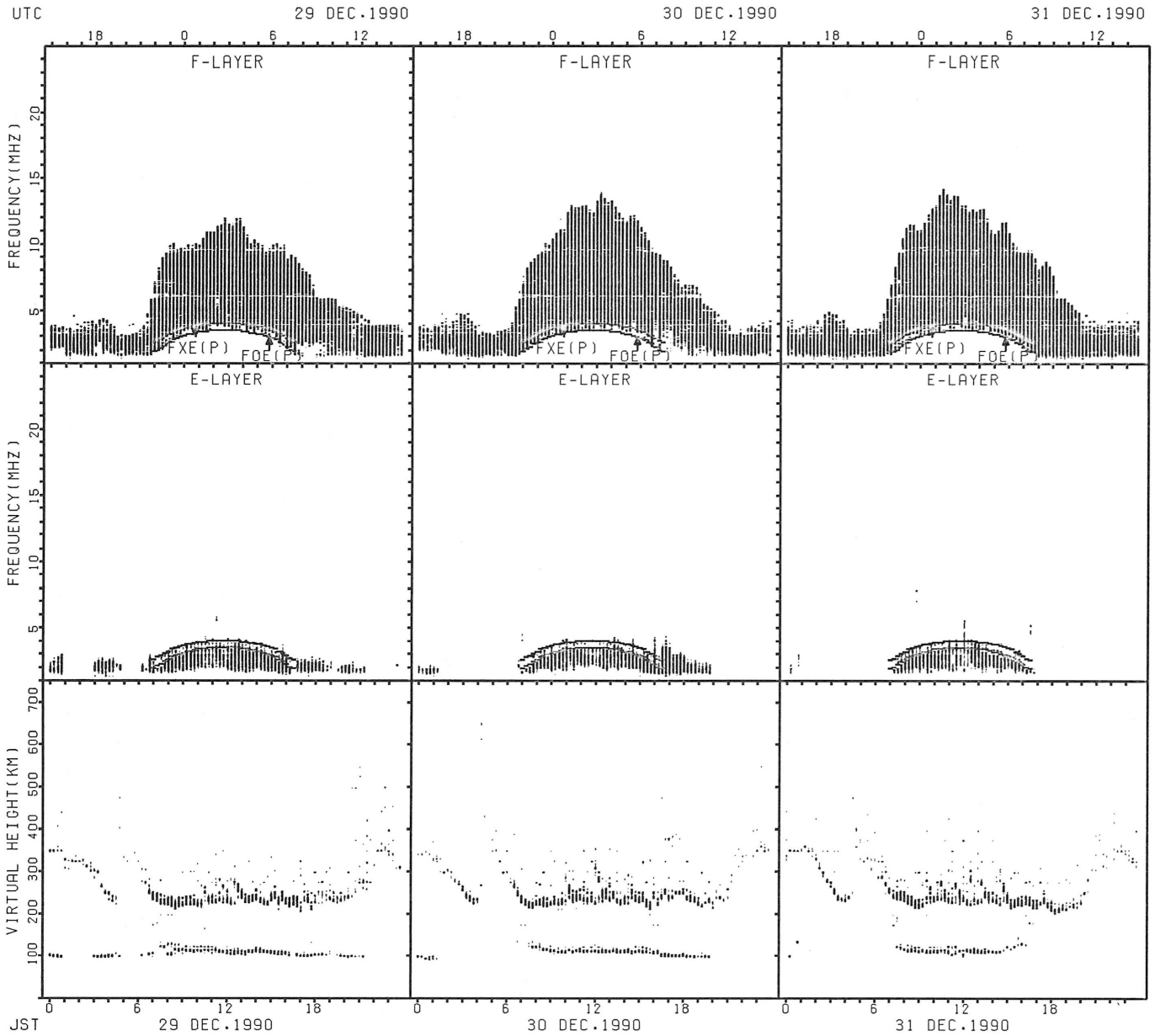
FXE(P): PREDICTED VALUE FOR FXE
FOE(P): PREDICTED VALUE FOR FOE

SUMMARY PLOTS AT KOKUBUNJI TOKYO

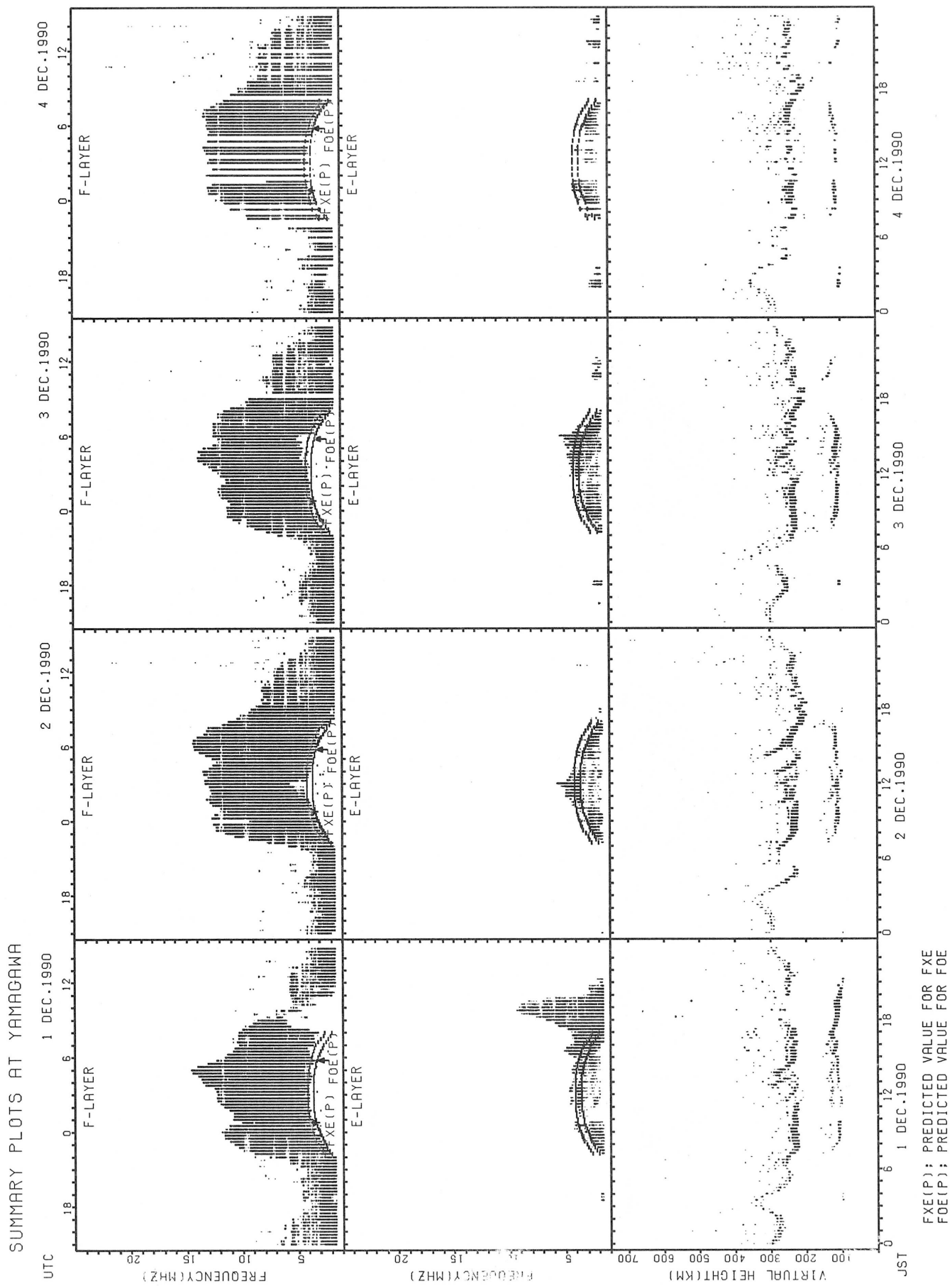


FXE(P); PREDICTED VALUE FOR FXE
FOE(P); PREDICTED VALUE FOR FOE

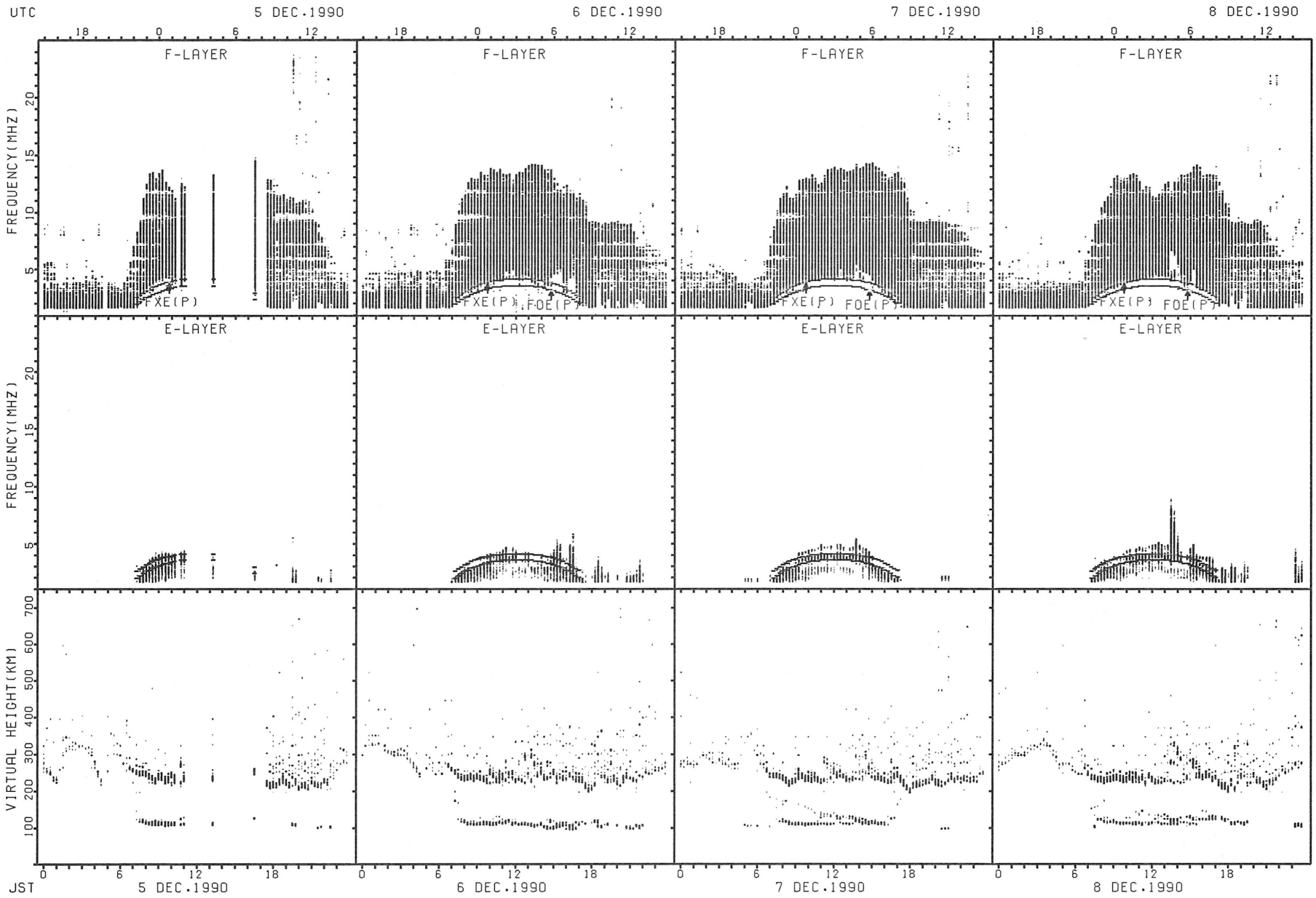
SUMMARY PLOTS AT KOKUBUNJI TOKYO



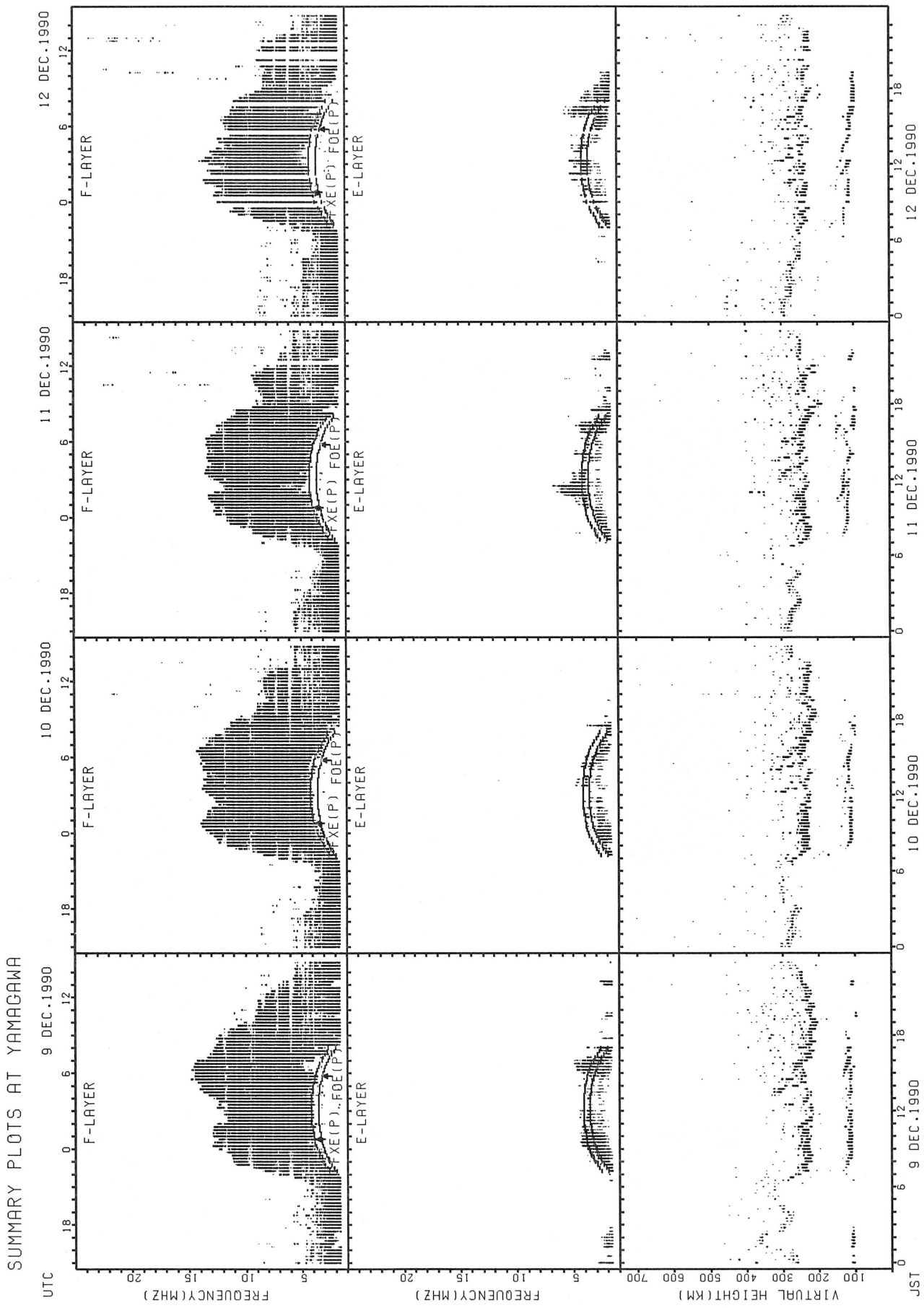
FXE(P): PREDICTED VALUE FOR FXE
FOE(P): PREDICTED VALUE FOR FOE

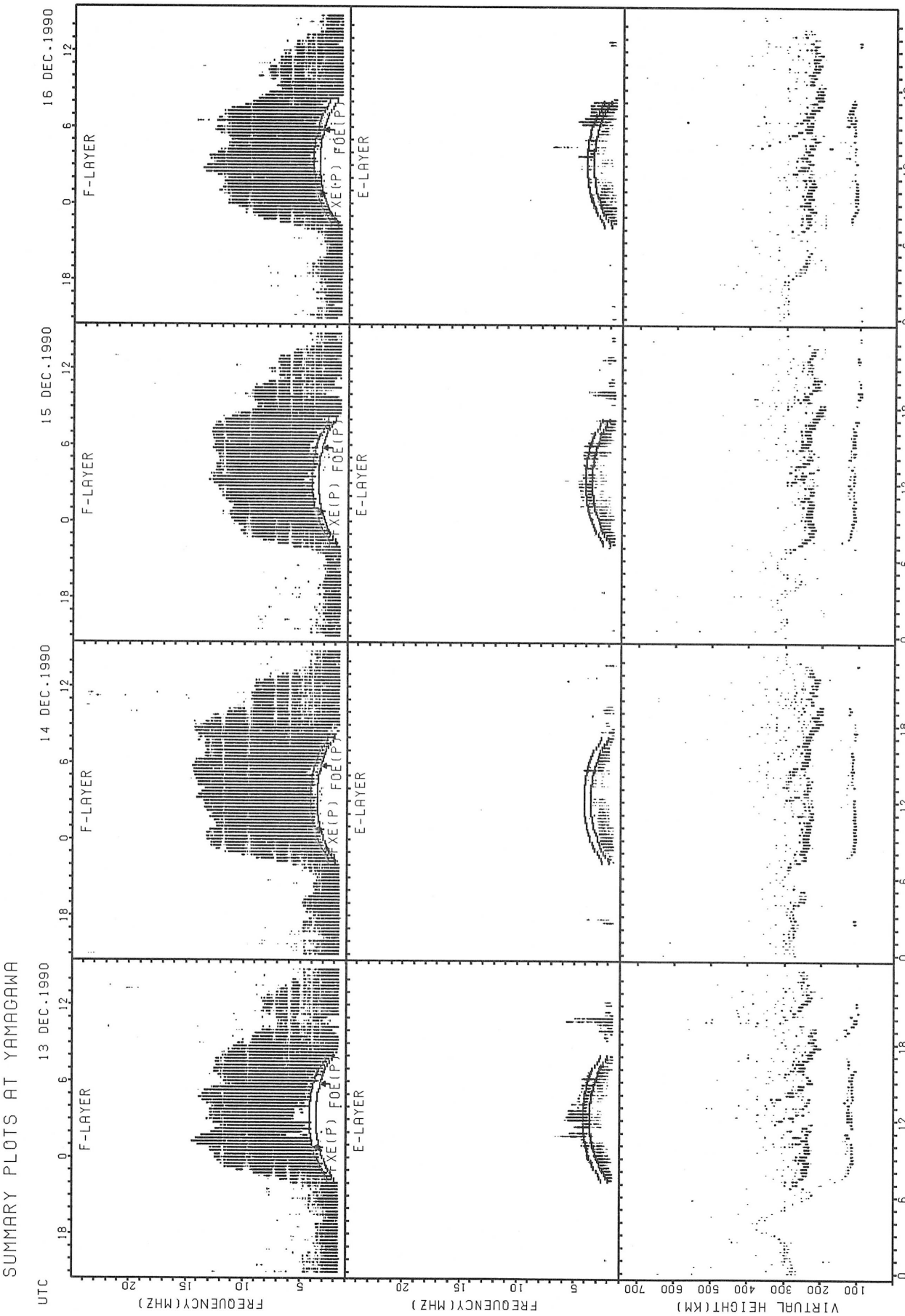

SUMMARY PLOTS AT YAMAGAWA
UTC
JST
1 DEC.1990
2 DEC.1990
3 DEC.1990
4 DEC.1990
F-LAYER
E-LAYER
FXE(P) FOE(P)
FREQUENCY(MHZ)
VIRTUAL HEIGHT(KM)
FXE(P): PREDICTED VALUE FOR FXE
FOE(P): PREDICTED VALUE FOR FOE

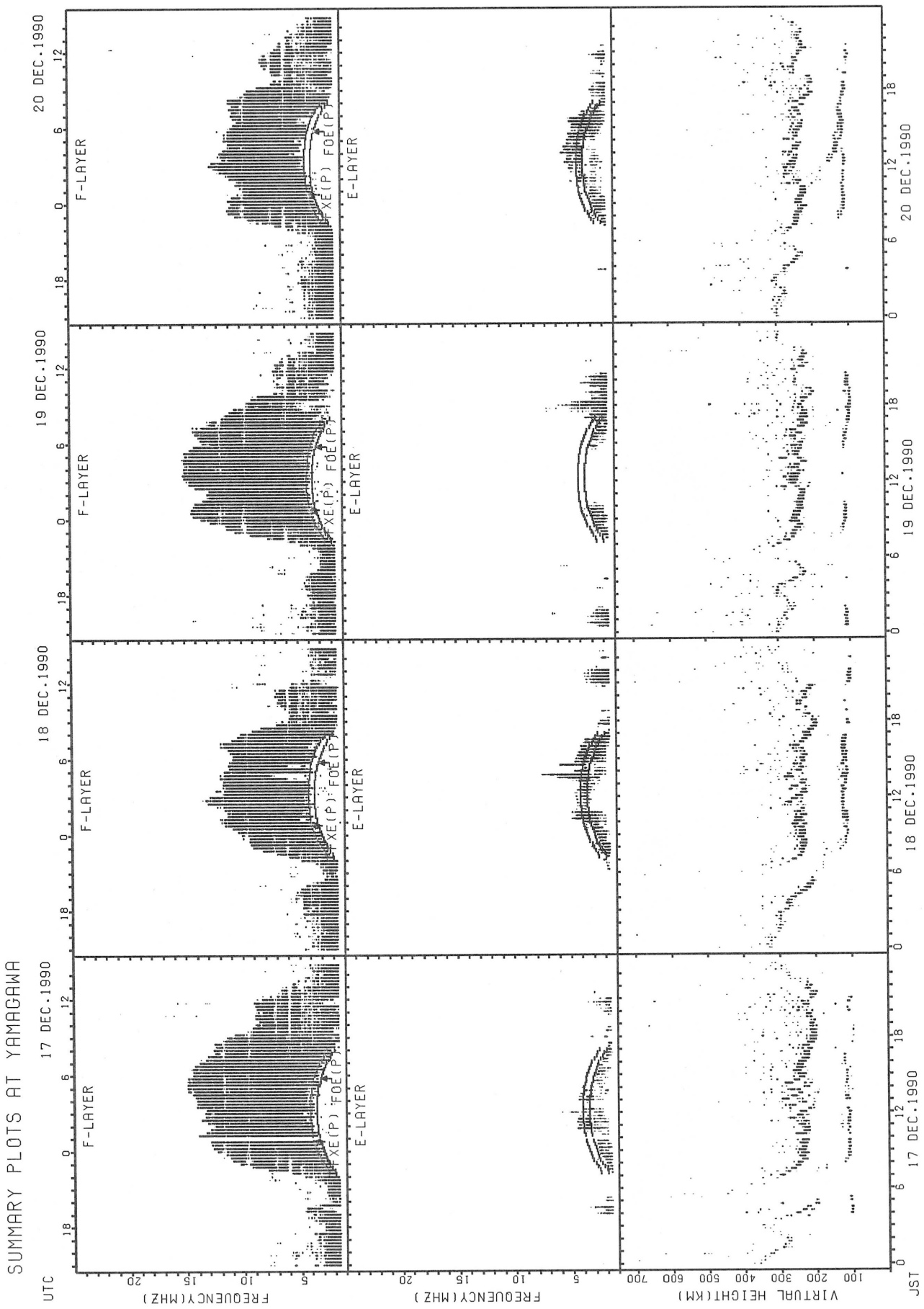
SUMMARY PLOTS AT YAMAGAWA



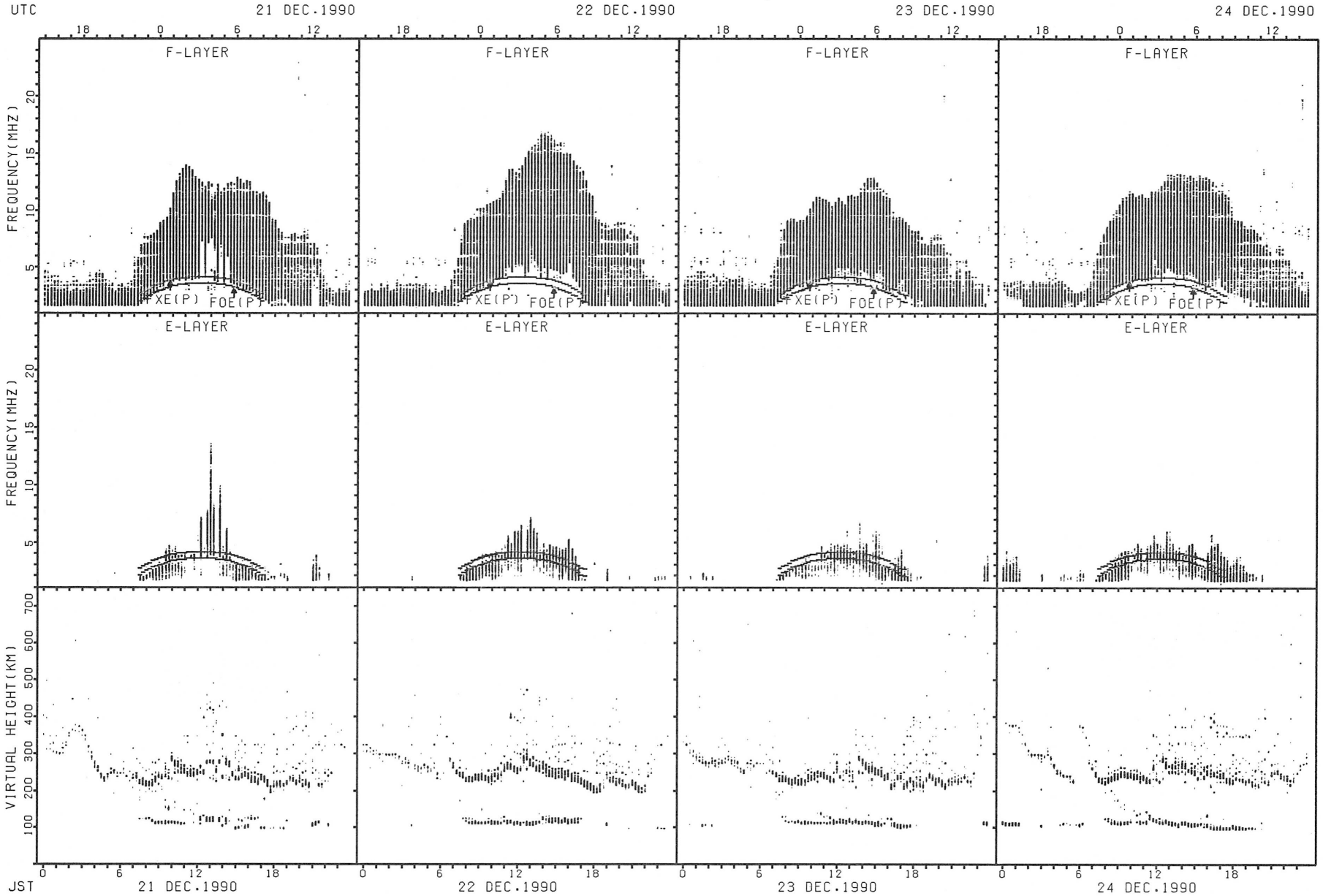
FXE(P): PREDICTED VALUE FOR FXE
FOE(P): PREDICTED VALUE FOR FOE


SUMMARY PLOTS AT YAMAGAWA
9 DEC.1990
10 DEC.1990
11 DEC.1990
12 DEC.1990
UTC
JST
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

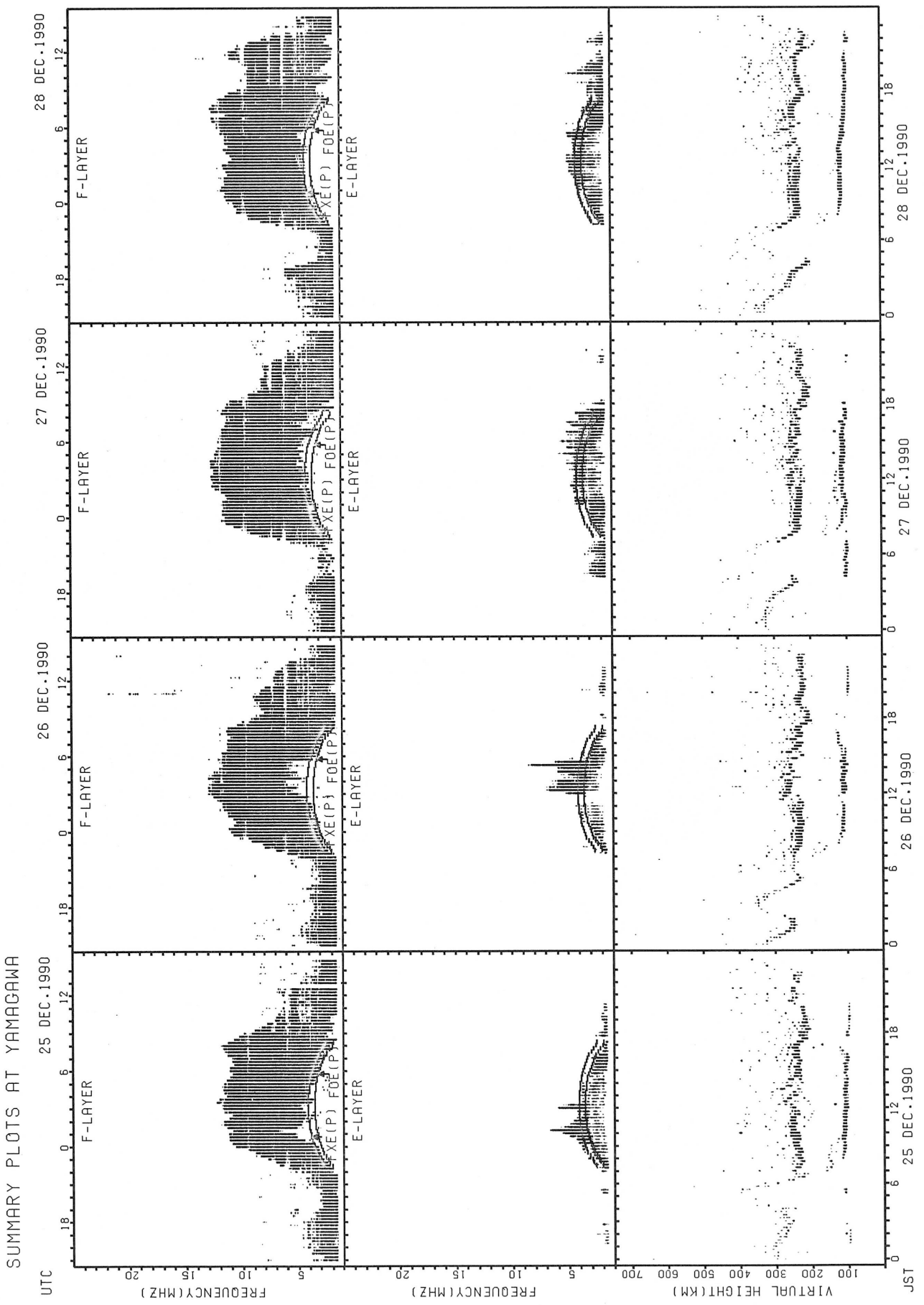

SUMMARY PLOTS AT YAMAGAWA
UTC
JST
13 DEC.1990
14 DEC.1990
15 DEC.1990
16 DEC.1990
F-LAYER
E-LAYER
FXE(P)
FOE(P)
FREQUENCY(MHZ)
VIRTUAL HEIGHT(KM)
FXE(P): PREDICTED VALUE FOR FXE
FOE(P): PREDICTED VALUE FOR FOE


SUMMARY PLOTS AT YAMAGAWA
17 DEC.1990
18 DEC.1990
19 DEC.1990
20 DEC.1990
F-LAYER
E-LAYER
FXE(P) FOE(P)
FREQUENCY(MHZ)
VIRTUAL HEIGHT(KM)
UTC
JST
FXE(P): PREDICTED VALUE FOR FXE
FOE(P): PREDICTED VALUE FOR FOE

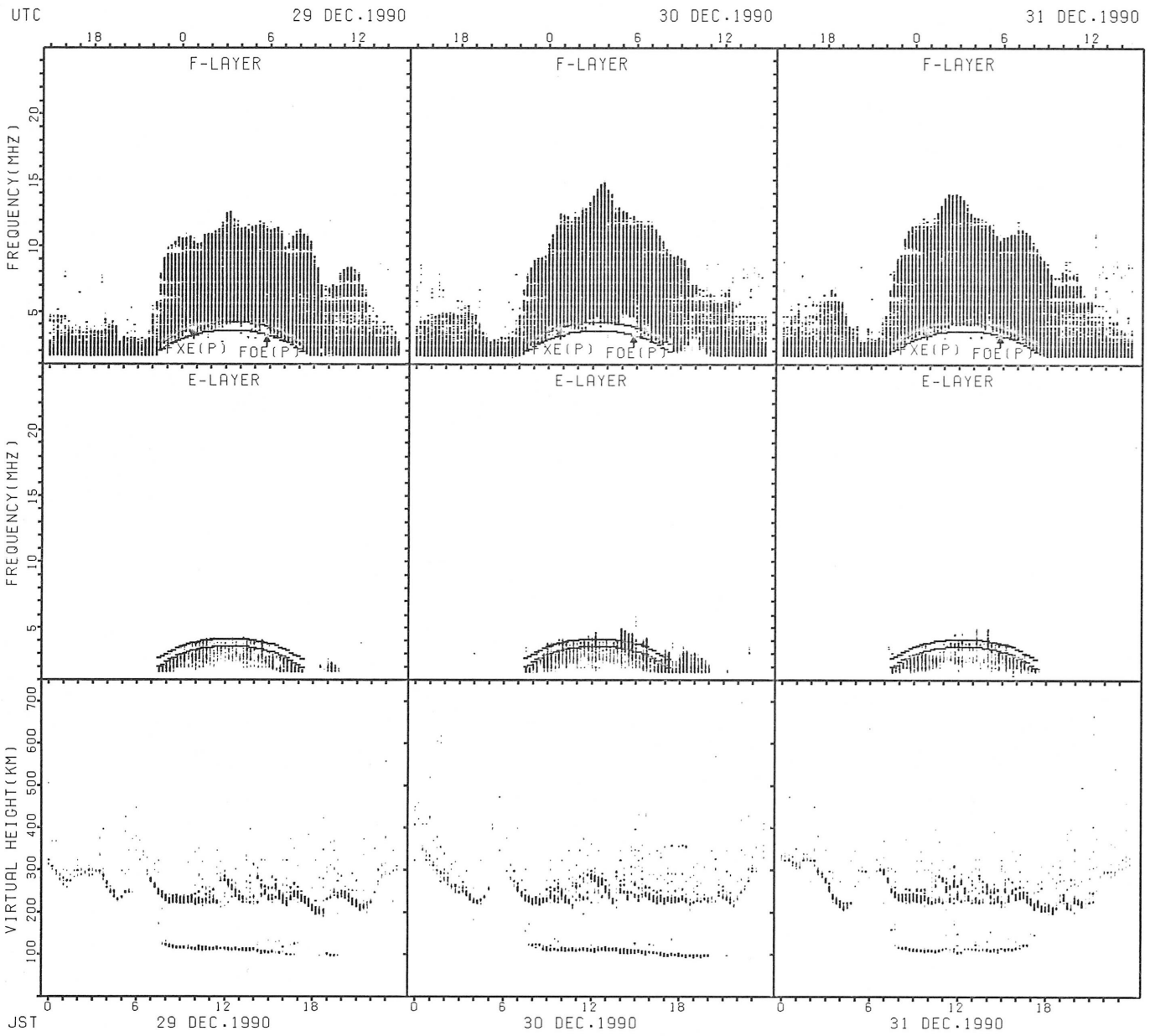
SUMMARY PLOTS AT YAMAGAWA



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

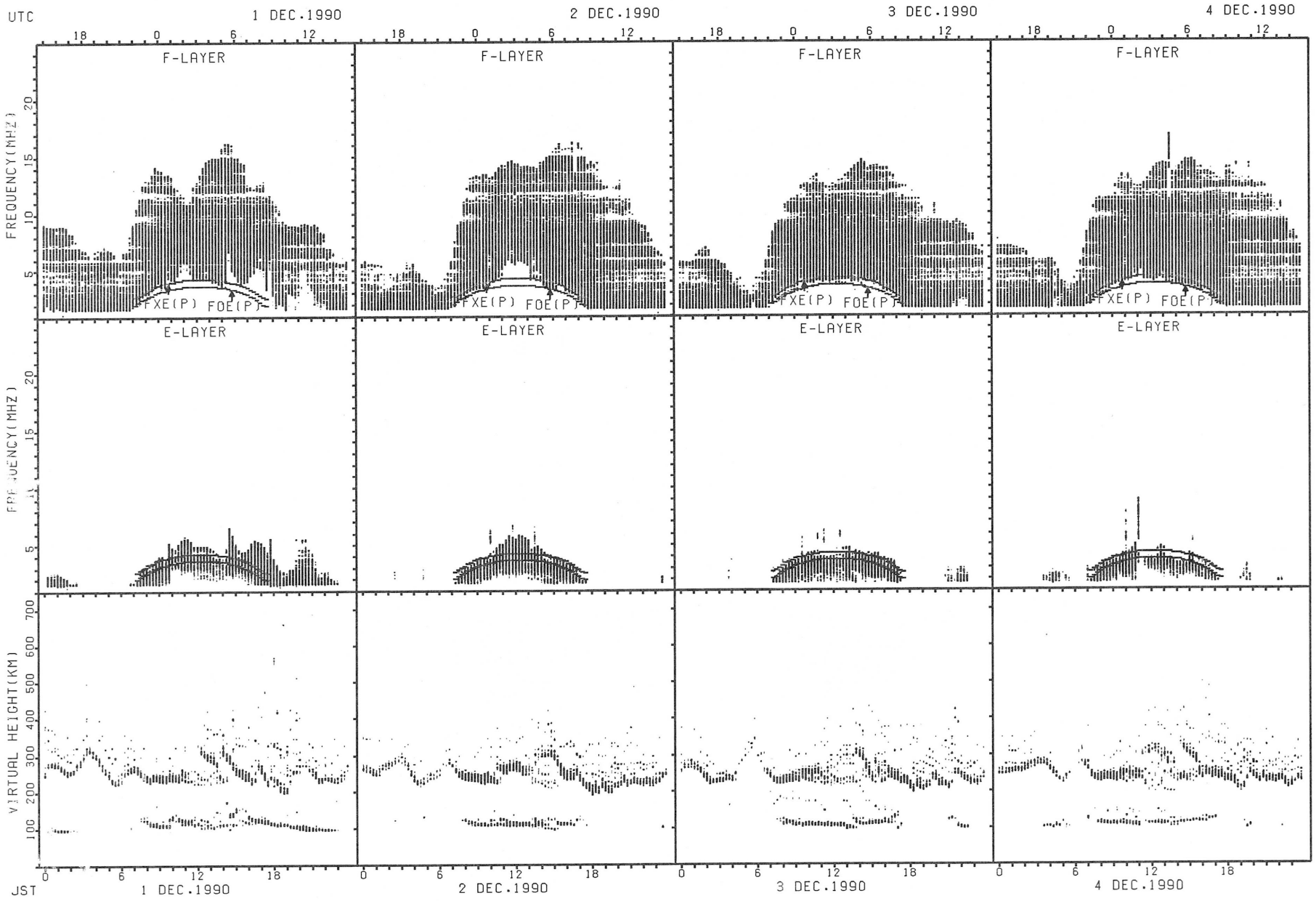

SUMMARY PLOTS AT YAMAGAWA
UTC
25 DEC.1990
26 DEC.1990
27 DEC.1990
28 DEC.1990
F-LAYER
E-LAYER
XE(P) FOE(P)
FREQUENCY(MHZ)
VIRTUAL HEIGHT(KM)
JST
FXE(P): PREDICTED VALUE FOR FXE
FOE(P): PREDICTED VALUE FOR FOE

SUMMARY PLOTS AT YAMAGAWA

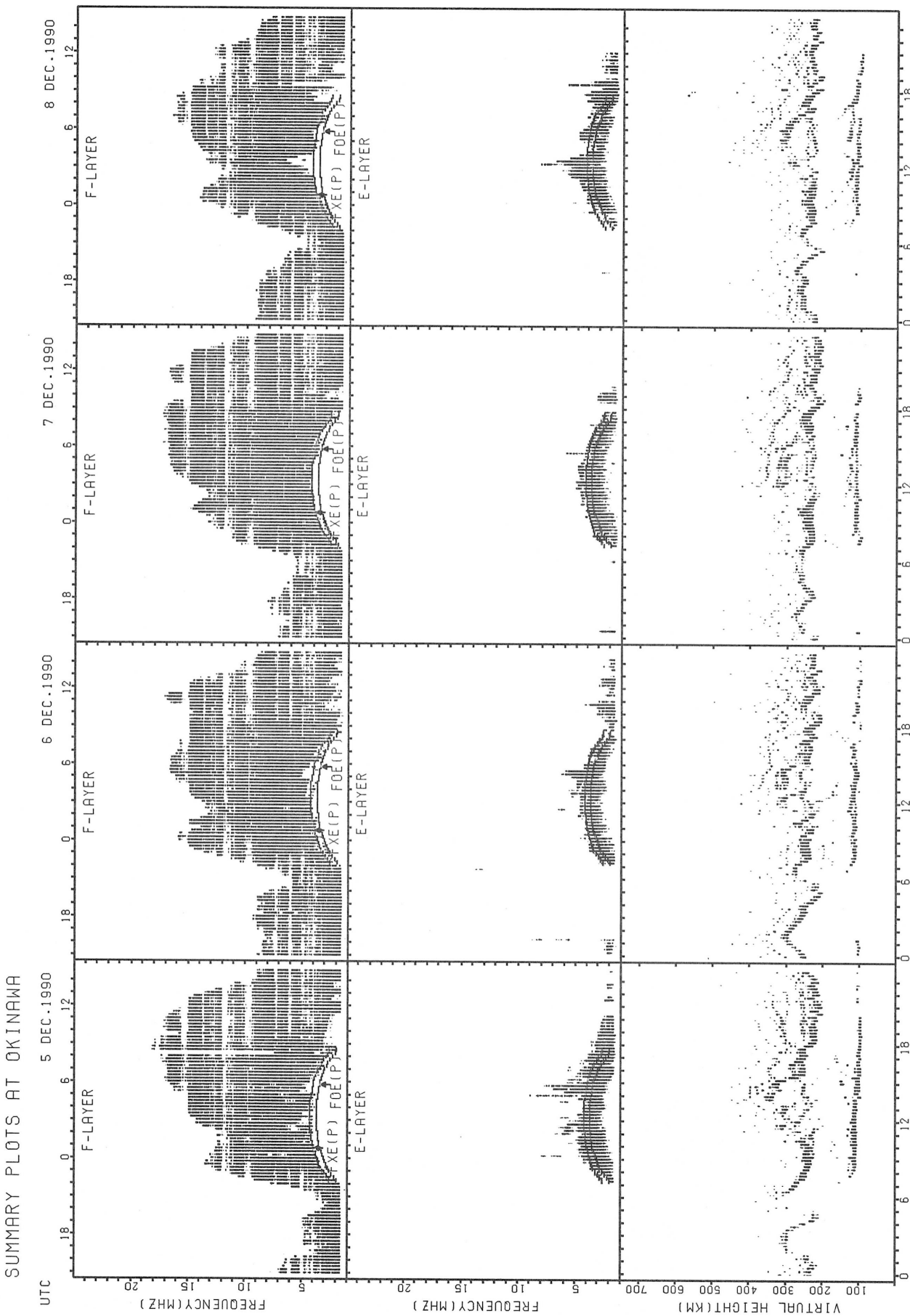


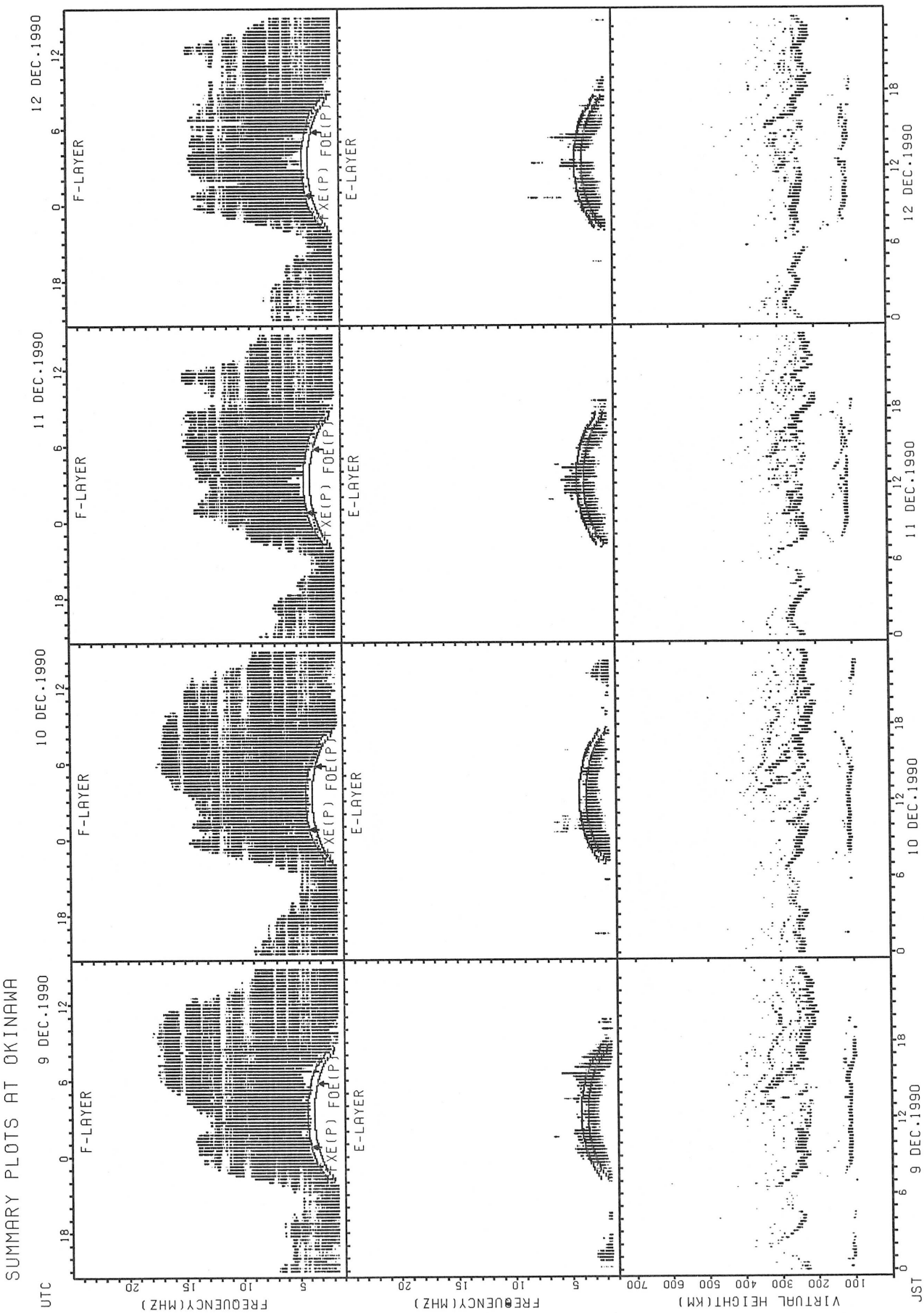
FXE(P); PREDICTED VALUE FOR FXE
FOE(P); PREDICTED VALUE FOR FOE

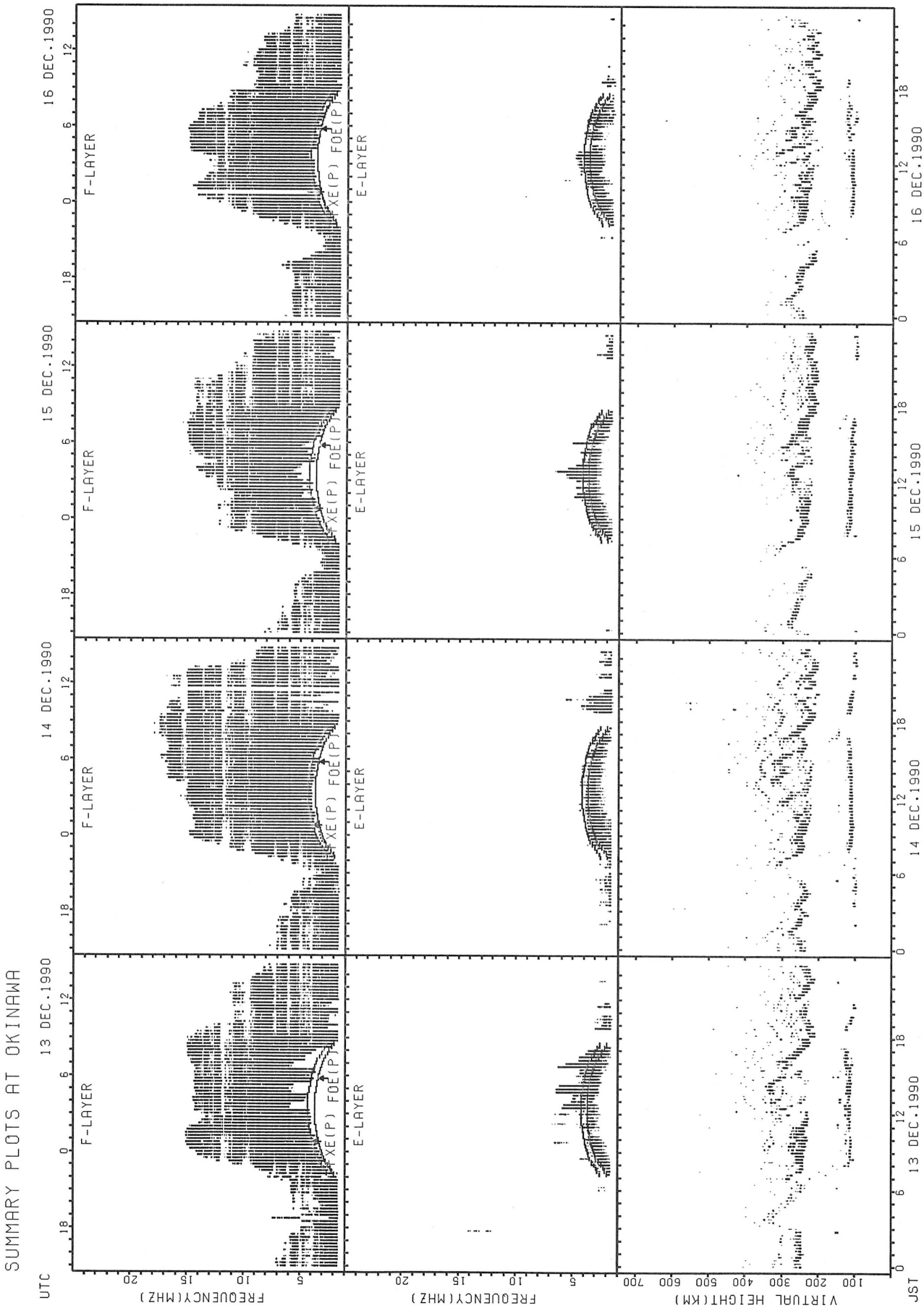
SUMMARY PLOTS AT OKINAWA

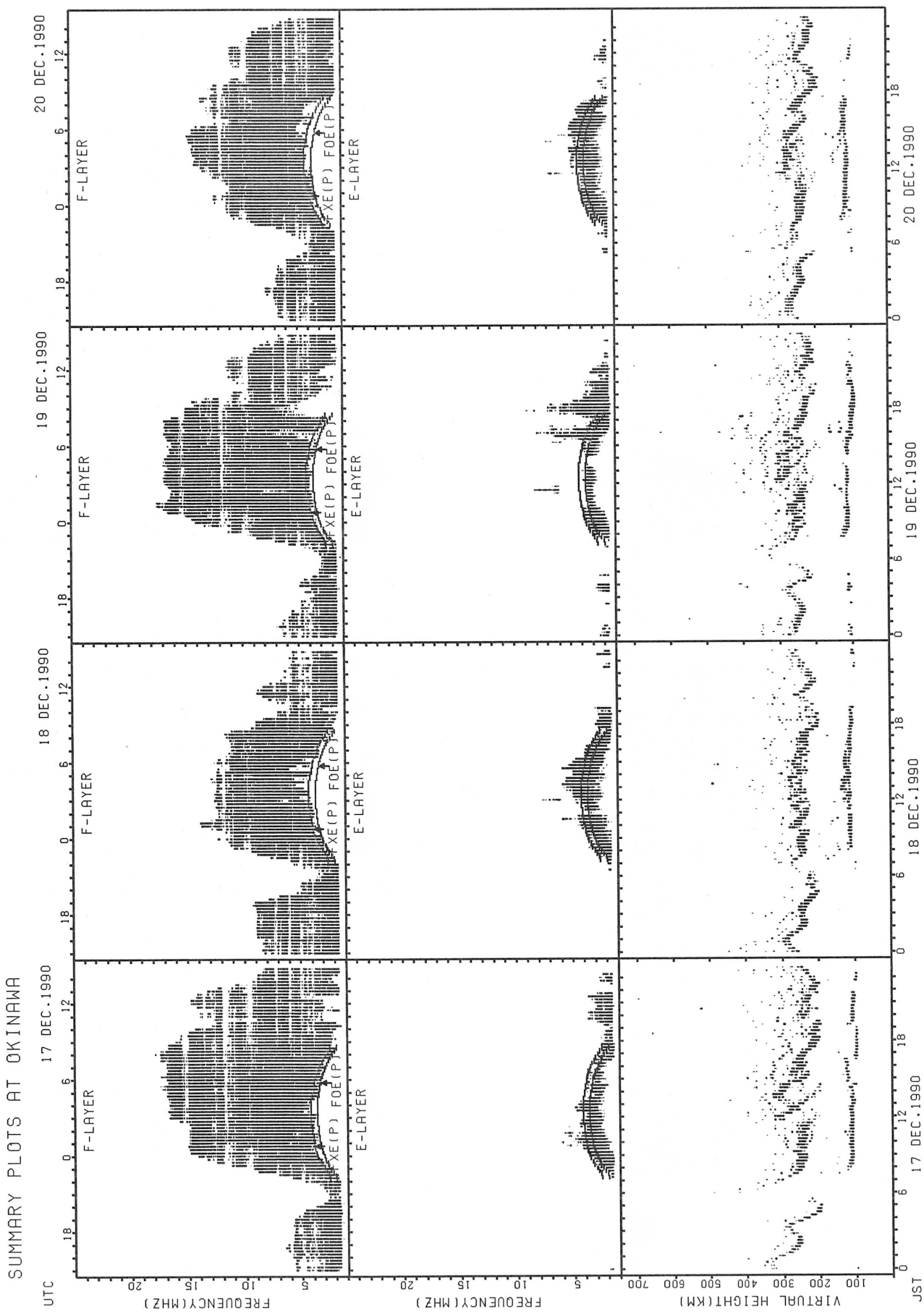


FXE(P): PREDICTED VALUE FOR FXE
FOE(P): PREDICTED VALUE FOR FOE

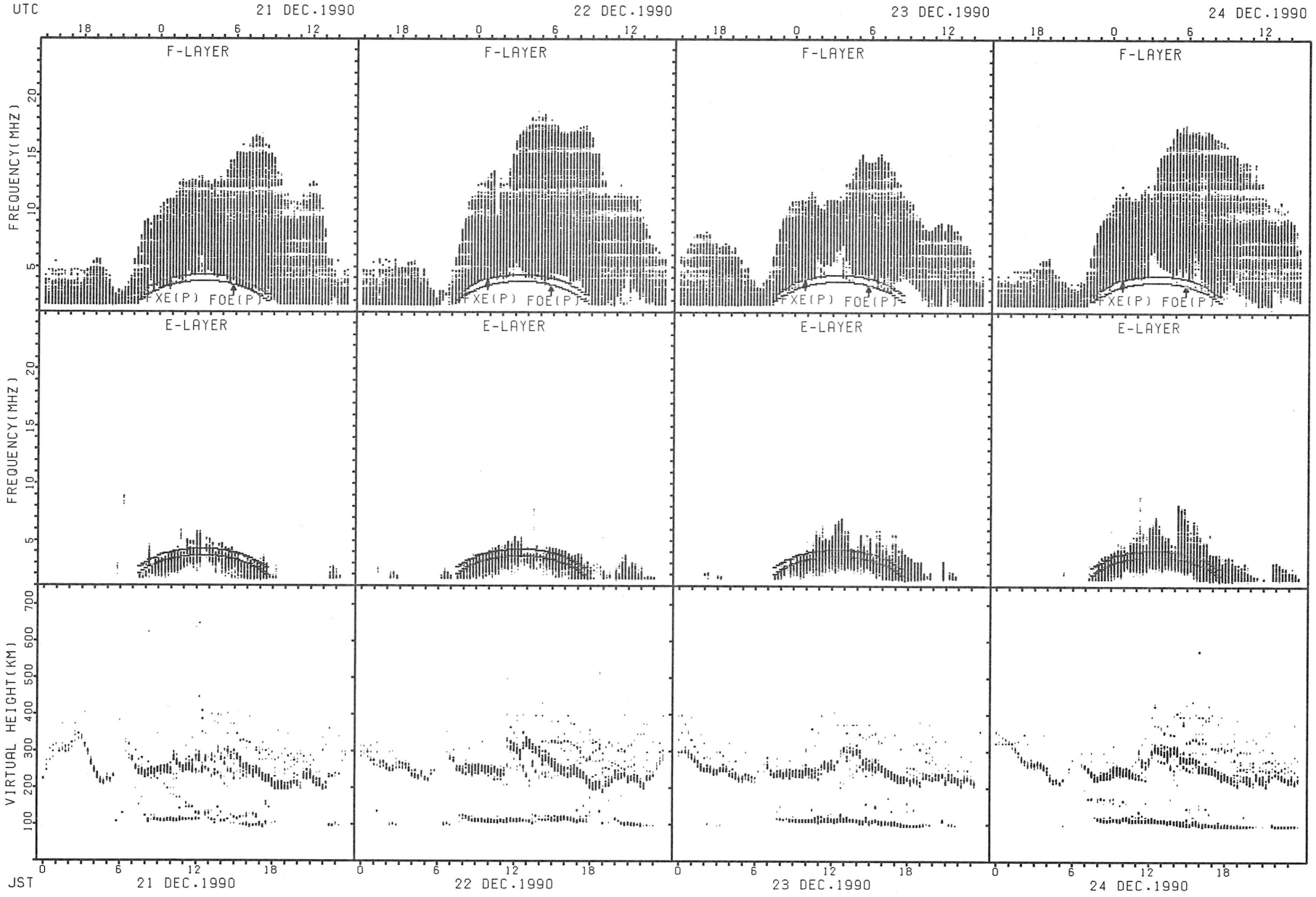

SUMMARY PLOTS AT OKINAWA
UTC
JST
5 DEC.1990
6 DEC.1990
7 DEC.1990
8 DEC.1990
F-LAYER
E-LAYER
FXE(P) FOE(P)
FREQUENCY(MHZ)
VIRTUAL HEIGHT(KM)
FXE(P): PREDICTED VALUE FOR FXE
FOE(P): PREDICTED VALUE FOR FOE


SUMMARY PLOTS AT OKINAWA
UTC
9 DEC.1990
10 DEC.1990
11 DEC.1990
12 DEC.1990
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
13 DEC.1990
14 DEC.1990
15 DEC.1990
16 DEC.1990
F-LAYER
E-LAYER
XE(P) FOE(P)
FREQUENCY(MHZ)
VIRTUAL HEIGHT(KM)
JST
FXE(P): PREDICTED VALUE FOR FXE
FOE(P): PREDICTED VALUE FOR FOE

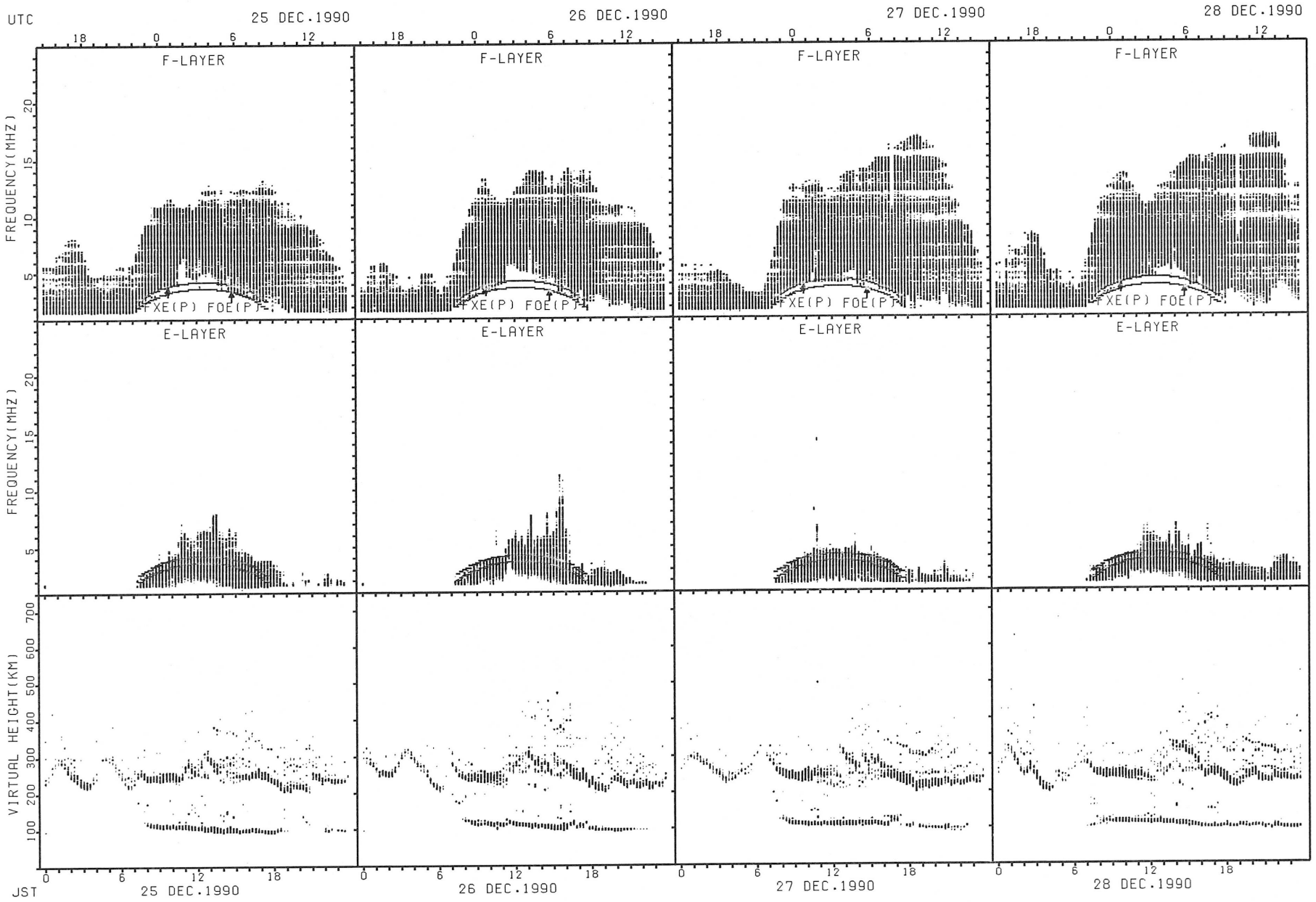

SUMMARY PLOTS AT OKINAWA
17 DEC.1990
18 DEC.1990
19 DEC.1990
20 DEC.1990
UTC
JST
F-LAYER
E-LAYER
FXE(P) FOE(P)
FREQUENCY(MHZ)
VIRTUAL HEIGHT(KM)
FXE(P): PREDICTED VALUE FOR FXE
FOE(P): PREDICTED VALUE FOR FOE

SUMMARY PLOTS AT OKINAWA



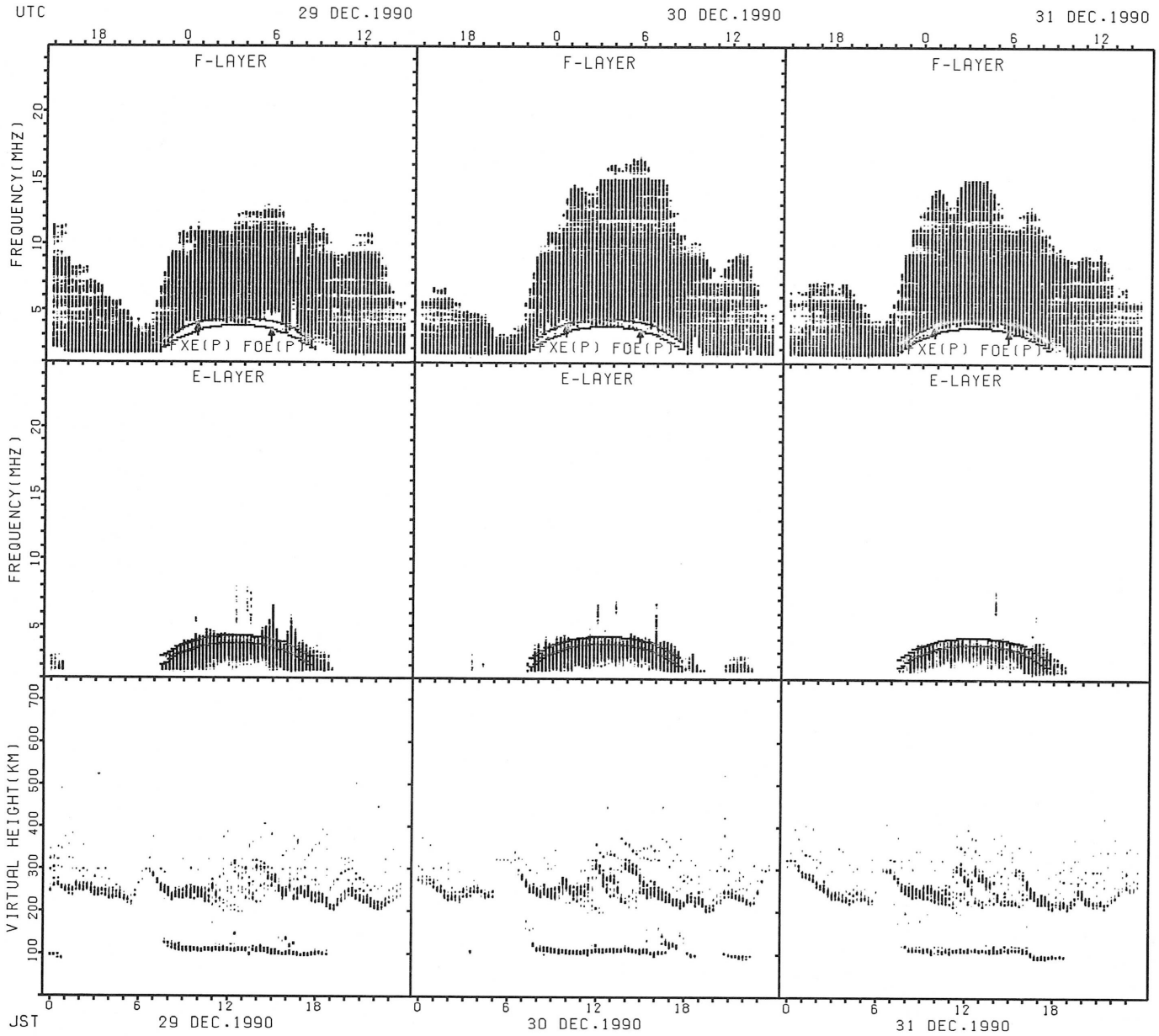
FXE(P): PREDICTED VALUE FOR FXE
FOE(P): PREDICTED VALUE FOR FOE

SUMMARY PLOTS AT OKINAWA



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

MONTHLY MEDIANS OF H'F AND H'ES
DEC.1990 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									30	31	31	31	31	31	31	31	25							
MED									237	234	240	236	238	240	244	242	254							
U Q									242	242	244	248	244	248	252	252	267							
L Q									232	228	234	230	230	236	238	238	242							

H'ES

	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
CNT			10																					
MED			117																					
U Q			119																					
L Q			113																					

H'F STATION AKITA LAT. 39.7N LON. 140.1E

	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	28	30	30	31	30	30	29	31	29							
MED								252	238	242	247	242	244	250	258	254	254							
U Q								268	244	248	258	254	268	262	270	266	264							
L Q								248	234	234	240	234	240	240	249	248	245							

H'ES

	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
CNT		12							12	19	19	17	19	17	16	13	17	13	15	15	13	10		
MED		106							122	119	117	117	115	115	117	113	105	99	109	109	107	103		
U Q		110							134	123	119	119	119	119	120	123	128	114	113	113	111	111		
L Q		105							120	115	115	115	113	112	109	109	102	99	101	103	102	101		

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

	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
CNT								16	31	31	31	31	31	31	31	31	31	19						
MED								261	232	234	244	244	246	252	254	248	250	272						
U Q								269	240	242	258	254	256	266	270	252	262	282						
L Q								250	224	230	236	238	234	240	244	236	240	256						

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								16	15	19	21	20	21	17	19	19	25	24	17	18	14	14		10
MED								122	119	115	119	119	115	115	115	111	131	103	105	109	106	104		105
U Q								166	137	119	125	123	121	117	123	119	158	107	111	115	109	107		109
L Q								107	119	113	113	114	113	112	111	105	111	101	102	105	103	103		101

MONTHLY MEDIANS OF H'F AND H'ES

DEC.1990 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									30	31	31	30	30	30	29	28	30	30	29	21	18	13		
MED									244	238	238	239	255	258	262	254	244	246	258	288	290	276		
U Q									252	244	242	248	264	270	270	270	250	250	269	308	306	314		
L Q									232	232	232	234	246	250	251	245	240	240	249	261	276	266		

H'ES

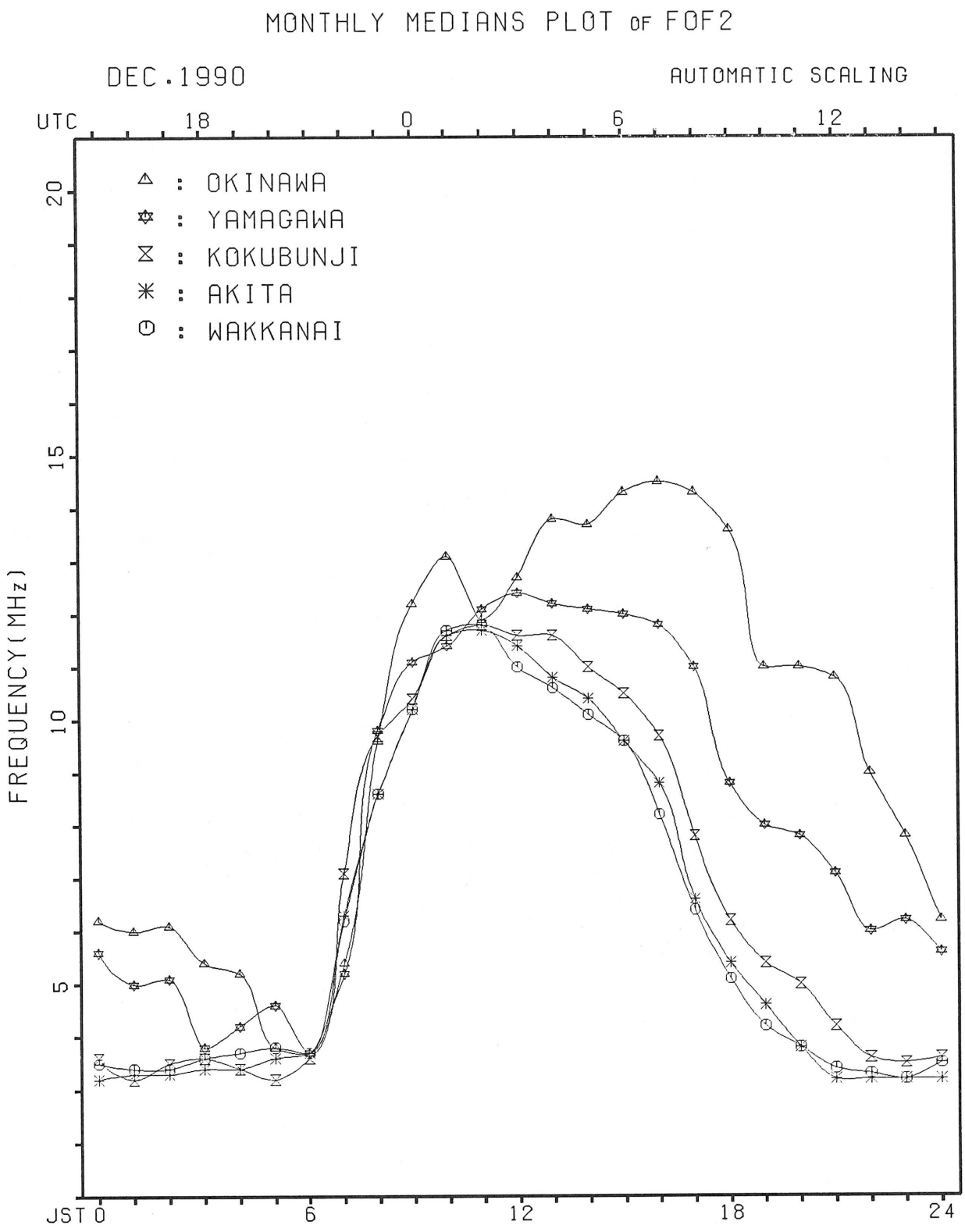
	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
CNT										10	17	17	22	20	25	19	15	15	12	13	10			
MED										117	115	123	117	118	119	117	119	105	104	103	107			
U Q										125	142	134	127	126	125	129	125	117	110	116	113			
L Q										113	113	118	113	116	114	107	109	101	100	100	101			

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									31	31	31	31	30	31	31	31	31	31	30	28	30	29	26	16
MED									252	242	244	246	274	288	296	284	262	250	238	246	263	264	249	280
U Q									268	250	250	254	294	322	306	308	286	260	246	257	284	281	272	295
L Q									242	236	238	240	258	276	276	264	254	240	228	235	254	253	242	251

H'ES

	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
CNT									10	19	23	23	26	24	22	26	23	22	18	17	11	11	10	
MED									125	115	119	121	120	116	115	117	119	108	102	107	103	101	97	
U Q									143	125	137	131	127	125	121	125	125	123	107	115	111	107	101	
L Q									115	113	113	113	117	112	111	107	103	99	99	101	99	99	97	


MONTHLY MEDIANS PLOT OF FOF2
DEC.1990
AUTOMATIC SCALING
UTC
18
0
6
12
△ : OKINAWA
✡ : YAMAGAWA
⧖ : KOKUBUNJI
✳ : AKITA
◷ : WAKKANAI
FREQUENCY(MHz)
20
15
10
5
JST 0
6
12
18
24

IONOSPHERIC DATA

DEC. 1990 | FXI (0.1 MHZ) | 135° E Mean Time (G.M.T. + 9 h)

Station KOKUBUNJI TOKYO Lat. 35°42.4'N, Long. 139°29.3'E Sweep 1 MHz to 25 MHz in 24 sec in automatic operation

Hour / Day	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
1	X 37	X 39	X 37	X 37	X 39	X 40	X 47											X 81	X 63	X 49	X 48	X 45	X 43	X 44
2	X 44	X 43	X 42	X 43	X 46	X 45	X 47											X 87	X 65	X 60	X 50	X 49	X 44	X 41
3	X 43	X 43	X 48	X 48	X 40	X 39	X 48											X 88	X 75	X 54	X 50	X 50	X 43	X 44
4	X 45	X 45	X 46	X 46	X 48	X 44	X 49											X 98	X 66	X 56	X 53	X 57	X 51	X 50
5	X 49	X 46	X 46	X 45	X 47	X 44	X 48											X 98	X 36	X 81	X 77	X 63	X 42	X 40
6	X 39	X 40	X 41	X 41	X 40	X 41	X 46											X 85	X 79	X 63	X 59	X 57	X 47	X 46
7	X 46	X 42	X 44	X 45	X 41	X 37	X 45											X 83	X 35	X 69	X 57	X 56	X 48	X 44
8	X 42	X 41	X 40	X 40	X 38	X 40	X 45											X 84	X 72	X 69	X 61	X 55	X 45	X 43
9	X 46	X 39	X 41	X 42	X 41	X 42	X 46											X 96	X 31	X 66	X 57	X 53	X 47	X 46
10	X 46	X 46	X 47	X 45	X 43	X 44	X 46											X 86	X 72	X 63	X 63	X 57	X 45	X 43
11	X 44	X 44	X 44	X 44	X 40	X 35	X 40											X 81	X 69	X 77	X 62	X 47	X 44	X 44
12	X 44	X 45	X 45	X 45	X 44	X 41	X 45											X 83	X 72	X 66	X 67	X 60	X 47	X 47
13	X 42	X 40	X 41	X 39	X 41	X 41	X 44											X 100	X 75	X 59	X 59	X 57	X 50	X 49
14	X 49	X 47	X 47	X 45	X 45	X 45	X 48											X 91	X 77	X 66	X 59	X 52	X 44	X 39
15	X 38	X 38	X 37	X 38	X 35	X 38	X 40											X 81	X 68	X 63	X 58	X 54	X 42	X 39
16	X 40	X 40	X 40	X 41	X 37	X 39	X 45											X 71	X 64	X 57	X 50	X 42	X 36	X 39
17	X 38	X 40	X 41	X 42	X 46	X 38	X 37											X 90	X 74	X 60	X 59	X 43	X 32	X 35
18	X 35	X 36	X 37	X 39	X 43	X 34	X 36											X 68	X 50	X 52	X 52	X 37	X 38	X 42
19	X 44	X 43	X 45	X 43	X 39	X 38	X 39											X 72	X 58	X 54	X 46	X 37	X 34	X 36
20	X 37	X 39	X 41	X 41	X 41	X 38	X 38											X 76	X 54	X 47	52	52	X 39	X 41
21	X 41	X 39	X 37	X 38	X 38	X 44	X 35											X 84	X 68	X 63	X 45	X 40	X 36	X 37
22	X 37	X 39	X 39	X 40	X 39	X 41	X 42											X 74	X 66	X 62	X 59	X 47	X 37	X 39
23	X 38	X 38	X 39	X 40	X 38	X 37	X 40											X 67	X 70	X 63	X 48	X 39	X 43	X 42
24	X 41	X 41	X 42	X 42	X 41	X 40	X 41											X 86	X 77	X 66	X 45	X 42	X 38	X 41
25	X 39	X 43	X 42	X 41	X 37	X 34	X 42											X 90	X 65	X 61	X 59	X 49	X 40	X 43
26	X 45	X 47	X 43	X 45	X 43	X 43	X 43											X 91	X 65	X 61	X 63	X 48	X 42	X 40
27	X 39	X 41	42	47	X 41	X 35	X 39											X 83	X 65	X 45	X 48	X 45	X 42	X 45
28	X 46	X 44	X 47	X 48	X 41	X 33	X 36											X 97	X 71	X 71	X 70	X 57	X 39	X 39
29	X 39	X 39	X 40	X 42	X 41	X 35	X 36											X 84	X 63	X 60	X 55	X 47	X 39	X 40
30	X 39	X 40	X 43	X 48	X 33	X 37	X 38											X 85	X 70	X 65	X 49	X 39	X 38	X 41
31	X 43	X 41	X 45	X 48	X 39	X 38	X 38											X 85	X 78	X 57	X 47	X 44	X 44	X 45
	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
MED	X 42	X 41	X 42	X 42	X 41	X 39	X 42											X 85	X 70	X 62	X 57	X 49	X 42	X 42
UQ	X 44	X 44	X 45	X 45	X 43	X 42	X 46											X 90	X 75	X 66	X 59	X 56	X 44	X 44
LQ	X 39	X 39	X 40	X 40	X 39	X 37	X 38											X 81	X 65	X 57	X 50	X 44	X 38	X 40

DEC. 1990 | FXI (0.1 MHZ)

IONOSPHERIC DATA

DEC. 1990 | FOF2 (0.1 MHZ) | 135° E Mean Time (G.M.T. + 9 h)

Station KOKUBUNJI TOKYO Lat. 35°42.4'N, Long. 139°29.3'E Sweep 1 MHz to 25 MHz in 24 sec in automatic operation

Hour / Day	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
1	31	33	31	31	33	34	41	81	100	98	110	115	114	107	111	89	95	75	57	42	42	39	38	38
2	38	37	36	37	40	39	41	81	104	108	115	119	118	123	119	117	103	81	59	54	44	43	38	35
3	37	37	J S 42	42	34	33	42	82	103	108	111	107	120	121	116	94	94	82	69	48	44	44	37	38
4	39	39	40	40	42	38	43	79	102	111	Z 128	130	128	126	122	120	111	92	60	50	52	51	45	44
5	43	40	39	39	41	38	42	83	117	120	121	118	112	130	R 117	111	105	92	80	75	71	57	35	34
6	33	34	35	35	34	35	40	77	104	122	136	135	127	125	120	100	99	79	74	57	53	50	41	40
7	40	36	38	39	35	31	39	39	117	122	127	135	121	114	113	119	104	77	79	63	50	49	42	38
8	36	35	34	34	32	34	39	74	103	113	117	108	110	108	110	113	101	77	67	63	55	47	39	37
9	40	33	36	36	35	36	40	83	100	109	117	118	R 108	121	121	115	R 102	90	75	60	47	47	41	40
10	40	40	41	39	37	38	40	77	101	131	130	135	124	125	120	111	101	80	J S 65	57	58	51	39	37
11	38	38	38	38	33	30	34	78	103	106	112	115	113	119	117	112	105	75	64	71	56	41	38	38
12	38	39	39	39	38	35	39	72	99	106	127	115	115	R 114	110	104	91	77	66	60	61	54	41	41
13	36	34	35	34	35	35	38	65	104	108	126	119	121	125	114	105	106	94	69	53	53	51	44	43
14	43	41	41	39	39	39	42	34	105	118	122	121	125	125	123	116	100	85	71	60	53	46	38	33
15	32	32	31	32	29	32	34	74	98	105	118	119	119	114	111	106	96	75	62	57	52	48	36	33
16	34	34	34	35	31	33	39	69	78	104	116	129	129	113	101	104	90	65	58	51	44	36	30	33
17	32	34	35	36	40	32	31	66	91	106	128	124	116	114	118	119	95	83	68	54	53	37	26	29
18	29	30	31	33	37	28	30	62	77	99	108	126	114	100	99	95	92	62	44	46	46	31	V 33	36
19	38	37	39	37	33	32	33	64	92	99	109	103	112	112	96	98	91	66	52	48	40	31	28	30
20	31	33	35	35	35	32	32	68	91	86	103	98	111	H 95	92	83	86	69	48	41	42	43	33	35
21	35	33	31	32	32	38	29	63	83	86	125	138	119	107	101	106	85	73	62	57	39	34	30	32
22	31	33	33	34	33	35	36	61	H 81	86	114	131	V 117	131	119	111	92	68	60	56	54	41	31	33
23	32	32	33	34	32	31	34	56	86	84	94	115	103	104	103	99	78	61	64	57	42	33	37	36
24	35	35	36	36	35	34	35	58	89	91	102	119	119	99	103	108	105	80	71	60	39	36	32	35
25	33	37	36	35	31	28	36	55	85	109	119	118	125	113	117	110	99	84	59	56	53	43	34	37
26	39	41	38	39	37	37	37	65	82	97	114	120	124	114	97	92	90	85	59	55	57	42	35	34
27	33	35	F 34	F 39	35	30	33	68	92	105	114	113	125	118	102	96	86	77	59	39	42	39	36	39
28	40	38	41	42	35	27	31	67	89	103	101	121	109	101	104	107	113	91	65	65	64	49	33	33
29	33	33	34	36	35	29	30	64	95	92	95	106	111	109	98	97	90	73	57	54	48	41	33	34
30	33	34	37	42	27	31	32	69	88	99	120	125	130	128	114	108	88	79	64	60	43	33	32	35
31	37	35	39	42	33	32	32	67	108	107	126	131	125	122	104	104	90	79	72	51	43	38	38	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	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31
MED	36	35	36	36	35	33	36	69	98	106	117	119	119	114	111	106	95	79	64	56	50	43	36	36
UQ	38	38	39	39	37	36	40	78	103	109	126	128	124	124	118	112	102	84	69	60	54	48	38	38
LQ	33	33	34	34	33	31	32	66	88	98	110	115	112	108	102	98	90	75	59	51	42	38	33	34

DEC. 1990 | FOF2 (0.1 MHZ)

IONOSPHERIC DATA

DEC. 1990 | FOF1 (0.01 MHZ) | 135° E Mean Time (G.M.T. + 9 h)

Station KOKUBUNJI TOKYO Lat. 35°42.4'N, Long. 139°29.3'E Sweep 1 MHz to 25 MHz in 24 sec in automatic operation

Hour / Day	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
1											L	L	U L 580		L									
2											L	L	L	L	L									
3											L	L	L	L										
4											L		L	L	L									
5										L	L	L	L	L										
6										L	L	L	L	L	L									
7												L	L	L										
8													L	L	L									
9												L	L	L										
10										L		L	L		L									
11											L			L										
12									L		L	L		L	U L 570	L								
13													L	L										
14												L	U L 620			L								
15											L	L		L		L								
16												L	L	L										
17										L	L			L										
18											L	L												
19										L	L			L										
20													L	L										
21											L	L	L	L	L									
22										L	L	L	L	U L 510										
23															L									
24											L	L												
25												L	L	L	L									
26											L	L												
27											L		L											
28												L	L	L	L									
29														L										
30											L	L	U L 650		L									
31												L		L										
	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
CNT													3	1	1									
MED													U L 620	U L 510	U L 570									
UQ													U L 635											
LQ													U L 600											

DEC. 1990 | FOF1 (0.01 MHZ)

IONOSPHERIC DATA

DEC. 1990 | FOE (0.01 MHZ) | 135° E Mean Time (G.M.T. + 9 h)

Station KOKUBUNJI TOKYO Lat. 35°42.4'N, Long. 139°29.3'E Sweep 1 MHz to 25 MHz in 24 sec in automatic operation

Hour / Day	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
1								180	270	305	340	365	350	340	325	285	200							
2								205	H 270	315	345	350	A	340	320	A	A							
3								175	270	310	340	350	A	A	315	270	205							
4								195	270	310	340	350	350	340	A	275	195							
5								175	270	A	A 345	A	345	345	315	280	195							
6								205	285	A	345	360	365	345	310	275	A							
7								185	260	310	330	U A 330	A	340	A	290	200		J K 140					
8								135	270	315	345	350	360	A	310	255	210							
9								190	A	325	345	355	A	340	A	A	A							
10								170	270	325	345	345	A	340	305	A	200							
11								190	270	320	350	A 355	360	A	330	290	220							
12								180	270	A 330	350	375	365	360	330	270	180							
13								170	265	320	A	365	360	340	325	235	210							
14								165	260	H 305	A	A	345	A	320	280	200							
15								B	270	305	335	340	345	345	315	A	A							
16								B	260	300	320	345	345	A	310	265	180							
17								170	245	A	A 340	340	335	330	A	A	H 195							
18								160	260	305	340	A 365	360	345	A	A	A 170							
19								145	255	300	U A 325	A	R	350	320	280	135							
20								B	255	300	325	340	345	A	A	A	200							
21								180	265	305	330	350	350	R 330	315	270	A							
22								B	260	310	325	A	A	A	A	A	A							
23								170	280	320	330	A 340	A	A	315	265	H 210							
24								A	240	305	330	345	345	345	310	280	A							
25								B	265	305	A	A	345	330	305	255	A 180							
26								B	255	R 305	B	B	A 340	A	330	290	200							
27								B	240	310	340	A	A	340	A	275	210							
28								B	255	305	330	A 350	355	A	320	A	A							
29								B	245	305	335	345	340	340	A 290	280	205							
30								B	260	305	335	A	355	340	3 315	280	205							
31								170	240	300	330	355	355	340	315	290	A 215							
	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	30	28	27	23	22	21	23	22	23		1					
MED								178	262	305	340	350	350	340	315	280	200		J K 140					
UQ								188	270	315	345	355	360	345	320	285	208							
LQ								170	255	305	330	345	345	340	310	270	195							

DEC. 1990 | FOE (0.01 MHZ)

IONOSPHERIC DATA

DEC. 1990 | FOES (0.1 MHZ) | 135° E Mean Time (G.M.T. + 9 h)

Station KOKUBUNJI TOKYO Lat. 35°42.4'N, Long. 139°29.3'E Sweep 1 MHz to 25 MHz in 24 sec in automatic operation

Hour / Day	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
1	E B 13	E B 13	E B 14	E B 13	E B 14	E B 14	J A 18	G	31	33	37	G	37	G 20	35	G	J A 55	57	J A 53	J A 53	J A 53	E B 14	J A 19	J A 19
2	24	J A 16	E B 13	E B 14	E B 14	E B 14	E B 14	G	G	34	48	40	J A 37	G 30	41	36	J A 43	J A 34	J A 48	E B 15	E B 14	J A 17	E B 14	E B 14
3	E B 14	E B 13	J A 16	J A 21	E B 13	E B 14	E B 14	J A 23	G	G	36	36	38	38	41	31	22	E B 14	E B 13	J A 25	J A 26	J A 27	J A 52	E B 13
4	E B 14	E B 14	E B 15	E B 13	E B 13	E B 14	E B 14	J A 26	G	G	G	40	36	G	J A 36	30	22	E B 14	J A 23	J A 24	J A 29	J A 22	J A 16	E B 15
5	E B 13	E B 14	E B 14	E B 14	E B 15	E B 14	J A 15	21	32	J A 43	39	J A 44	G 29	G 33	J A 35	30	G	E B 12	E B 13	J A 18	J A 18	E B 14	E B 14	E B 14
6	20	J A 15	E B 14	18	J A 21	E B 14	E B 13	J A 20	G	37	G 27	G	G	G	G 26	J A 52	J A 36	J A 29	J A 17	J A 20	E B 13	J A 22	E B 15	E B 14
7	E B 14	E B 15	E B 13	E B 14	E B 14	E B 14	E B 15	G	G	37	40	43	J A 49	G 34	35	G 22	G	E B 14	K 14	E B 14	E B 14	E B 14	J A 17	E B 13
8	19	E B 15	E B 14	E B 14	E B 14	E B 14	E B 13	G 16	30	38	40	40	G 25	J A 36	G 28	G	26	J A 26	E B 13	J A 22	J A 19	19	19	E B 15
9	E B 15	E B 15	19	E B 14	E B 14	E B 14	J A 22	G 19	J A 33	36	37	39	J A 47	53	J A 55	J A 33	25	J A 33	J A 46	J A 26	J A 26	J A 23	J A 23	J A 37
10	J A 29	E B 14	E B 14	E B 14	J A 18	E B 14	E B 13	G	G	G 28	G	G 29	J A 52	G 24	G 26	J A 30	G 20	32	J A 22	21	20	E B 13	E B 14	E B 14
11	E B 16	E B 13	E B 14	E B 13	E B 14	E B 15	E B 14	G	J A 32	G	41	40	G 33	J A 38	G	33	29	J A 20	22	E B 15	J A 26	E B 14	E B 14	E B 13
12	E B 14	E B 14	E B 13	E B 13	E B 15	E B 14	E B 14	J A 23	G	J A 37	G	43	45	G	G 32	J A 32	22	J A 21	J A 21	E B 15	E B 13	E B 13	E B 14	E B 14
13	E B 15	E B 14	E B 13	E B 14	E B 16	J A 20	E B 15	G	G	J A 37	J A 53	39	39	36	G	G	G	E B 15	E B 14	E B 14	E B 14	E B 13	E B 14	J A 21
14	J A 20	J A 21	J A 16	J A 27	J A 22	E B 14	J A 20	G	G	G	J A 39	J A 42	G	J A 48	J A 54	30	24	J A 25	J A 21	J A 21	J A 23	J A 21	22	E B 15
15	J A 22	J A 22	E B 13	E B 15	J A 20	E B 13	E B 15	J A 51	G	36	40	36	G 26	38	36	29	J A 29	31	J A 24	J A 22	J A 21	24	J A 18	J A 17
16	J A 15	E B 15	E B 14	E B 14	E B 14	E B 13	E B 15	J A 21	J A 28	G	36	43	39	J A 37	33	J A 32	22	E B 15	J A 14	E B 13	E B 14	E B 15	E B 14	E S 17
17	E B 14	J A 25	J A 23	E B 13	E B 13	19	E B 14	G	27	J A 34	39	J A 52	J A 42	G	J A 37	29	G	J A 25	E B 14	J A 21	E B 13	20	E B 15	E B 15
18	E B 16	E B 13	E B 13	E B 14	E B 15	E B 14	E B 14	G	G	J A 34	40	41	43	J A 48	J A 67	J A 33	J A 37	J A 25	J A 37	J A 27	J A 22	J A 23	21	J A 45
19	J A 29	J A 29	J A 23	J A 27	J A 40	J A 21	J A 17	G	G	37	J A 44	J A 42	G 35	G 34	G 28	34	G	J A 30	J A 24	J A 22	20	J A 30	E B 14	J A 16
20	E B 14	J A 21	J A 18	E B 14	E B 14	J A 20	J A 21	J A 18	G	G	36	36	38	J A 42	J A 39	J A 37	J A 28	J A 27	20	J A 20	J A 21	J A 17	E B 14	J A 23
21	E B 14	E B 14	E B 14	E B 15	E B 14	E B 14	E B 14	G	G	G	36	40	G 27	G	G	G	27	21	E B 13	E B 14	E B 13	E B 14	E B 15	E B 14
22	E B 14	E B 13	J A 22	J A 17	J A 23	E B 14	E B 15	J A 18	G	G	39	J A 45	J A 44	J A 38	J A 55	J A 34	J A 38	J A 21	J A 19	J A 14	J A 26	J A 43	J A 42	J A 28
23	E B 14	J A 20	E B 14	E B 13	E B 13	E B 14	E B 14	21	G	G	G	43	39	J A 35	J A 42	G 25	J A 24	J A 23	J A 22	J A 18	J A 17	J A 21	J A 18	J A 29
24	J A 20	J A 24	J A 20	E B 13	J A 18	J A 18	21	J A 26	J A 26	34	35	42	39	G	J A 35	34	J A 39	J A 22	J A 29	J A 34	J A 20	J A 18	20	J A 21
25	E B 15	25	J A 16	J A 17	E B 14	E B 14	E B 14	E B 15	J A 52	38	39	J A 36	G 32	G 25	G	28	J A 24	J A 17	E B 13	21	E B 12	E B 14	E B 14	E B 14
26	E B 14	E B 14	20	E B 15	E B 14	E B 13	E B 14	E B 14	G	G	35	E B 36	J A 42	J A 54	35	J A 38	J A 44	J A 21	J A 21	E B 14	E B 14	E B 14	E B 13	E B 13
27	E B 14	J A 38	J A 21	J A 25	J A 22	J A 23	J A 18	J A 21	G	G	39	J A 46	J A 42	35	J A 37	J A 39	J A 26	26	J A 36	J A 19	E B 15	J A 19	20	20
28	J A 16	J A 17	J A 21	J A 51	E B 13	E B 13	20	J A 23	G	G	G	39	G	34	G	J A 31	J A 55	J A 53	J A 48	J A 25	J A 21	J A 23	J A 20	J A 22
29	J A 19	E B 14	E B 13	J A 19	J A 21	J A 16	E B 15	J A 19	G 23	G	G	36	37	35	35	G 26	J A 24	J A 20	J A 21	J A 21	J A 17	J A 16	E B 14	E B 14
30	22	21	E B 16	E B 16	E B 15	E B 13	E B 14	E B 15	G	G	36	36	G	G	G 31	29	J A 41	J A 30	J A 26	J A 21	E B 14	E B 14	E B 14	E B 16
31	E B 15	E B 14	E B 13	E B 13	E B 13	E B 15	E B 14	G	G	G	36	37	G 21	38	35	G	25	E B 13	E B 13	E B 13	E B 13	E B 13	E B 14	E B 14
	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
CNT	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31
MED	E B 15	E B 15	E B 14	E B 14	E B 14	E B 14	E B 14	16	G	G 28	37	40	37	35	35	30	25	J A 23	J A 21	J A 21	J A 18	17	E B 15	E B 15
UQ	20	J A 21	J A 18	17	J A 18	E B 15	16	J A 21	26	36	40	42	42	J A 38	J A 38	J A 34	J A 36	J A 30	J A 25	J A 22	J A 22	J A 22	J A 20	J A 20
LQ	E B 14	E B 14	E B 14	E B 14	E B 14	E B 14	E B 14	G	G	G	35	36	G 28	G 22	G 28	27	22	18	14	E B 15	E B 14	E B 14	E B 14	E B 14

DEC. 1990 | FOES (0.1 MHZ)

IONOSPHERIC DATA

DEC. 1990 | FBES (0.1 MHZ) | 135° E Mean Time (G.M.T. + 9 h)

Station KOKUBUNJI TOKYO Lat. 35°42.4'N, Long. 139°29.3'E Sweep 1 MHz to 25 MHz in 24 sec in automatic operation

Hour / Day	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
1	E B 13	E B 13	E B 14	E B 13	E B 14	E B 14	E B 14	G	29	32	35	G	G	G 20	34	G	53	50	33	28	35	E B 14	18	E 3 13
2	16	E B 13	E B 13	E B 14	E B 13	E B 14	E B 14	G	G	34	43	38	37	G 27	37	30	30	19	E B 15	E B 15	E B 14	E B 13	E B 14	E B 14
3	E B 14	E B 13	E B 13	E B 13	E B 13	E B 14	E B 14	E B 14	G	G	36	36	37	35	33	G 24	G 18	E B 14	E B 13	18	17	16	21	E B 13
4	E B 14	E B 14	E B 15	E B 13	E B 13	E B 14	E B 14	G 13	G	G	G	39	36	G	32	30	21	E B 14	20	20	19	19	E B 14	E B 15
5	E B 13	E B 14	E B 14	E B 14	E B 15	E B 14	E B 14	E B 14	G	33	37	35	G 28	G 32	G 28	30	G	E B 12	E B 13	E B 15	E B 14	E B 14	E B 14	E B 14
6	E B 15	E B 14	E B 14	E B 15	E B 13	E B 14	E B 13	E B 14	G	35	G 25	G	G	G	G 24	G 24	32	20	E B 14	16	E B 13	16	E B 15	E B 14
7	E B 14	E B 15	E B 13	E B 14	E B 14	E B 14	E B 15	G	G	35	39	40	37	G 33	34	G 20	G	E B 14	K 14	E B 14	E B 14	E B 14	E B 14	E B 13
8	E B 15	E B 15	E B 14	E B 14	E B 14	E B 14	E B 13	G	30	36	37	39	G 24	34	G 27	G	24	20	E B 13	16	E B 14	E B 14	E B 14	E B 15
9	E B 15	E B 15	E B 14	E B 14	E B 14	E B 14	E B 15	G 17	27	34	36	38	43	41	37	31	23	27	22	21	18	17	E B 14	17
10	17	E B 14	E B 14	E B 14	E B 13	E B 14	E B 13	G	G	G 27	G	G 28	51	G 22	G 24	29	G 19	18	20	18	E B 13	E B 13	E B 14	E B 14
11	E B 16	E B 13	E B 14	E B 13	E B 14	E B 15	E B 14	G	G 23	G	40	39	G 32	35	G	31	26	15	E 3 17	E B 15	20	E B 14	E B 14	E 3 13
12	E B 14	E B 14	E B 13	E B 13	E B 15	E B 14	E B 14	G	G	G 28	G	40	40	G	G 31	30	21	E B 14	E B 13	E B 15	E B 13	E B 13	E B 14	E B 14
13	E B 15	E B 14	E B 13	E B 14	E B 16	E B 14	E B 15	G	G	G 23	G	39	38	36	G	G	G	E 3 15	E B 14	E B 14	E B 14	E B 13	E B 14	E 3 14
14	17	E B 14	E B 14	19	E B 13	E B 14	E B 13	G	G	G	34	36	G	35	G 23	30	22	16	17	15	E B 13	16	E B 14	E B 15
15	15	15	E B 13	E B 15	E B 14	E B 13	E B 15	E B 15	G	G	39	36	G 25	36	35	28	22	26	20	17	18	16	E B 14	15
16	E B 13	E B 15	E B 14	E B 14	E B 14	E B 13	E B 16	E B 14	G 21	G	35	40	G	34	33	G 21	21	E B 15	E B 13	E B 13	E B 14	E B 15	E B 14	E B 17
17	E B 14	E B 15	16	E B 13	E B 13	E B 14	E B 14	G	27	31	G	41	37	G	33	28	G	E B 13	E B 14	E B 13	E B 13	E B 13	E B 15	E 3 15
18	E B 16	E B 13	E B 13	E B 14	E B 15	E B 14	E B 14	G	G	G	36	40	G	42	41	27	G 16	E B 14	23	20	E B 13	16	E 3 15	19
19	20	E B 13	E B 13	17	16	E B 13	E B 13	G	G	34	37	39	U G 35	G 33	G 23	32	G	15	18	16	E B 14	23	E B 14	E B 14
20	E B 14	E B 13	E B 12	E B 14	E B 14	E B 14	E B 15	G	G	G	35	36	37	40	35	30	23	16	E B 13	E B 14	E B 13	17	E B 14	17
21	E B 14	E B 14	E B 14	E B 15	E B 14	E B 14	E B 14	G	G	G	36	G	G 27	G	G	G	25	E B 14	E B 13	E B 14	E B 13	E B 14	E B 15	E B 14
22	E B 14	E B 13	E B 13	E B 13	E B 13	E B 14	E B 15	E B 16	G	G	37	37	37	35	33	28	22	16	E B 14	E B 14	19	25	23	17
23	E B 14	15	E B 14	E B 13	E B 13	E B 14	E B 14	G	G	G	G	37	36	34	34	G 21	G 15	16	17	E B 13	E B 14	19	E B 14	20
24	17	E B 13	16	E B 13	16	E B 14	E B 14	16	G 18	G 25	35	40	38	G	G	30	27	19	23	17	E B 14	E B 13	E B 13	E B 13
25	E B 15	15	E B 13	E B 14	E B 14	E B 14	E B 14	E B 15	G	37	36	34	G 31	G 23	G	28	G 18	E B 13	E B 13	E B 13	E B 12	E B 14	E B 14	E B 14
26	E B 14	E B 14	E B 13	E B 15	E B 14	E B 13	E B 14	E B 14	G	G	35	E B 36	39	34	G 31	G 24	G	14	19	E B 14	E B 14	E B 14	E B 13	E B 13
27	E B 14	18	E B 13	14	15	18	15	E B 14	G	G	35	37	36	G 31	33	G 25	G 18	17	25	E B 15	E B 15	17	E B 13	E B 13
28	E B 13	E B 13	E B 13	25	E B 13	E B 13	E B 14	E B 15	G	G	G	36	G	34	G	30	24	42	35	17	17	17	18	19
29	E B 14	E B 14	E B 13	E B 15	18	E B 13	E B 15	G	G 18	G	G	36	36	G	33	G 25	G 17	E B 13	E B 14	E B 14	E B 14	E B 15	E B 14	E B 14
30	E B 15	E B 14	E B 16	E B 16	E B 15	E B 13	E B 14	E B 15	G	G	36	35	G	G	G 31	G 22	G 17	20	16	E B 14	E B 14	E B 14	E B 14	E B 16
31	E B 15	E B 14	E B 13	E B 13	E B 13	E B 15	E B 14	G	G	G	35	37	G 20	37	34	G	24	E B 13	E B 13	E B 13	E B 13	E B 13	E B 14	E B 14
	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
CNT	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31
MED	E B 14	E B 14	E B 13	E B 14	E B 14	E B 14	E B 14	G	G	G	35	37	36	G 33	32	28	21	15	E E 15	E B 15	E B 14	E B 14	E B 14	E B 14
UQ	E B 15	E B 15	E B 14	E B 14	E B 15	E B 15	E B 14	E B 15	E B 14	E G 18	32	36	39	37	35	34	30	24	19	20	17	16	16	E B 14	E E 16
LQ	E B 14	E B 13	E B 13	E B 13	E B 13	E B 14	E B 14	G	G	G	E G 25	36	G 22	E G 20	G 24	G 22	G 16	E B 14	E B 13	E B 14	E B 13	E B 14	E B 14	E B 14

DEC. 1990 | FBES (0.1 MHZ)

IONOSPHERIC DATA

DEC. 1990 | FMIN (0.1 MHZ) | 135° E Mean Time (G.M.T. + 9 h)

Station KOKUBUNJI TOKYO Lat. 35°42.4'N, Long. 139°29.3'E Sweep 1 MHz to 25 MHz in 24 sec in automatic operation

Hour / Day	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
1	13	13	14	13	14	14	14	14	15	15	21	30	15	18	16	16	16	14	14	13	14	14	14	13
2	13	13	13	14	13	14	14	13	16	15	18	18	18	18	13	13	13	13	15	15	14	13	14	14
3	14	13	13	13	13	14	14	14	14	16	16	17	17	15	17	15	15	14	13	13	14	13	13	13
4	14	14	15	13	13	14	14	14	15	15	18	20	17	15	16	14	13	14	13	14	13	15	14	15
5	13	14	14	14	15	14	14	14	17	17	17	17	17	17	15	16	13	12	13	15	14	14	14	14
6	15	14	14	15	13	14	13	14	14	19	16	20	20	16	14	14	16	14	14	14	13	13	15	14
7	14	15	13	14	14	14	15	14	14	16	18	18	19	20	18	17	14	14	13	14	14	14	14	13
8	15	15	14	14	14	14	13	13	16	15	19	18	18	18	20	16	13	15	13	13	14	14	14	15
9	15	15	14	14	14	14	15	14	14	17	17	18	17	22	17	16	13	14	13	13	14	14	14	13
10	13	14	14	14	13	14	13	14	15	16	19	21	17	16	14	14	14	12	14	14	13	13	14	14
11	16	13	14	13	14	15	14	14	17	18	20	22	22	22	21	18	15	12	E S 17	15	13	14	14	13
12	14	14	13	13	15	14	14	14	15	18	17	16	20	34	19	17	14	14	13	15	13	13	14	14
13	15	14	13	14	16	14	15	14	16	17	19	23	21	19	17	18	15	15	14	14	14	13	14	14
14	14	14	14	14	13	14	13	18	16	15	17	18	17	17	17	15	16	13	13	13	13	13	14	15
15	13	14	13	15	14	13	15	16	14	16	16	19	18	14	15	17	14	13	12	13	13	14	14	13
16	13	15	14	14	14	13	16	14	13	16	18	16	18	18	18	15	14	15	13	13	14	15	14	E S 17
17	14	15	13	13	13	14	14	14	13	17	17	18	17	20	17	17	14	13	14	13	13	13	15	15
18	16	13	13	14	15	14	14	18	15	14	17	29	22	18	18	16	13	14	14	13	13	14	15	15
19	14	13	13	14	14	13	13	13	14	14	18	23	22	20	17	14	15	13	13	13	14	14	14	14
20	14	13	12	14	14	14	15	14	14	14	16	17	17	17	18	14	13	13	13	14	13	13	14	14
21	14	14	14	15	14	14	14	14	14	15	18	18	18	20	16	13	13	14	13	14	13	14	15	14
22	14	13	13	13	13	14	15	16	16	16	17	23	18	21	17	15	14	13	14	14	14	16	15	14
23	14	13	14	13	13	14	14	18	19	20	18	19	17	20	17	15	14	14	14	13	14	15	14	15
24	13	13	13	13	14	14	14	13	14	14	20	20	21	17	16	15	16	14	14	14	14	13	13	13
25	15	13	13	14	14	14	14	15	15	18	20	18	20	17	16	14	13	13	13	13	12	14	14	14
26	14	14	13	15	14	13	14	14	17	27	34	36	24	20	22	16	13	12	13	14	14	14	13	13
27	14	14	13	13	13	13	13	14	15	16	16	16	16	17	16	16	14	13	14	15	15	14	13	13
28	13	18	13	14	13	13	14	15	16	16	16	17	16	16	16	16	13	15	15	13	14	13	13	13
29	14	14	13	15	13	13	15	14	15	16	18	20	17	17	18	16	14	13	14	14	14	15	14	14
30	15	14	16	16	15	13	14	15	16	17	17	21	22	18	21	17	13	13	14	14	14	14	14	16
31	15	14	13	13	13	15	14	14	15	16	18	18	18	19	20	17	16	13	13	13	13	13	14	14
	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
CNT	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31
MED	14	14	13	14	14	14	14	14	15	16	18	18	18	18	17	16	14	13	13	14	14	14	14	14
UQ	15	14	14	14	14	14	14	14	16	17	18	21	20	20	18	16	15	14	14	14	14	14	14	14
LQ	14	13	13	13	13	14	14	14	14	15	17	18	17	17	16	14	13	13	13	13	13	13	14	13

DEC. 1990 | FMIN (0.1 MHZ)

IONOSPHERIC DATA

DEC. 1990 | M(3000)F2 (0.01) | 135° E Mean Time (G.M.T. + 9 h)

Station KOKUBUNJI TOKYO Lat. 35°42.4'N, Long. 139°29.3'E Sweep 1 MHz to 25 MHz in 24 sec in automatic operation

Hour / Day	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
1	280	285	270	270	285	285	305	340	350	330	325	315	300	305	315	315	305	325	335	315	305	305	275	290
2	285	280	270	275	300	310	305	330	340	335	330	325	295	325	305	320	325	335	310	330	310	290	300	275
3	275	280	J S 305	325	290	275	300	345	345	330	330	300	300	305	310	310	315	325	335	320	305	315	295	270
4	270	270	270	275	310	290	320	335	340	335	Z 310	305	300	285	285	300	305	320	310	280	270	285	275	280
5	295	275	270	265	285	270	275	320	340	325	320	310	285	295	R 310	305	300	310	305	305	310	340	255	280
6	270	270	270	260	270	270	320	320	320	320	320	295	295	295	305	305	305	310	310	290	285	285	275	270
7	275	270	270	305	285	260	290	330	340	325	320	300	300	290	290	310	315	300	310	320	280	300	295	280
8	270	280	270	275	280	280	300	320	325	325	325	310	300	295	295	305	310	305	290	335	310	300	270	270
9	285	280	260	265	245	270	280	330	345	325	310	310	R 295	295	290	295	R 305	305	315	315	280	295	275	275
10	270	260	275	285	270	275	300	310	325	325	320	310	290	290	290	305	310	305	J S 325	305	290	320	280	260
11	270	280	290	290	320	270	275	330	345	330	315	310	295	295	300	300	310	290	290	330	310	255	270	270
12	270	280	280	280	305	290	340	330	340	325	310	315	300	R 300	305	300	325	305	300	330	310	300	260	265
13	285	275	270	255	260	270	325	320	320	315	295	300	280	290	290	285	295	305	290	285	285	275	275	285
14	275	280	280	265	300	280	275	325	330	320	310	295	295	295	290	300	315	315	315	300	290	280	305	270
15	280	280	275	275	295	280	295	335	340	350	310	315	310	310	310	310	320	320	320	305	305	310	255	275
16	275	270	280	300	305	285	335	350	325	330	310	320	310	305	310	335	310	320	335	325	315	340	270	265
17	270	270	265	270	315	320	295	320	340	320	320	310	305	310	295	305	305	330	340	310	325	310	255	255
18	275	265	270	290	340	285	300	335	340	340	315	325	315	310	320	310	330	350	305	300	330	295	V 250	260
19	270	290	300	310	300	300	305	330	345	340	330	310	320	315	320	315	350	320	330	340	325	265	270	255
20	280	265	270	295	295	295	310	345	345	320	345	305	325	H 325	315	335	325	330	340	310	320	290	300	275
21	290	295	270	265	295	305	325	340	360	320	315	330	320	325	300	310	320	330	340	325	290	285	280	280
22	290	275	280	290	290	305	315	340	H 330	345	285	330	V 295	320	310	310	335	315	325	315	330	305	270	265
23	280	275	285	285	320	290	320	350	350	345	310	335	320	315	330	340	335	310	320	330	350	275	285	290
24	275	270	275	295	310	305	295	340	360	335	320	320	320	300	300	320	315	305	320	320	295	300	280	270
25	280	275	300	300	255	250	340	325	330	325	315	310	320	295	295	300	315	315	295	310	310	320	285	260
26	290	295	295	275	265	275	320	340	335	340	320	310	310	310	310	330	320	325	315	300	325	320	305	275
27	280	280	F 270	F 300	310	280	290	340	345	335	320	315	315	310	310	320	310	315	340	290	300	310	280	265
28	265	290	300	315	370	265	280	330	340	340	320	320	305	325	305	305	315	325	320	315	320	340	245	255
29	270	285	280	305	340	260	285	325	350	335	320	310	315	325	320	310	330	295	300	315	305	280	275	265
30	275	280	300	325	340	260	295	345	340	325	305	300	290	310	290	305	315	310	305	335	310	290	260	255
31	265	260	265	310	340	265	285	295	335	300	295	290	295	290	295	325	315	310	345	320	310	255	270	260
	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
CNT	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31
MED	275	280	275	285	300	280	300	330	340	330	320	310	300	305	305	310	315	315	315	315	310	300	275	270
UQ	280	280	282	300	312	290	320	340	345	335	320	318	315	312	310	315	322	325	332	325	318	310	282	275
LQ	270	270	270	272	285	270	290	325	332	325	310	305	295	295	295	305	310	305	305	305	292	285	270	262

DEC. 1990 | M(3000)F2 (0.01)

IONOSPHERIC DATA

DEC. 1990 | M(3000)F1 (0.01)

135° E Mean Time (G.M.T. + 9 h)

Station KOKUBUNJI TOKYO Lat. 35°42.4'N, Long. 139°29.3'E Sweep 1 MHz to 25 MHz in 24sec in automatic operation

Day \ Hour	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
1											L	L	U L 360		L									
2											L	L	L	L	L									
3											L	L	L	L										
4											L		L	L	L									
5										L	L	L	L	L										
6										L	L	L	L	L	L									
7												L	L	L										
8													L	L	L									
9												L	L	L										
10										L		L	L		L									
11											L			L										
12									L		L	L		L	L	L								
13													L	L										
14												L	U L 340			L								
15											L	L		L		L								
16												L	L	L										
17										L	L			L										
18											L	L												
19										L	L			L										
20													L	L										
21											L	L	L	L	L									
22										L	L	L	L	U L 335										
23															L									
24											L	L												
25												L	L	L	L									
26											L	L												
27											L		L											
28												L	L	L	L									
29														L										
30											L	L	U L 350	L										
31												L		L										
	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
CNT													3	1										
MED													U L 350	U L 335										
UQ													U L 355											
LQ													U L 345											

DEC. 1990 | M(3000)F1 (0.01)

IONOSPHERIC DATA

DEC. 1990 | H'F2 (KM) | 135° E Mean Time (G.M.T. + 9 h)

Station KOKUBUNJI TOKYO Lat. 35°42.4'N, Long. 139°29.3'E Sweep 1 MHz to 25 MHz in 24 sec in automatic operation

Hour / Day	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
1											250	235H	280		265									
2											250	245	285L	260	275									
3											235	235	270	255										
4											245		265	300L	305									
5										235	240	235	L	280										
6										250	250	280L	235	280	250									
7												255	230	305L										
8													250	255L	285									
9												255L	230H	270										
10										255		255	300		295L									
11											275L			305										
12									255		265	240		280	280	255								
13													300L	265										
14												305	305			280								
15											270	280		265		265L								
16												260	260	250										
17										250	240			250										
18											255	255												
19										225	255			265										
20													250	230H										
21											270	250	235	240	250									
22										225	305L	240	255	270										
23															250									
24											230	250												
25												260	255	245	275									
26											255	240												
27											255		260											
28												260	240	240	275L									
29														255										
30											290	255	310	265										
31												240		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									1	6	18	21	19	23	11	3								
MED									255	242	255	255	260	265	275	265								
UQ										250	270	260	282	280	282	272								
LQ										225	245	240	245	252	258	260								

DEC. 1990 | H'F2 (KM)

IONOSPHERIC DATA

DEC. 1990 | H°F (KM) | 135° E Mean Time (G.M.T. + 9 h)

Station KOKUBUNJI TOKYO Lat. 35°42.4'N, Long. 139°29.3'E Sweep 1 MHz to 25 MHz in 24sec in automatic operation

Hour / Day	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
1	310	305	315	350	315	295	265	235	215	225	235	215	H 200	230	235	215	E A 260	E A 255	E A 255	E A 275	A	260	305	290
2	290	290	330	305	265	255	250	235	215	225	230	H 230	225	230	225	235	225	220	235	225	235	260	250	305
3	320	305	280	245	265	330	265	225	225	225	230	220	230	235	230	220	230	215	225	A 250	260	265	A 305	310
4	325	320	325	315	255	260	225	220	220	225	225	225	220	225	230	245	230	215	220	A 255	300	275	275	290
5	255	300	305	325	285	280	250	240	230	225	225	215	220	230	225	235	225	215	235	235	235	215	235	305
6	305	340	340	350	310	325	240	230	225	225	220	H 210	235	220	235	220	230	220	245	220	260	240	235	310
7	300	285	315	265	275	355	300	240	235	230	220	230	225	220	230	245	220	210	255	215	215	240	255	290
8	325	315	325	310	305	305	250	225	220	230	230	225	220	H 210	230	245	225	200	225	225	235	225	300	315
9	305	330	355	315	315	325	275	230	225	225	220	H 220	A 230	A 245	240	225	220	A 240	235	235	240	265	245	305
10	320	325	305	285	300	305	250	225	220	H 230	230	235	A 235	H 225	230	240	220	205	225	240	235	240	255	325
11	325	305	300	280	250	310	285	245	225	230	230	235	235	235	250	240	220	200	260	235	235	245	305	305
12	315	305	305	300	270	280	225	230	230	225	230	235	H 230	220	235	245	230	220	240	220	250	240	300	305
13	290	320	335	330	350	315	235	235	235	235	230	235	240	245	235	235	245	215	215	225	265	235	295	290
14	300	295	295	A 325	280	290	295	245	215	230	H 225	H 225	H 210	245	230	230	225	225	230	225	225	250	270	300
15	330	320	330	320	260	285	285	245	225	230	230	220	H 210	225	245	230	225	A 225	225	240	240	240	260	330
16	315	335	330	290	260	300	235	220	210	H 215	225	225	235	220	225	H 225	205	205	230	225	225	235	285	355
17	365	330	335	320	255	215	280	235	225	225	220	A 240	225	220	225	230	210	215	220	220	230	225	355	345
18	340	350	330	310	250	255	280	225	220	230	230	235	225	A 230	A 245	235	A 225	210	A 255	240	230	260	350	A 385
19	A 340	285	285	275	260	270	280	230	230	230	225	230	245	H 230	225	240	220	225	230	220	225	E A 355	340	350
20	350	340	320	280	260	270	270	225	225	H 215	235	235	240	230	245	220	230	205	225	235	255	260	280	315
21	300	300	350	355	300	280	225	220	220	230	245	240	235	230	220	230	H 210	230	225	230	H 210	235	320	315
22	300	330	325	295	285	280	240	230	210	225	225	240	230	215	235	230	220	205	235	230	230	260	A 370	355
23	320	345	320	305	260	280	250	230	215	215	220	230	230	225	240	230	210	220	240	225	220	315	295	320
24	320	335	320	290	265	250	275	235	230	225	230	230	230	230	H 230	240	235	215	A 245	220	225	265	300	320
25	325	320	275	270	350	400	230	230	240	A 250	235	225	240	230	235	240	235	210	205	230	245	225	275	345
26	305	270	285	325	335	310	225	220	220	225	H 215	210	250	230	H 215	230	225	215	225	225	230	240	260	300
27	315	335	350	285	250	325	290	230	215	230	225	230	220	230	225	225	220	215	230	240	240	250	280	350
28	320	290	295	A 280	220	315	305	235	220	230	225	220	230	225	225	235	250	235	A 250	245	235	215	A 305	365
29	325	310	320	285	240	310	305	235	230	225	220	230	230	240	240	235	230	210	215	240	235	270	315	340
30	320	310	290	260	230	350	280	230	225	225	220	H 235	220	235	230	230	225	225	230	215	220	240	320	345
31	330	350	330	270	240	330	305	255	240	H 210	235	230	230	230	235	235	225	220	215	215	230	305	320	340
	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	30	31	31	31
MED	320	320	320	300	265	300	265	230	225	225	225	230	230	230	230	235	225	215	230	228	235	242	295	315
UQ	325	332	330	320	300	320	282	235	230	230	230	235	235	230	235	240	230	221	239	239	240	261	310	345
LQ	305	302	302	280	255	280	240	225	220	225	222	222	222	225	225	230	220	210	225	222	225	238	272	305

DEC. 1990 | H°F (KM)

IONOSPHERIC DATA

DEC. 1990 | H'E (KM) | 135° E Mean Time (G.M.T. + 9 h)

Station KOKUBUNJI TOKYO Lat. 35° 42.4' N, Long. 139° 29.3' E Sweep 1 MHz to 25 MHz in 24 sec in automatic operation

Day \ Hour	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
1								130	E A 140	A 120	A 120	120	110	115	A 115	115	B 130							
2								140	115	110	110	110	A	A 120	A 115	A	A							
3								E B 160	110	110	110	A 115	115	A	A	E A 145	E A 160							
4								A 130	120	115	115	A 130	110	110	A	125	130							
5								135	115	110	115	A 110	A 125	A 130	A 130	115	125							
6								155	120	115	115	110	120	110	A 120	E A 140	A							
7								130	115	110	110	110	110	A 130	A	A 120	120		F					
8								A 145	120	115	A	A	120	A	E A 130	115	130							
9								E A 155	A	115	115	115	110	110	A	A	A							
10								E B 150	110	A 130	110	A 125	A	A 115	A 120	A	E A 125							
11								145	A 130	115	115	115	E A 135	A	115	115	E A 140							
12								A 140	115	A 130	110	115	115	B 120	A 130	115	130							
13								E B 165	115	120	115	115	110	110	110	115	125							
14								E B 170	115	110	110	110	110	A	A 125	E A 130	B 130							
15								B	120	115	A 120	A 115	A 120	E A 130	115	115	A							
16								B	E A 140	110	115	115	115	110	115	115	135							
17								B 170	115	115	110	110	115	120	115	A	130							
18								B 160	120	110	115	120	120	115	A	A	A							
19								E B 155	115	115	110	115	A	A 130	A 120	A 125	130							
20								B	115	110	115	115	110	110	115	A	E A 140							
21								E B 195	120	110	110	110	110	115	105	110	A							
22								B	110	110	110	115	110	A	A	A	A							
23								E B 160	120	115	115	110	110	A	A 125	A 120	A 130							
24								A	A 125	A 120	110	A 120	110	115	A 120	115	A							
25								B	120	115	110	A	A 130	115	110	110	A							
26								B	125	B 135	B	B	120	115	E A 140	A 130	E A 135							
27								B	115	110	110	A	110	A 130	A	E A 130	A 130							
28								B	115	115	110	110	115	A	115	A	A							
29								B	A 125	115	115	115	115	110	115	A 130	E A 140							
30								B	125	115	115	115	120	115	A	A 130	A 135							
31								E B 160	120	115	115	110	115	115	115	120	135							
	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	30	31	29	27	28	24	23	23	21							
MED								U 142	118	115	115	115	115	115	A 115	118	130							
UQ								E B 160	120	115	115	115	120	A 120	A 121	A 125	A 132							
LQ								136	115	110	110	110	110	110	115	115	130							

DEC. 1990 | H'E (KM)

IONOSPHERIC DATA

DEC. 1990 | H'ES (KM) | 135° E Mean Time (G.M.T. + 9 h)

Station KOKUBUNJI TOKYO Lat. 35°42.4'N, Long. 139°29.3'E Sweep 1 MHz to 25 MHz in 24 sec in automatic operation

Hour / Day	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
1	B	B	B	B	B	B	105	G	150	E G 170	150	G	130	110	150	G	115	115	110	105	105	B	110	105
2	100	105	B	B	B	B	B	G	G	E G 155	120	135	105	105	125	95	100	95	115	B	B 120	B	B	
3	B	B	110	110	B	B	B	105	G	G	E G 155	135	120	115	135	110	110	B	B	115	115	110	110	B
4	B	B	B	B	B	B	B	120	G	G	G	150	E G 190	G	105	150	150	B	120	120	110	110	110	B
5	B	B	B	B	B	B	125	120	120	120	120	110	110	115	110	145	G	B	B	110	105	B	B	B
6	105	110	B	105	105	B	B	115	G	115	105	G	G	G	105	100	100	100	100	120	B	105	B	B
7	B	B	B	B	B	B	B	G	G	130	120	110	120	115	110	110	G	B	B	B	B	B	110	B
8	105	B	B	B	B	B	B	105	E G 170	150	150	135	110	110	110	G	140	105	B	100	105	105	115	B
9	B	B	115	B	B	B	115	130	120	E G 195	E G 160	135	110	115	115	115	130	110	110	110	105	105	105	115
10	110	B	B	B	115	B	B	G	G	110	G	105	100	100	100	100	100	100	100	100	105	B	B	B
11	B	B	B	B	B	B	B	G	115	G	140	125	115	105	G	140	135	105	105	B	120	B	B	B
12	B	B	B	B	B	B	B	115	G	115	G	140	120	G	115	140	130	110	115	B	B	B	B	B
13	B	B	B	B	B	110	B	G	G	110	110	140	E G 195	E G 180	G	G	G	B	B	B	B	B	B	110
14	105	105	105	100	120	B	125	G	G	G	120	120	G	105	110	E G 200	E G 190	110	110	110	110	105	105	B
15	105	105	B	B	105	B	B	105	G	130	125	125	105	140	120	115	110	110	100	105	105	100	100	105
16	105	B	B	B	B	B	B	120	115	G	E G 165	120	130	125	E G 165	120	140	B	105	B	B	B	B	B
17	B	110	110	B	B	115	B	G	E G 180	120	120	115	120	G	110	110	G	110	B	120	B	100	B	B
18	B	B	B	B	B	B	B	G	G	110	125	125	130	120	115	110	110	120	110	110	110	110	105	110
19	115	110	110	105	105	110	110	G	G	125	120	115	115	115	115	E G 180	G	105	100	105	100	105	B	110
20	B	100	105	B	B	110	110	105	G	G	E G 205	E G 200	E G 155	110	110	105	135	105	110	110	105	105	B	100
21	B	B	B	B	B	B	B	G	G	G	E G 200	130	105	G	G	G	125	100	B	B	B	B	B	B
22	B	B	105	110	105	B	B	110	G	G	120	120	115	110	110	105	135	100	120	110	110	110	105	105
23	B	110	B	B	B	B	B	110	G	G	G	120	120	115	130	105	110	105	105	110	105	105	100	110
24	105	110	110	B	105	105	115	110	110	105	E G 175	135	120	G	130	125	120	120	115	110	120	105	100	110
25	B	105	110	110	B	B	B	B	110	125	115	115	110	110	G	E G 195	100	105	B	100	B	B	B	B
26	B	B	100	B	B	B	B	B	G	G	140	B	125	110	120	115	130	115	110	B	B	B	B	B
27	B	105	110	110	100	100	105	110	G	G	140	110	120	110	110	105	110	105	105	105	B	105	105	105
28	100	100	115	105	B	B	105	115	G	G	G	120	G	120	G	105	105	100	100	105	100	100	100	100
29	105	B	B	100	100	110	B	110	105	G	G	E G 145	135	130	120	110	110	110	105	110	105	105	B	B
30	100	100	B	B	B	B	B	B	G	G	125	120	G	G	115	120	110	100	105	105	B	B	B	B
31	B	B	B	B	B	B	B	G	G	G	E G 200	E G 175	105	E G 155	E G 165	G	135	B	B	B	B	B	B	B
	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
CNT	12	13	12	9	9	7	9	16	10	16	25	28	27	24	26	26	26	24	22	22	18	18	14	12
MED	105	105	110	105	105	110	110	110	115	118	122	122	118	112	114	111	115	105	108	110	105	105	105	108
UQ	105	110	110	110	105	110	115	118	U 135	U 132	E G 155	135	124	118	122	U 130	135	110	110	110	110	110	110	110
LQ	102	105	105	105	105	108	105	108	110	112	120	118	110	110	110	105	110	100	105	105	105	105	100	105

DEC. 1990 | H'ES (KM)

IONOSPHERIC DATA

DEC. 1990 | TYPES OF ES | 135° E Mean Time (G.M.T. + 9 h)

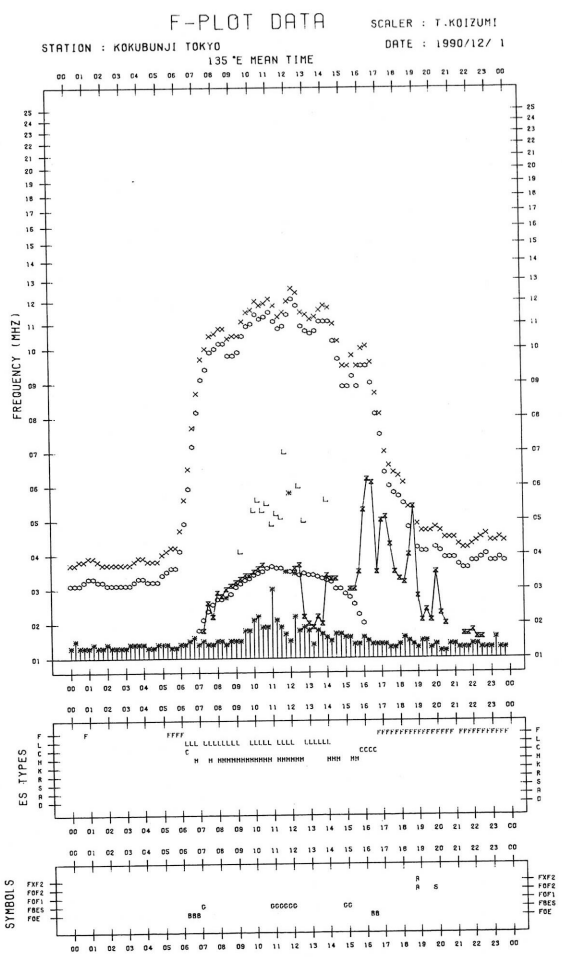
Station KOKUBUNJI TOKYO Lat. 35°42.4'N, Long. 139°29.3'E Sweep 1 MHz to 25 MHz in 24 sec in automatic operation

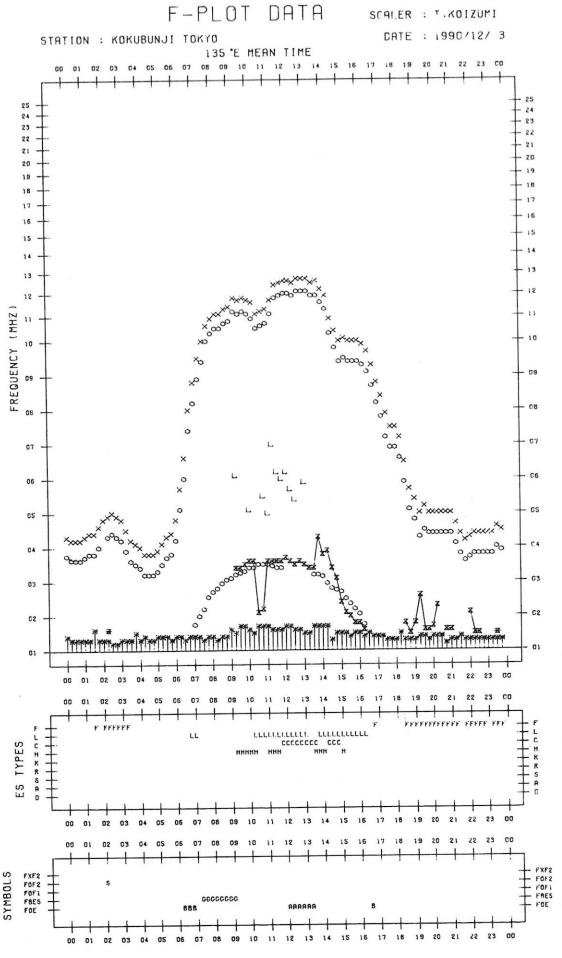
Day \ Hour	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
1							F 1		HL 12	HL 12	HL 11		HL 11	L 1	HL 11		C 4	F 6	F 4	F 4	F 4		FF 21	F 2
2	F 2	F 1								H 1	C 2	H 1	L 2	L 2	HL 22	L 3	L 5	F 3	F 1			F 1		
3			F 1	F 2				LI 1			H 1	HL 11	CL 11	CL 21	HL 21	LH 21	L 1			F 4	F 2	F 2	F 2	
4								LI 1				HL 11	H 1		C 2	HL 12	H 1		F 3	F 5	F 3	F 4	F 2	
5							F 1	LI 1	C 1	C 2	C 2	C 2	L 1	LL 11	LH 21	H 1				F 3	F 2			
6	F 1	F 1		F 1	F 1			L 1		CL 21	L 2				L 2	L 2	L 3	L 3	F 1	F 1		F 2		
7										H 2	C 2	C 2	CC 21	L 2	L 2	L 2			K 1				F 1	
8	F 1							LI 1	H 1	HL 21	HL 21	HL 22	L 1	L 1	L 1		H 2	F 4		F 3	F 1	F 1	F 1	
9			F 1				F 1	L 1	L 2	H 1	H 1	H 1	C 2	C 2	CL 32	C 2	CL 21	FF 22	F 4	F 3	F 3	F 2	F 2	FF 21
10	F 2				F 1					L 2		L 2	L 3	L 1	L 2	L 2	L 2	F 4	F 1	F 1	F 1			
11									LH 11		H 1	H 1	L 1	L 2		H 1	HL 21	F 1	F 1		L 2			
12								LI 1		L 1		H 1	C 1		L 1	H 1	C 1	F 1	F 1					
13						F 1				LH 11	LC 11	H 1	H 1	H 1										F 1
14	F 1	F 1	F 1	F 2	FF 11		F 1				C 1	C 1		L 2	LH 21	HL 12	H 1	F 2	F 2	F 2	F 2	F 2	F 1	
15	F 2	F 1			F 1			L 1		H 1	HL 21	CL 11	L 2	HL 12	CL 21	C 2	L 2	F 3	F 3	F 3	F 3	F 2	F 2	F 2
16	F 1							LL 11	L 1		H 1	CL 21	CL 11	H 1	H 1	LH 21	C 1		F 1					
17		F 1	F 3			F 1			H 1	C 1	C 1	C 2	C 2		C 1	L 2		F 1		F 1		F 1		
18										L 1	C 2	C 1	H 1	C 2	C 3	C 2	L 3	F 1	F 4	F 3	F 2	F 2	F 2	F 3
19	F 3	F 2	F 2	F 2	F 2	F 2	F 1			H 2	C 2	C 2	L 1	L 2	L 1	HL 11		F 3	F 3	FF 21	F 1	F 4		F 1
20		FF 11	FF 11			F 1	F 1	LI 1			H 1	H 1	H 1	C 2	C 2	L 3	HL 11	F 1	F 1	F 2	F 2	F 1		F 1
21											H 1	H 1	L 1				CL 21	F 1						
22			F 2	F 1	F 2			LI 1			C 2	C 1	C 2	L 1	C 2	L 2	HL 12	FF 11	F 1	F 1	FF 21	F 3	F 4	F 3
23		F 1						LI 1				C 2	C 1	C 1	CL 11	L 2	L 1	F 2	F 2	F 1	F 1	F 1	F 1	FF 21
24	F 3	F 1	F 2		F 2	F 1	F 1	L 2	L 1	LH 31	H 1	HL 21	CL 21		CL 11	C 1	C 3	FF 21	F 4	F 1	F 1	F 2	F 1	F 1
25		F 2	F 1	F 1					LH 11	C 3	C 2	C 1	L 2	L 2		H 1	L 2	F 1		F 1				
26			F 1								H 1		C 1	L 2	L 1	L 1	CL 12	F 1	F 2					
27		F 3	F 2	F 2	F 2	F 3	F 2	LI 1			H 1	C 1	C 1	L 2	L 2	L 2	L 2	F 2	F 3	F 2		F 1	F 1	F 1
28	F 1	F 2	F 1	F 4			F 1	LI 1				C 1		C 1		L 3	L 2	F 3	F 4	F 2	F 3	F 2	F 1	F 2
29	F 1			F 2	F 2	F 1		LI 1	L 2			H 1	HL 11	C 1	C 2	L 2	L 2	F 1	F 1	F 1	F 2	F 1		
30	F 1	F 2									H 1	C 1			L 1	L 2	L 1	F 4	F 2	F 1				
31											H 1	H 1	L 1	H 1	H 1		C 1							
	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
CNT																								
MED																								
UQ																								
LQ																								

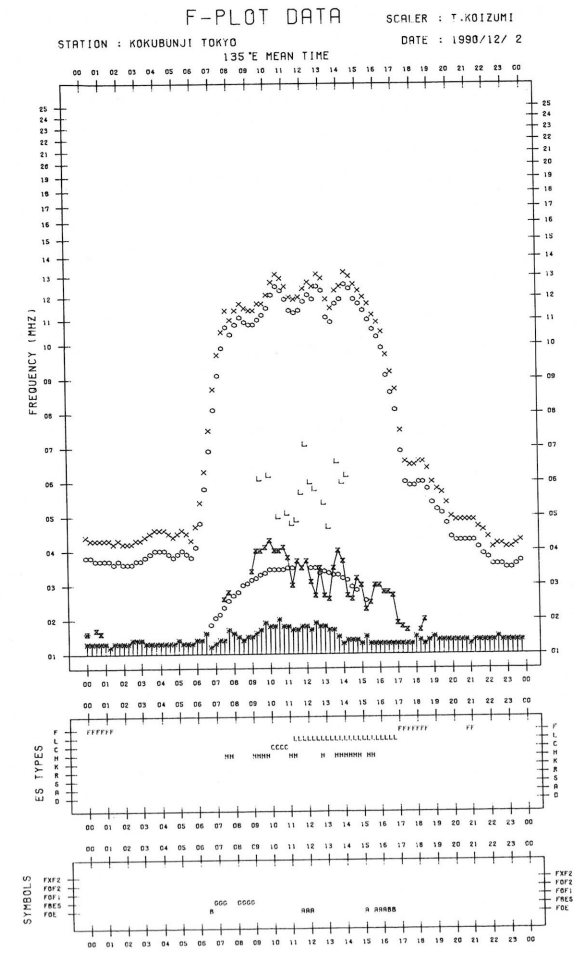
DEC. 1990 | TYPES OF ES

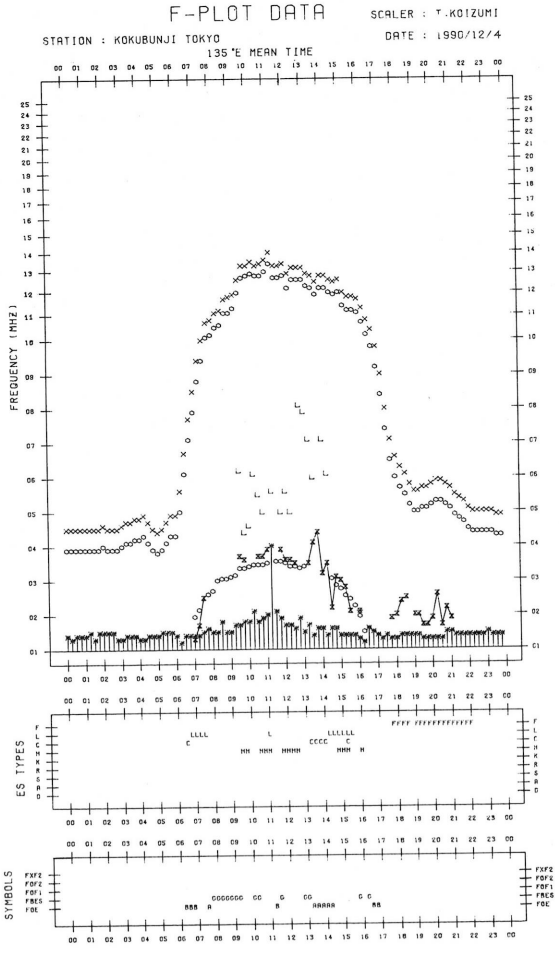
f-PLOTS OF IONOSPHERIC DATA

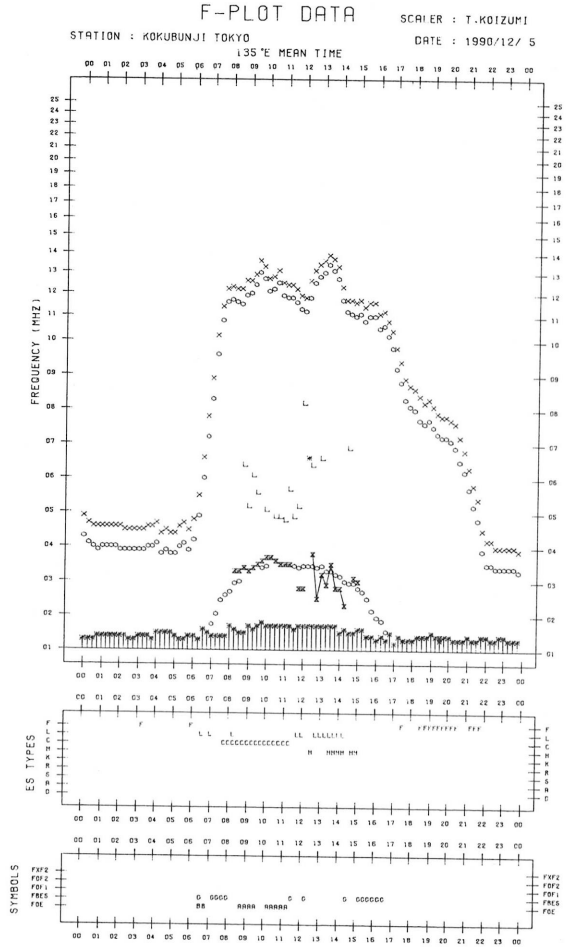
KEY OF F-PLOT	
!	SPREAD
○	FOF2,FOF1,FOE
×	FXF2
✳	DOUBTFUL FOF2,FOF1,FOE
⧖	FBES
⌊	ESTIMATED FOF1
*↑,↑	FMIN
∧	GREATER THAN
∨	LESS THAN

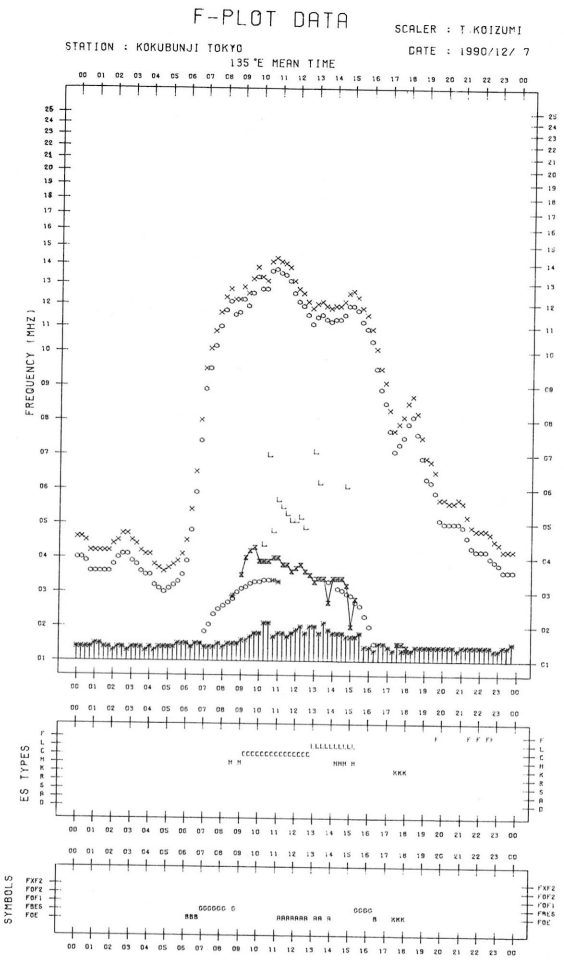

F-PLOT DATA
SCALER : T.KOIZUMI
STATION : KOKUBUNJI TOKYO
DATE : 1990/12/ 1
135 °E MEAN TIME
FREQUENCY (MHZ)
ES TYPES
SYMBOLS

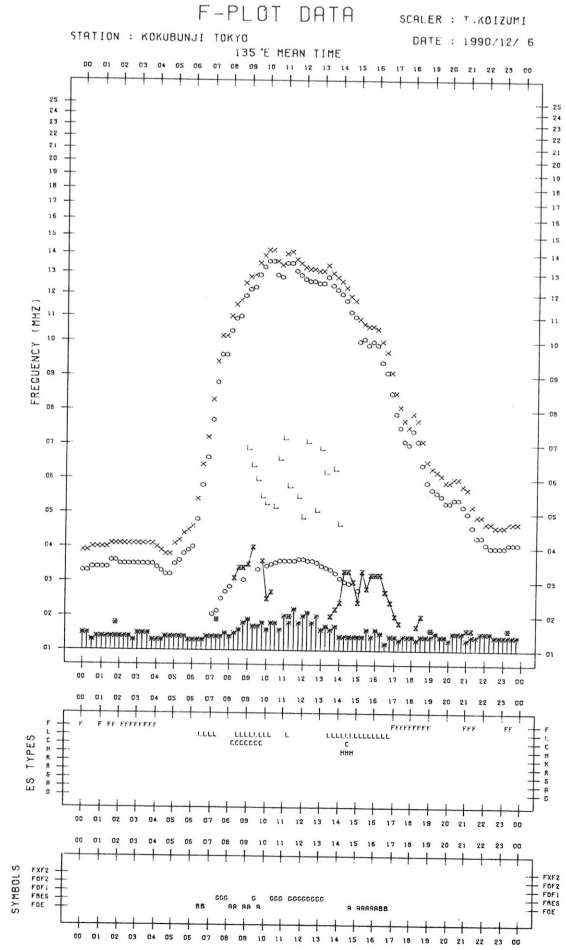

F-PLOT DATA
SCALER : T.KOIZUMI
STATION : KOKUBUNJI TOKYO
DATE : 1990/12/ 3
135 °E MEAN TIME
FREQUENCY (MHZ)
ES TYPES
SYMBOLS

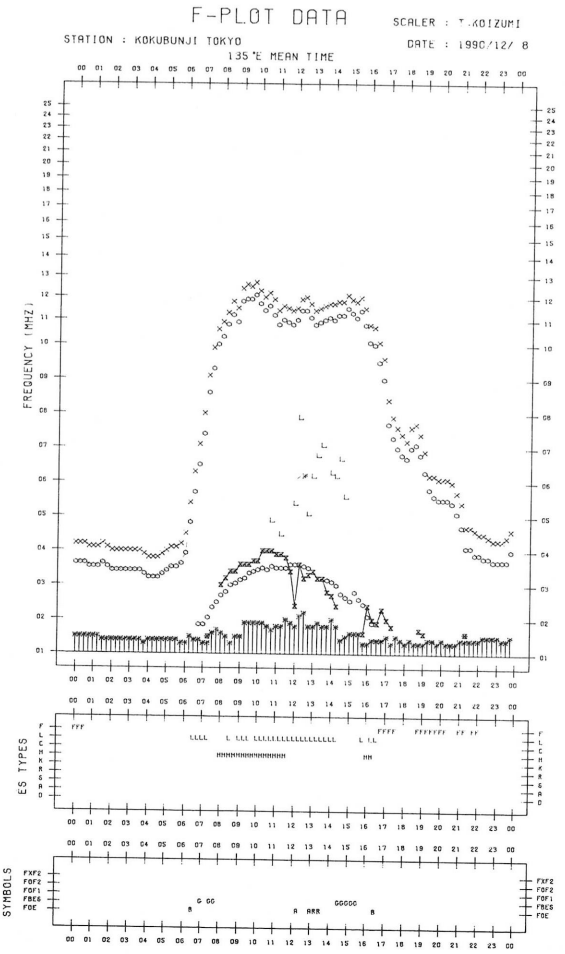

F-PLOT DATA
SCALER : T.KOIZUMI
STATION : KOKUBUNJI TOKYO
DATE : 1990/12/ 2
135 °E MEAN TIME
FREQUENCY (MHZ)
ES TYPES
SYMBOLS

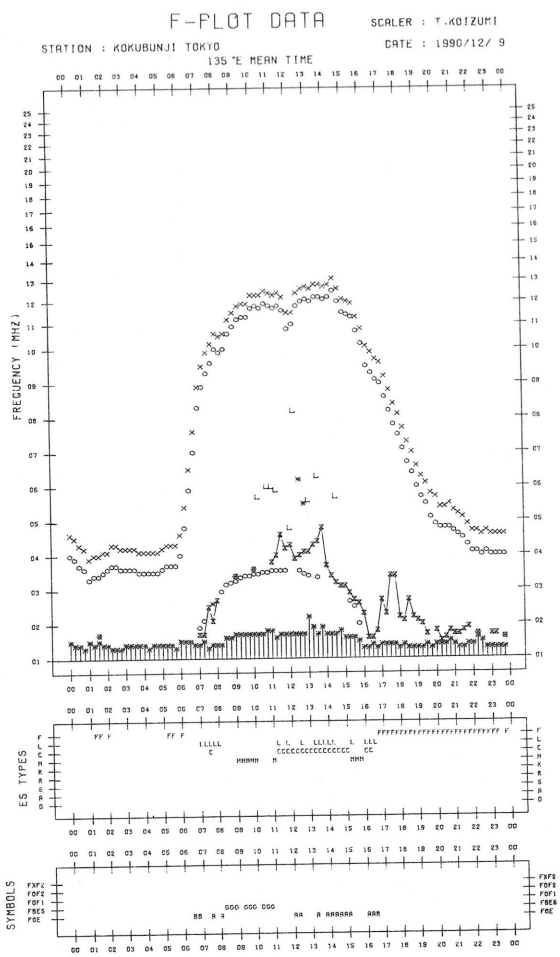

F-PLOT DATA
SCALER : T.KOIZUMI
STATION : KOKUBUNJI TOKYO
DATE : 1990/12/4
135 °E MEAN TIME
FREQUENCY (MHZ)
ES TYPES
SYMBOLS

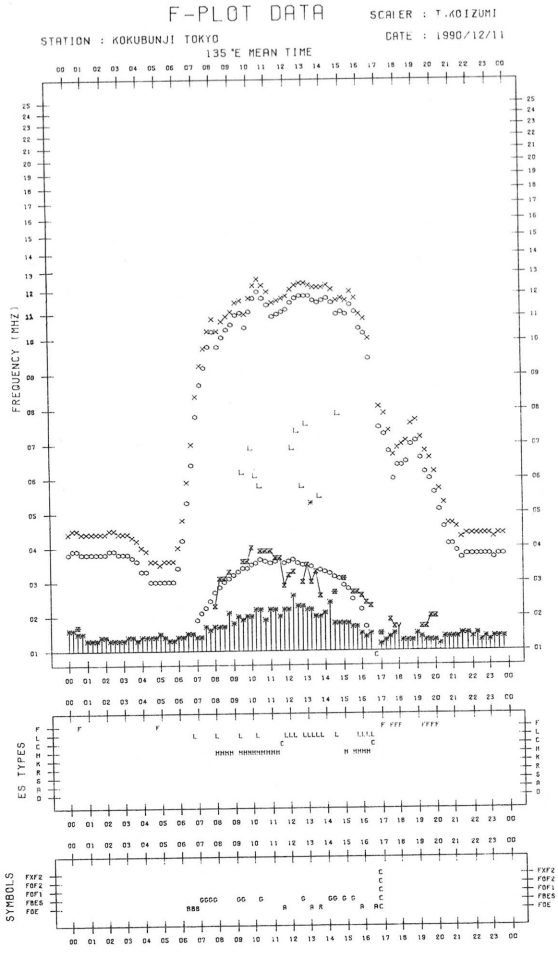

F-PLOT DATA
SCALER : T.KOIZUMI
STATION : KOKUBUNJI TOKYO
DATE : 1990/12/ 5
135 °E MEAN TIME
FREQUENCY (MHZ)
ES TYPES
SYMBOLS
FXF2
FOF2
FOF1
FMES
FOE

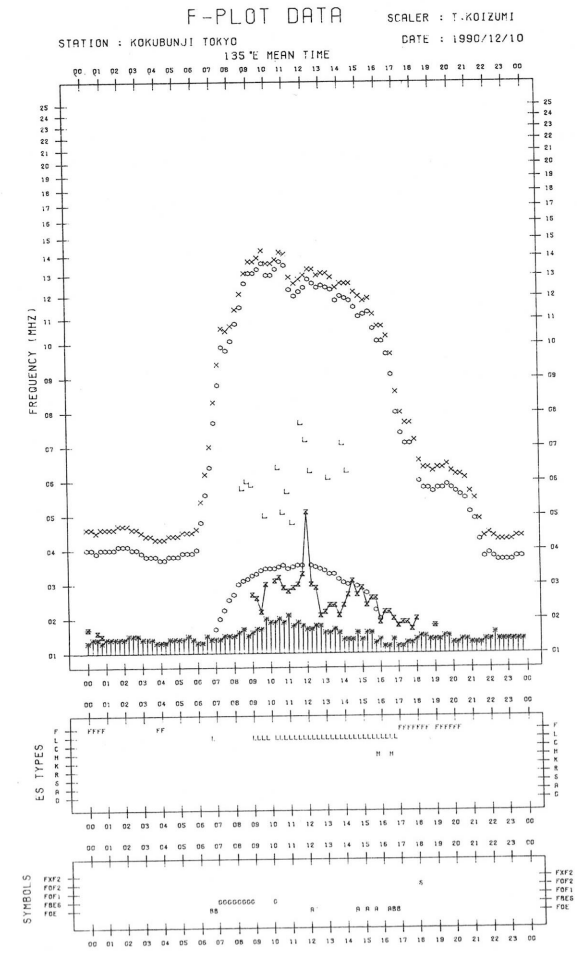

F-PLOT DATA
SCALER : T.KOIZUMI
STATION : KOKUBUNJI TOKYO
DATE : 1990/12/ 7
135 °E MEAN TIME
FREQUENCY (MHZ)
ES TYPES
SYMBOLS
FXF2
FOF2
FOF1
FMES
FOE

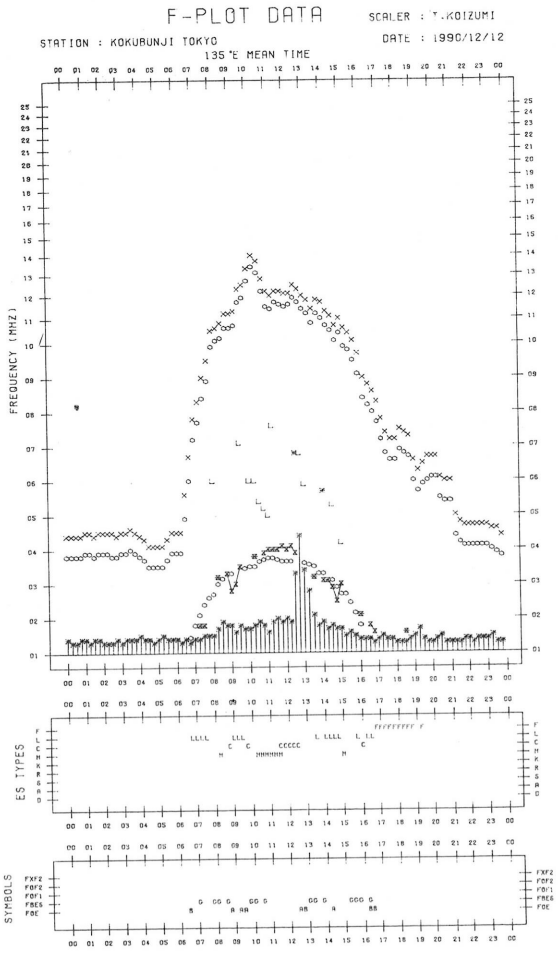

F-PLOT DATA
SCALER : T.KOIZUMI
STATION : KOKUBUNJI TOKYO
DATE : 1990/12/ 6
135 °E MEAN TIME
FREQUENCY (MHZ)
ES TYPES
SYMBOLS
FXF2
FOF2
FOF1
FMES
FOE

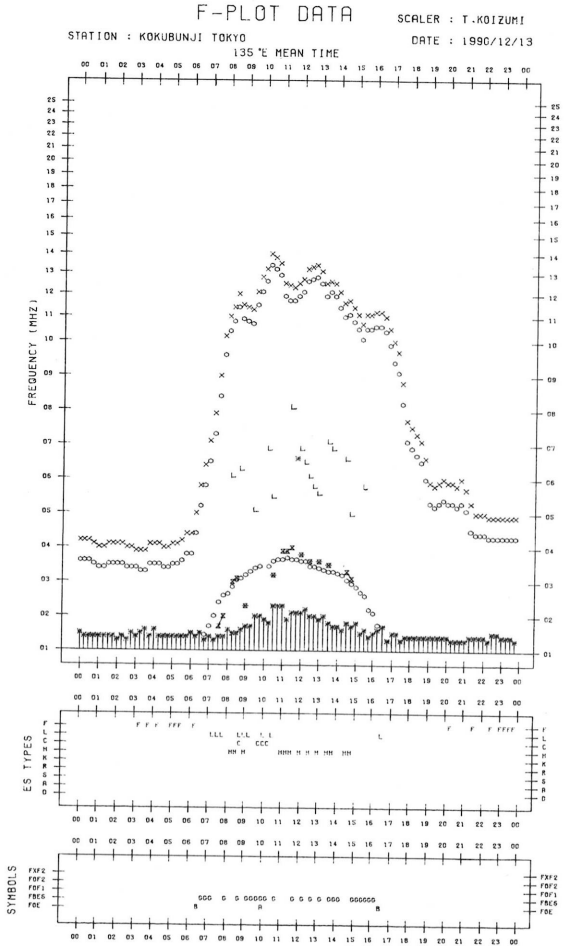

F-PLOT DATA
SCALER : T.KOIZUMI
STATION : KOKUBUNJI TOKYO
DATE : 1990/12/ 8
135 °E MEAN TIME
FREQUENCY (MHZ)
ES TYPES
SYMBOLS
FXF2
FOF2
FOF1
FMES
FOE

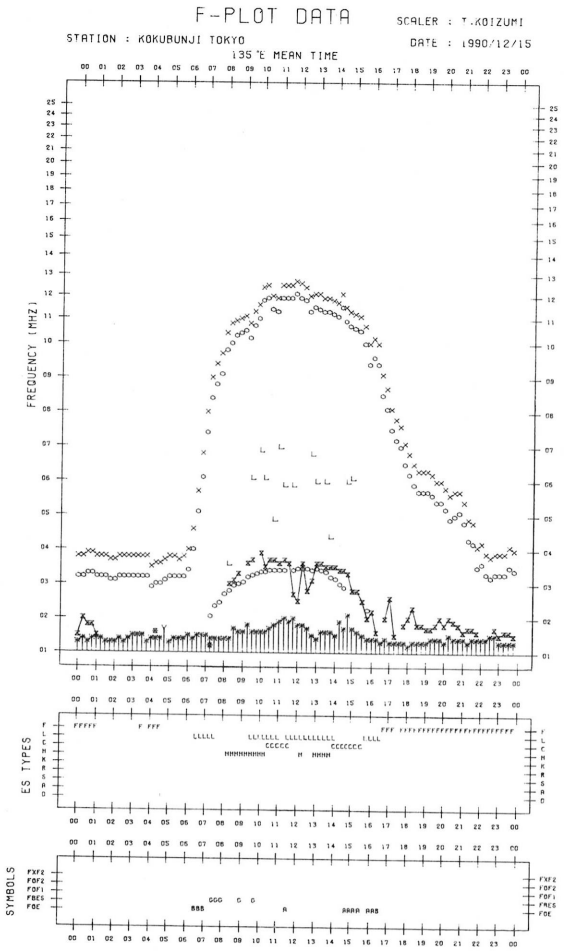

F-PLOT DATA
SCALER : T.KOIZUMI
STATION : KOKUBUNJI TOKYO
DATE : 1990/12/ 9
135 °E MEAN TIME
FREQUENCY (MHZ)
ES TYPES
SYMBOLS

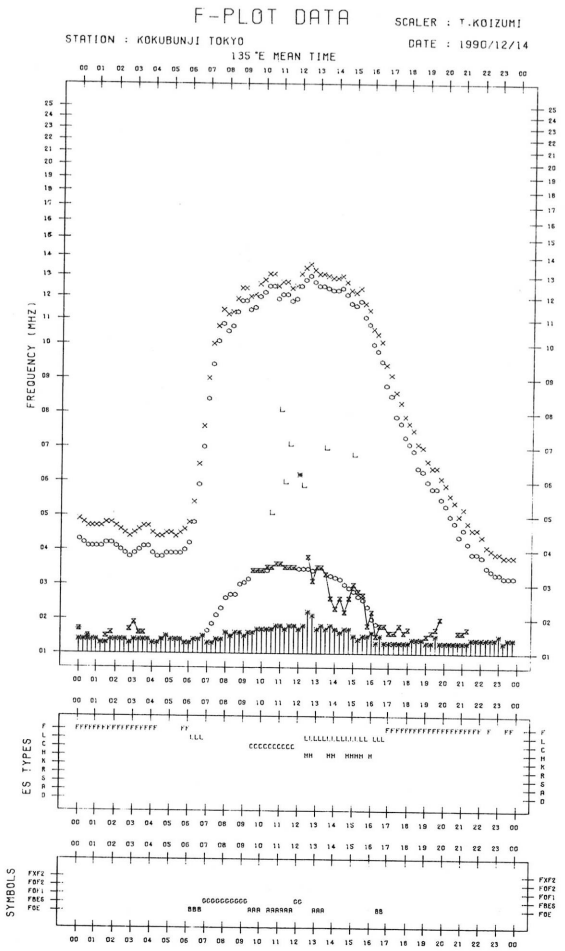

F-PLOT DATA
SCALER : T.KOIZUMI
STATION : KOKUBUNJI TOKYO
DATE : 1990/12/11
135 °E MEAN TIME
FREQUENCY (MHZ)
ES TYPES
SYMBOLS

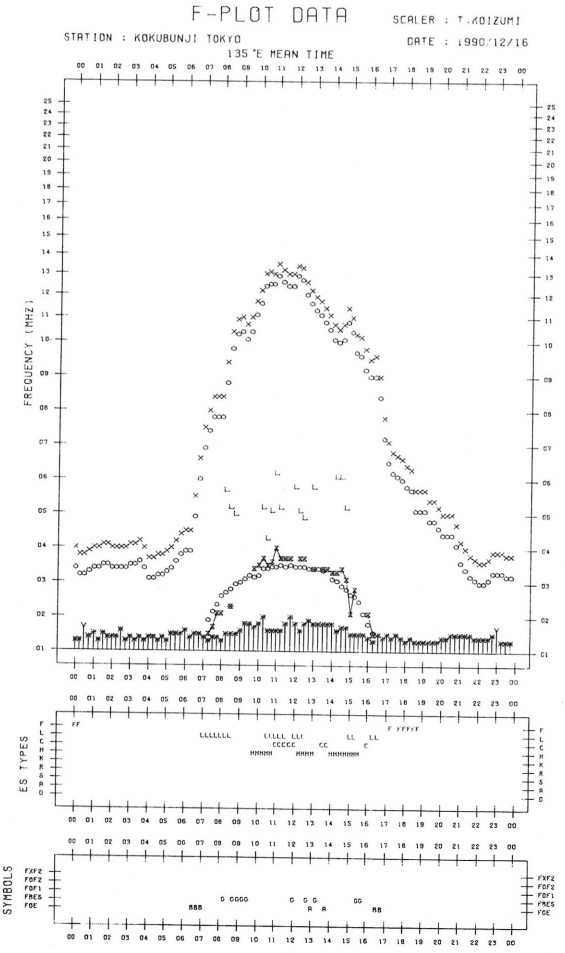

F-PLOT DATA
SCALER : T.KOIZUMI
STATION : KOKUBUNJI TOKYO
DATE : 1990/12/10
135 °E MEAN TIME
FREQUENCY (MHZ)
ES TYPES
SYMBOLS

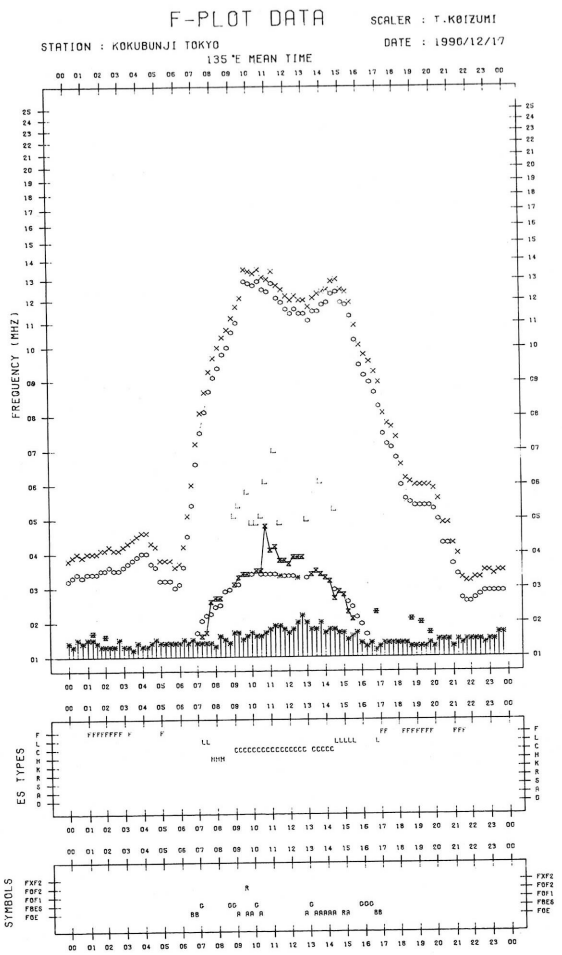

F-PLOT DATA
SCALER : T.KOIZUMI
STATION : KOKUBUNJI TOKYO
DATE : 1990/12/12
135 °E MEAN TIME
FREQUENCY (MHZ)
ES TYPES
SYMBOLS

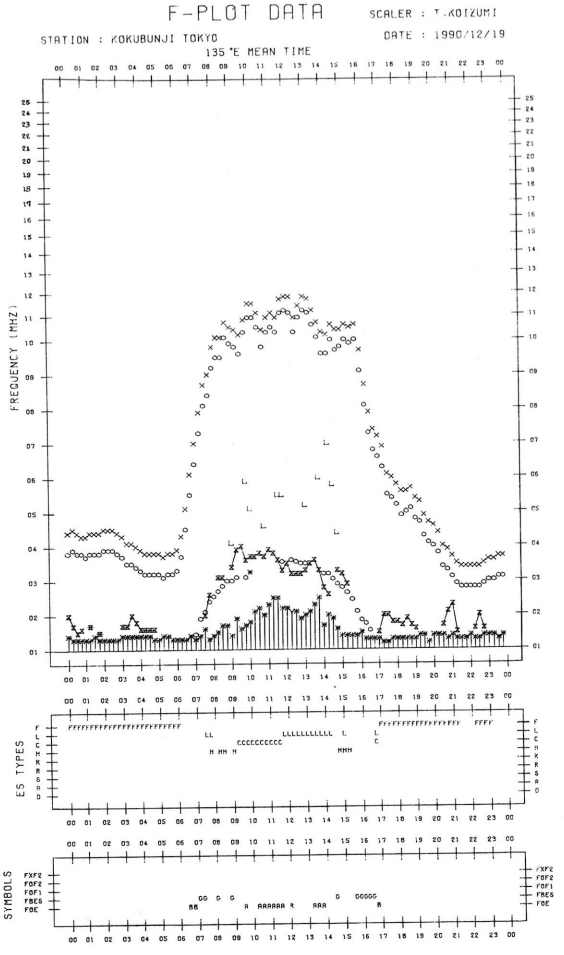

F-PLOT DATA
SCALER : T.KOIZUMI
STATION : KOKUBUNJI TOKYO
DATE : 1990/12/13
135°E MEAN TIME
FREQUENCY (MHZ)
ES TYPES
SYMBOLS

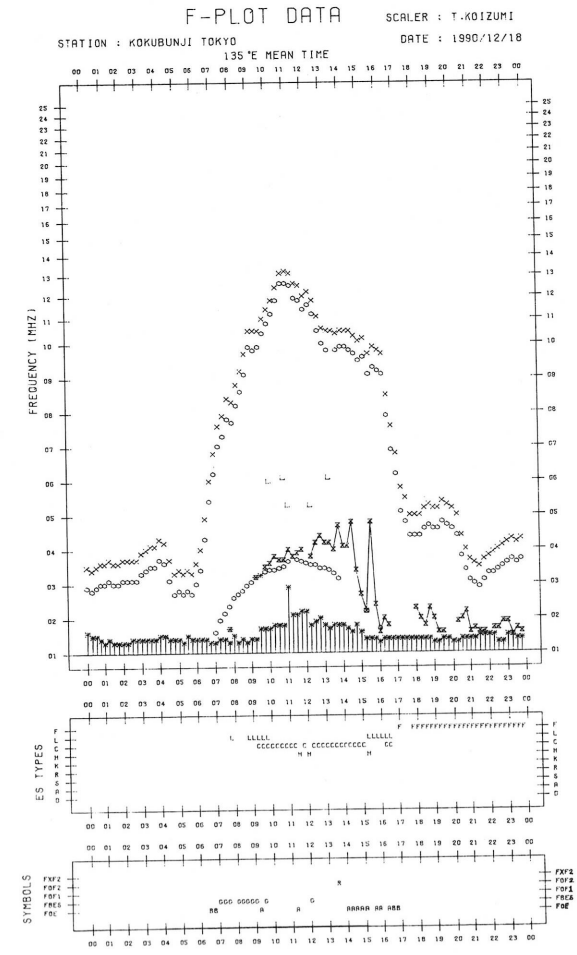

F-PLOT DATA
SCALER : T.KOIZUMI
STATION : KOKUBUNJI TOKYO
DATE : 1990/12/15
135°E MEAN TIME
FREQUENCY (MHZ)
ES TYPES
SYMBOLS

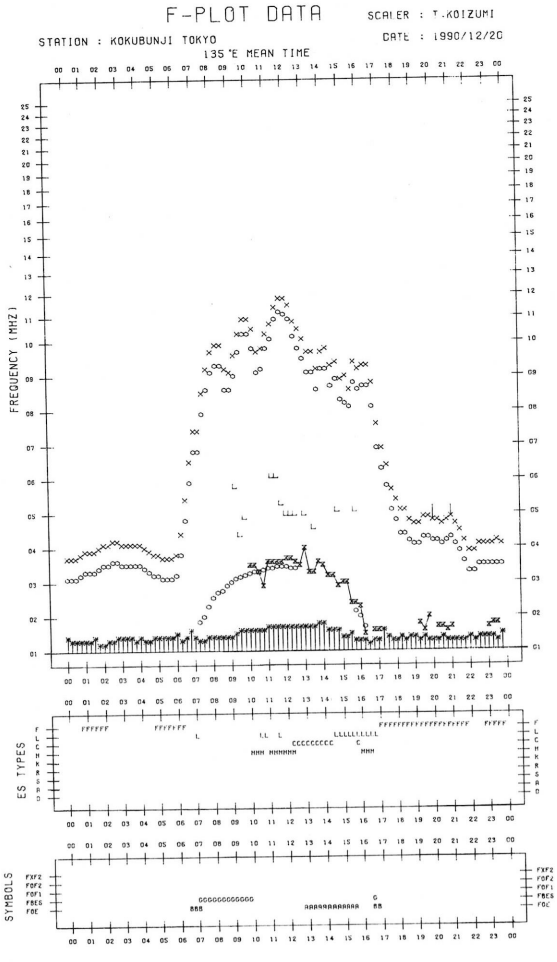

F-PLOT DATA
SCALER : T.KOIZUMI
STATION : KOKUBUNJI TOKYO
DATE : 1990/12/14
135°E MEAN TIME
FREQUENCY (MHZ)
ES TYPES
SYMBOLS

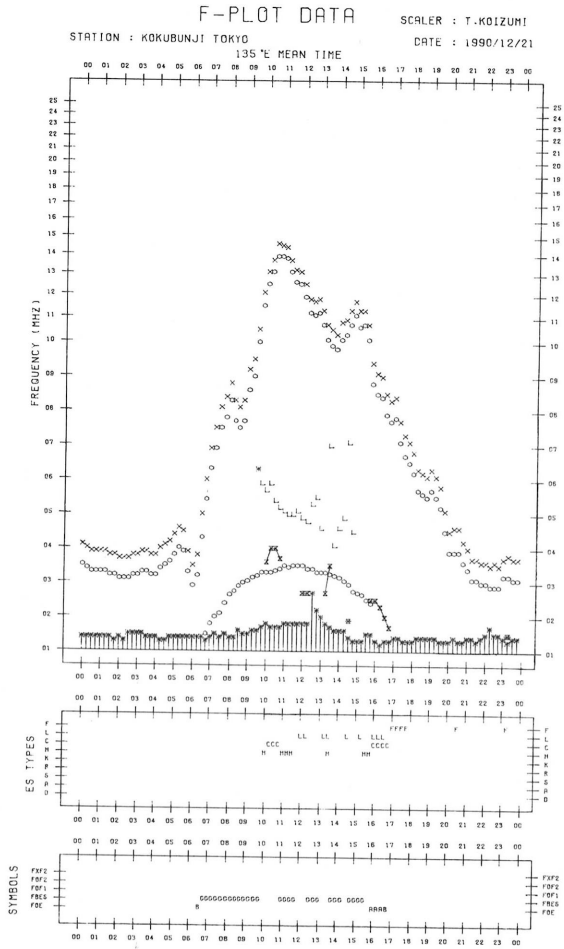

F-PLOT DATA
SCALER : T.KOIZUMI
STATION : KOKUBUNJI TOKYO
DATE : 1990/12/16
135°E MEAN TIME
FREQUENCY (MHZ)
ES TYPES
SYMBOLS

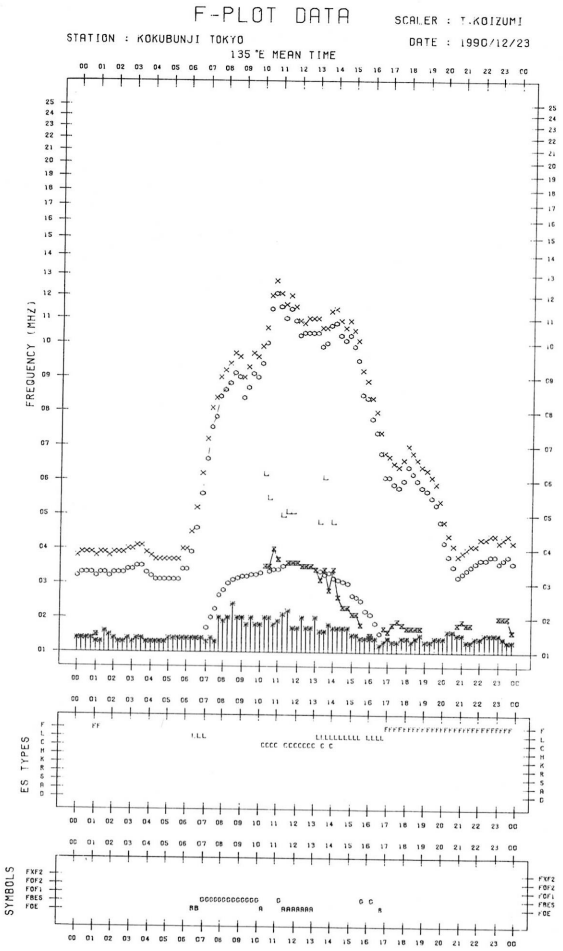

F-PLOT DATA
SCALER : T.KOIZUMI
STATION : KOKUBUNJI TOKYO
DATE : 1990/12/17
135 °E MEAN TIME
FREQUENCY (MHZ)
ES TYPES
SYMBOLS

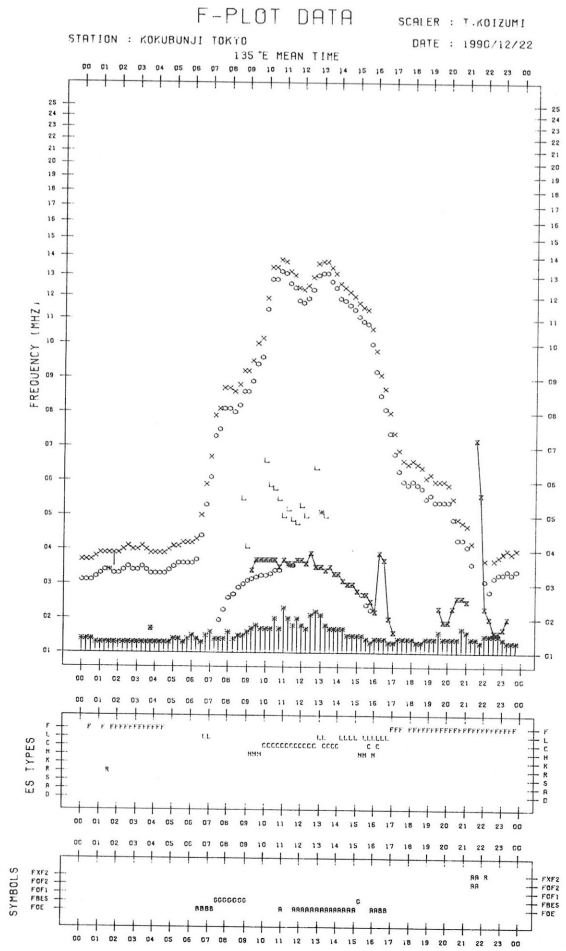

F-PLOT DATA
SCALER : T.KOIZUMI
STATION : KOKUBUNJI TOKYO
DATE : 1990/12/19
135 °E MEAN TIME
FREQUENCY (MHZ)
ES TYPES
SYMBOLS

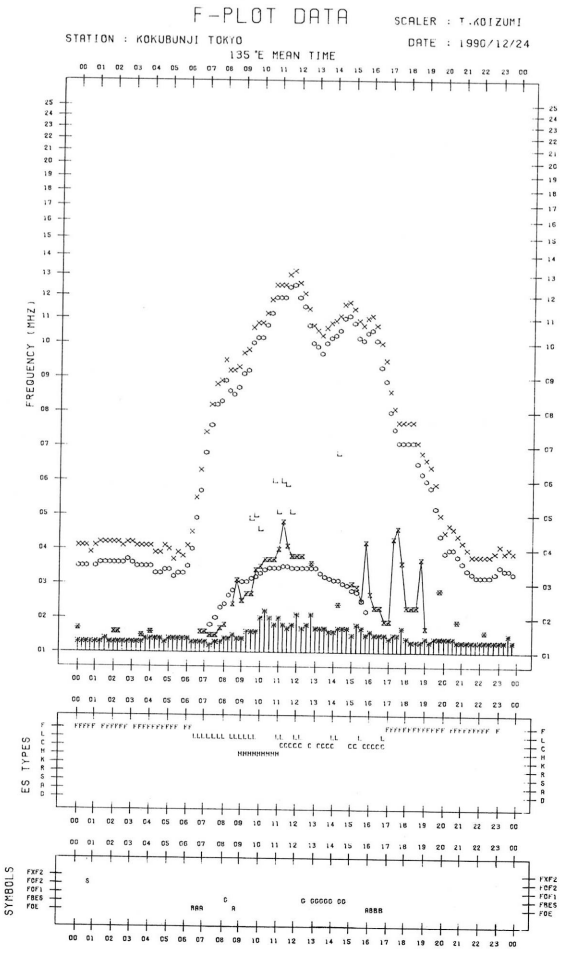

F-PLOT DATA
SCALER : T.KOIZUMI
STATION : KOKUBUNJI TOKYO
DATE : 1990/12/18
135 °E MEAN TIME
FREQUENCY (MHZ)
ES TYPES
SYMBOLS

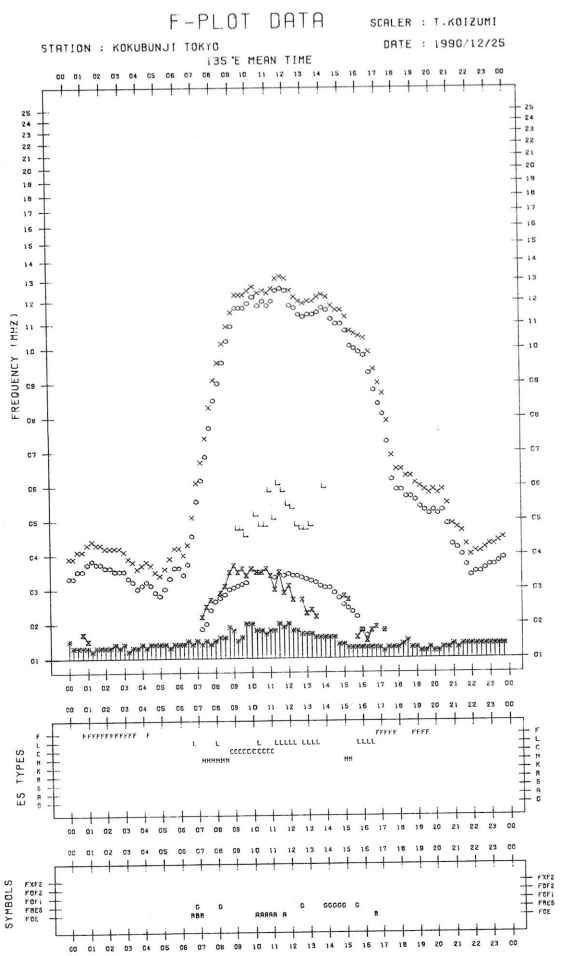

F-PLOT DATA
SCALER : T.KOIZUMI
STATION : KOKUBUNJI TOKYO
DATE : 1990/12/20
135 °E MEAN TIME
FREQUENCY (MHZ)
ES TYPES
SYMBOLS

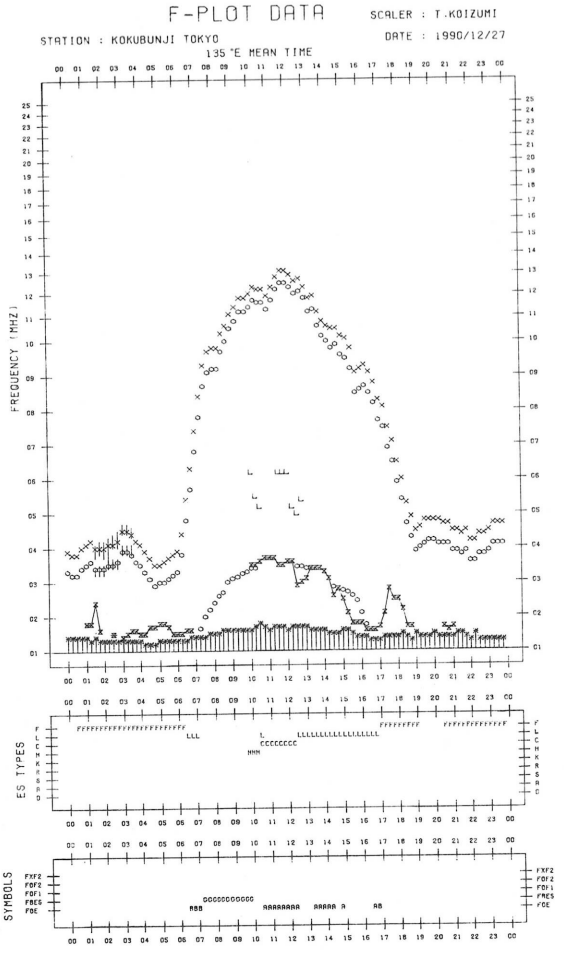

F-PLOT DATA
SCALER : T.KOIZUMI
STATION : KOKUBUNJI TOKYO
DATE : 1990/12/21
135°E MEAN TIME
FREQUENCY (MHZ)
ES TYPES
SYMBOLS
FXF2
FOF2
FOF1
FMES
FOE

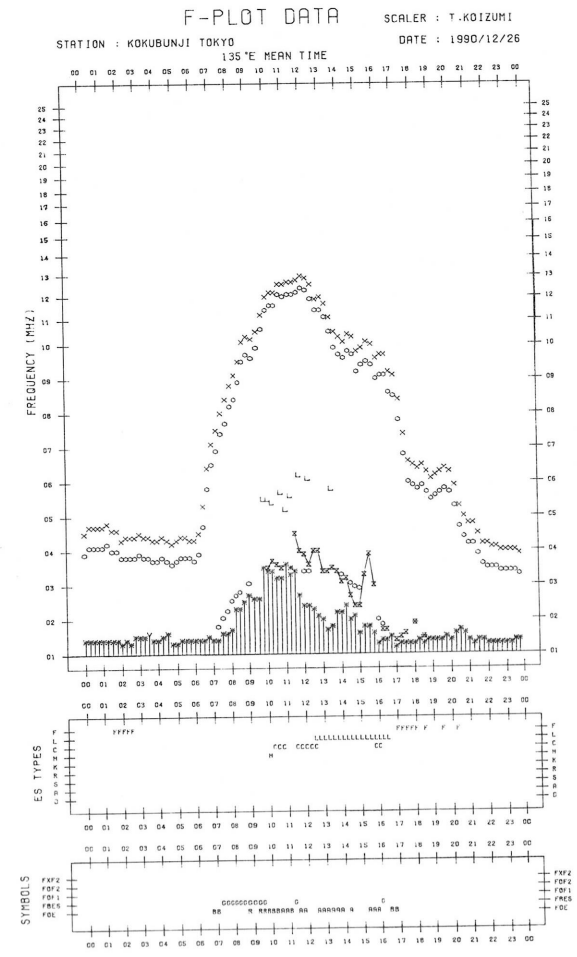

F-PLOT DATA
SCALER : T.KOIZUMI
STATION : KOKUBUNJI TOKYO
DATE : 1990/12/23
135°E MEAN TIME
FREQUENCY (MHZ)
ES TYPES
SYMBOLS
FXF2
FOF2
FOF1
FMES
FOE

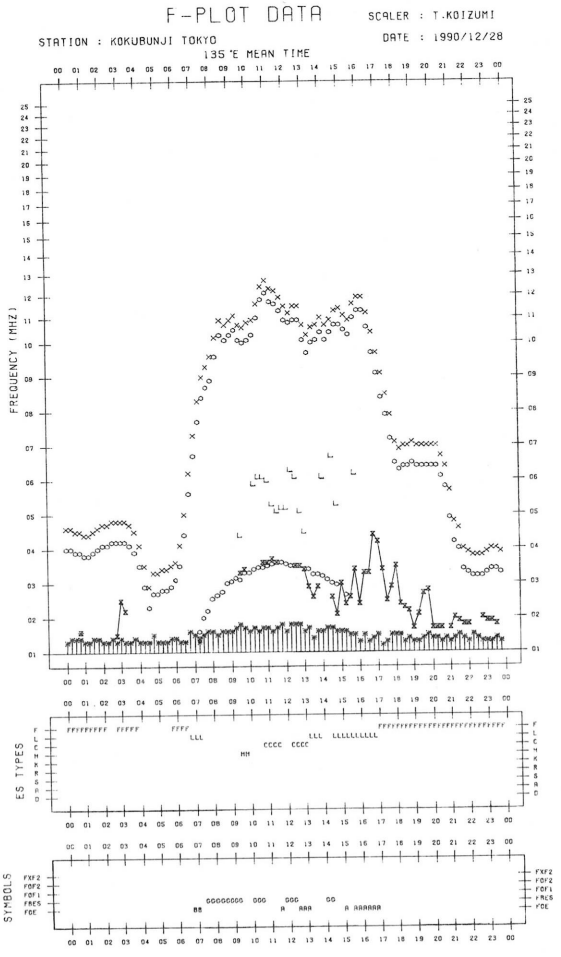

F-PLOT DATA
SCALER : T.KOIZUMI
STATION : KOKUBUNJI TOKYO
DATE : 1990/12/22
135°E MEAN TIME
FREQUENCY (MHZ)
ES TYPES
SYMBOLS
FXF2
FOF2
FOF1
FMES
FOE

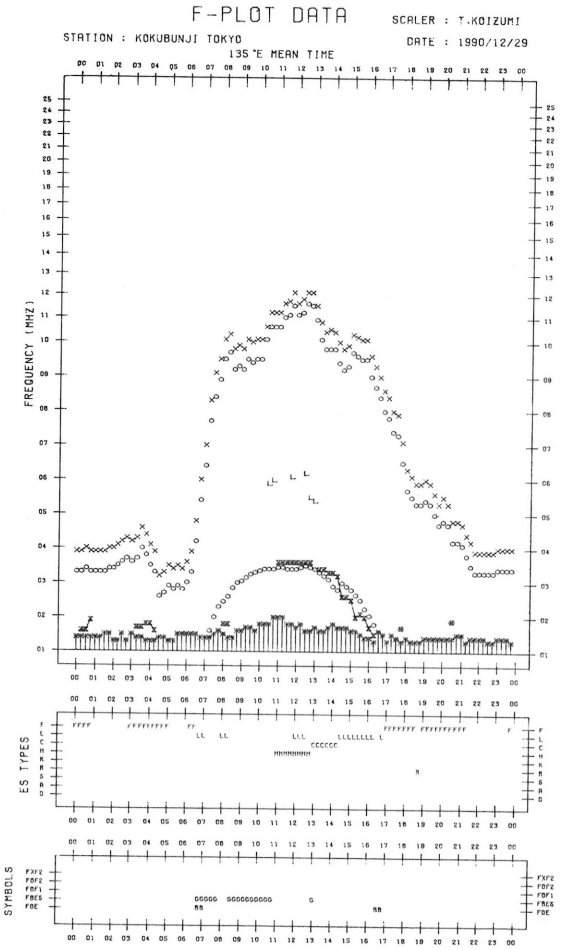

F-PLOT DATA
SCALER : T.KOIZUMI
STATION : KOKUBUNJI TOKYO
DATE : 1990/12/24
135°E MEAN TIME
FREQUENCY (MHZ)
ES TYPES
SYMBOLS
FXF2
FOF2
FOF1
FMES
FOE

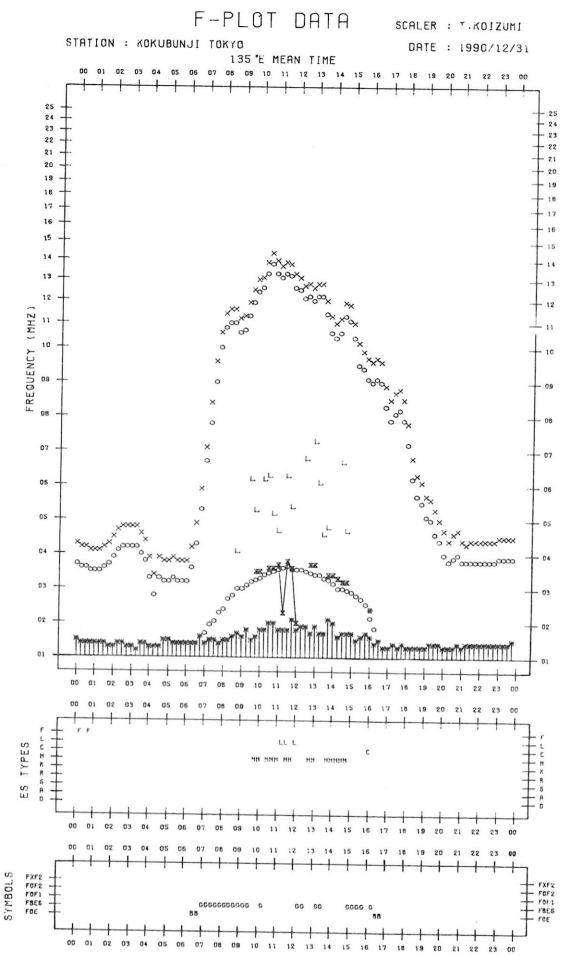

F-PLOT DATA
SCALER : T.KOIZUMI
STATION : KOKUBUNJI TOKYO
DATE : 1990/12/25
135 °E MEAN TIME
FREQUENCY (MHZ)
ES TYPES
SYMBOLS

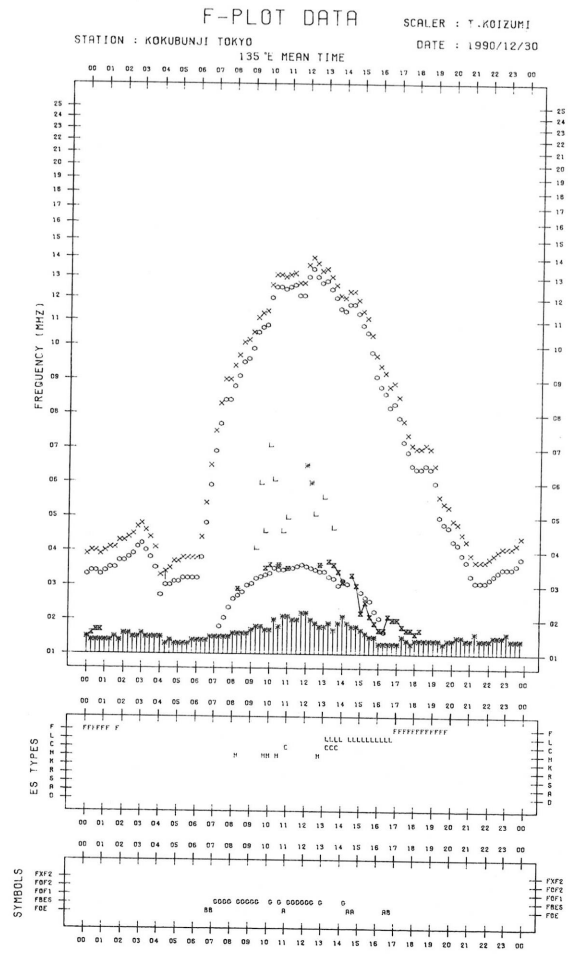

F-PLOT DATA
SCALER : T.KOIZUMI
STATION : KOKUBUNJI TOKYO
DATE : 1990/12/27
135 °E MEAN TIME
FREQUENCY (MHZ)
ES TYPES
SYMBOLS


F-PLOT DATA
SCALER : T.KOIZUMI
STATION : KOKUBUNJI TOKYO
DATE : 1990/12/26
135 °E MEAN TIME
FREQUENCY (MHZ)
ES TYPES
SYMBOLS


F-PLOT DATA
SCALER : T.KOIZUMI
STATION : KOKUBUNJI TOKYO
DATE : 1990/12/28
135 °E MEAN TIME
FREQUENCY (MHZ)
ES TYPES
SYMBOLS


F-PLOT DATA
SCALER : T.KOIZUMI
STATION : KOKUBUNJI TOKYO
DATE : 1990/12/29
135 °E MEAN TIME
FREQUENCY (MHZ)
ES TYPES
SYMBOLS


F-PLOT DATA
SCALER : T.KOIZUMI
STATION : KOKUBUNJI TOKYO
DATE : 1990/12/31
135 °E MEAN TIME
FREQUENCY (MHZ)
ES TYPES
SYMBOLS


F-PLOT DATA
SCALER : T.KOIZUMI
STATION : KOKUBUNJI TOKYO
DATE : 1990/12/30
135 °E MEAN TIME
FREQUENCY (MHZ)
ES TYPES
SYMBOLS

B.Solar Radio Emission

B1.Daily Data at Hiraiso

200 MHz

Hiraiso — December 1990

Single-frequency total flux observations at 200 MHz

	FLUX DENSITY: $10^{-22}Wm^{-2}Hz^{-1}$					VARIABILITY: 0 TO 3				
UT	00-03	03-06	06-09	21-24	DAY	00-03	03-06	06-09	21-24	DAY
DATE										
1	9	9	(9)	9	9	*	*	(*)	0	*
2	8	8	(8)	9	8	0	0	(0)	0	0
3	9	8	(8)	10	8	0	0	(0)	0	0
4	10	10	(10)	B	10	0	0	(0)	2	0
5	B	10	(11)	(12)	B	2	0	(*)	1	1
6	12	11	(11)	12	12	2	1	(1)	2	1
7	10	9	(10)	10	10	0	0	(0)	0	0
8	10	9	(9)	12	9	0	0	(0)	3	0
9	12	10	(12)	11	11	2	2	(2)	3	2
10	10	10	(10)	11	10	1	1	(1)	0	1
11	11	11	(11)	11	11	*	*	(*)	0	*
12	11	(12)	(12)	B	11	0	(1)	(1)	*	0
13	B	B	(B)	B	B	2	2	(*)	3	2
14	B	B	(B)	B	B	3	3	(3)	3	3
15	B	B	(B)	B	B	3	3	(3)	3	3
16	B	B	(B)	13	B	3	3	(2)	0	3
17	12	11	(13)	B	12	0	*	(*)	3	0
18	B	B	(B)	B	B	3	3	(3)	3	3
19	B	B	(B)	B	B	3	3	(2)	3	3
20	B	B	(B)	12	B	3	3	(3)	*	3
21	12	10	(8)	14	11	1	1	(1)	*	1
22	B	11	(*)	13	13	*	*	(*)	*	*
23	10	10	(10)	10	11	*	0	(0)	0	0
24	10	10	(10)	B	10	0	0	(0)	3	0
25	12	11	(11)	B	13	1	1	(1)	2	2
26	B	B	(B)	B	B	2	3	(2)	2	2
27	B	B	(B)	12	B	2	2	(2)	1	2
28	11	11	(11)	*	11	1	1	(*)	*	1
29	11	10	(10)	B	10	*	0	(0)	3	*
30	B	B	(12)	12	B	3	3	(2)	*	3
31	10	10	(10)	11	10	0	0	(0)	*	0

Note: No observations during the following periods.

12th 0131 - 0500.

B. Solar Radio Emission

B1. Daily Data at Hiraiso

500 MHz

Hiraiso December 1990

Single-frequency total flux observations at 500 MHz					
FLUX DENSITY: 10^{-22} Wm^{-2}Hz^{-1}					
UT	00-03	03-06	06-09	21-24	DAY
DATE					
1	48	48	(48)	49	48
2	49	50	(48)	50	49
3	50	49	(47)	52	49
4	B	50	(49)	-	51
5	52	52	(50)	55	51
6	*	52	(50)	56	52
7	*	50	(50)	-	52
8	*	50	(49)	*	50
9	*	*	(*)	*	*
10	*	55	(57)	57	*
11	60	58	(58)	58	58
12	59	-	(58)	62	58
13	63	65	(67)	B	64
14	B	B	(B)	55	B
15	57	56	(54)	B	56
16	B	56	(53)	-	B
17	56	56	(57)	B	56
18	B	B	(B)	B	B
19	B	B	(B)	53	B
20	53	52	(51)	-	52
21	52	51	(51)	-	52
22	-	53	(51)	(54)	52
23	53	53	(51)	(52)	53
24	52	52	(52)	-	52
25	53	52	(51)	(53)	52
26	54	53	(52)	-	53
27	53	52	(51)	(51)	52
28	52	51	(50)	(52)	51
29	52	52	(50)	(53)	51
30	54	54	(53)	(52)	54
31	52	52	(51)	*	52

Note: No observations during the following periods:

4th 2130 - 2347.
7th 2130 - 2400.
12th 0128 - 0520.
16th 2140 - 2346.
20th 2143 - 2347.
21st 2143 - 22nd 0410.
24th 2145 - 2352.
26th 2145 - 2350.

B. Solar Radio Emission

B2. Outstanding Occurrences at Hiraiso

Hiraiso December 1990

Single-freqency observations

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

DEC 1990	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
1	200	8 S	0313.4	0313.7	1.0	64	-	0
	200	42 SER	0401.3	0401.3	28.4	490	-	0
	500	41 F	0554.0	0651.5	75D	27	-	0 SUNSET
2	500	41 F	0023.0	0039.3	26	28	-	WL
3	200	8 S	0540.5	0540.6	0.5	45	-	0
	100	8 S	0540.6	0540.6	0.8	1000D	-	-
4	200	41 F	2132E	2321	210D	65	-	0
5	100	46 C	0222.4	0223.8	2.4	140	-	-
	200	46 C	0222.4	0224.4	3.0	130	-	WL
8	100	41 F	0550.5	0551.0	4.0	1000D	-	-
	200	42 SER	0657.4	0707.5	11.9	1800U	-	MR SUNSET
	100	45 C	0701.1	0702.0	2.0	1000D	-	-
	100	42 SER	2244.2	2308.6	30.4	790	-	-
	200	42 SER	2248.8	2250.2	33.0	278	-	MR
9	200	46 C	0005.7	0008.4	5.3	117	-	MR
	200	46 C	0248.8	0249.5	2.8	170	-	MR
	100	46 C	0311.2	0311.9	3.3	915	-	-
	200	45 C	0311.4	0312.1	1.5	605	-	MR
	200	41 F	0611.0	0618.5	18.5	105	-	WR
	100	46 C	0611.6	0613.1	3.0	150	-	-
	200	42 SER	2236.3	2336.4	37.0	75	-	0
	100	46 C	2242.1	2243.5	1.7	3200	-	0
10	100	8 S	0001.9	-	0.8	1000D	-	-
	200	8 S	0002.2	0002.5	0.5	150	-	0
	200	46 C	0051.5	0051.7	2.1	240	-	0
	100	46 C	0201.3	0202.0	2.0	920	-	-
	200	41 F	0201.7	0201.7	2.4	1200	-	0
	200	41 F	0300.0	0303.0	5.3	140	-	0
	200	41 F	0603.3	0604.2	5.3	390	-	0
	100	46 C	2201.3	2201.3	1.3	740	-	-
	200	46 C	2230.2	2231.0	2.9	90	-	0
	200	42 SER	2305.9	2308.6	7.3	160	-	0
11	200	42 SER	0223.8	0229.0	10.1	930	-	0
	200	45 C	0410.3	0410.9	1.3	640	-	0
	500	46 C	2303.8	2304.4	2.1	52	-	0
12	200	44 NS	2138E	0503	580D	30	9	MR
	200	41 F	2211.2	2220.9	16.5	135	-	0
	500	46 C	2223.8	2224.3	3.0	90	-	MR
	100	8 S	2224.0	2224.0	1.0	1300	-	0
	500	27 RF	2229.0	2247.0	45	18	6	WR
13	500	46 C	0009.0	0011.3	11.5	14	7	WR
	500	42 SER	0048.0	0210.5	153	44	-	MR
	200	42 SER	0322.2	0328.4	10.6	235	-	MR
	500	41 F	0400.0	0453.5	130	45	-	MR
	200	8 S	0452.1	0452.8	0.8	546	-	WR
	200	46 C	0644.0	0645.5	7.9	160	-	0
	500	44 NS	2139E	2246	580D	42	8	WR
	200	44 NS	2139E	2249	580D	160	39	MR
14	200	44 NS	2140E	0133	580D	80	31	SR
	100	44 NS	2140E	0230	580D	180	130	-
	500	41 F	2215.0	2217.3	4.0	150	-	0
	100	8 S	2218.4	2218.5	0.9	410	-	-
	500	8 S	2309.0	2309.4	0.6	15	-	WR
	100	8 S	2318.8	2319.8	1.1	360	-	-
	500	46 C	2355.5	2355.7	1.0	194	-	0
15	200	42 SER	0102.2	0102.8	18.5	135	-	SR
	100	46 C	0117.8	0118.7	2.5	400	-	-
	500	46 C	0118.7	0119.0	4.0	54	-	0
	100	42 SER	0135.6	0207.5	76.0	1800	-	WR
	500	46 C	0156.2	0156.2	26.5	240	11	0
				0202.3		30		WR
	200	48 C	0158.3	0205.1	8.1	7000	480	0
	500	8 S	0349.3	0349.6	1.0	195	-	0
	100	8 S	0409.6	0410.3	1.2	920	-	-
	100	46 C	0454.8	0456.8	4.6	410	-	-
	200	42 SER	0516.5	0519.8	34.3	134	-	SR

DEC 1990	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
15	100	44 NS	2142E	0000	580D	130	72	-
	200	44 NS	2142E	0403	580D	47	22	MR
	500	20 GRF	2214	0024	286	48	16	MR
16	100	42 SER	0319.8	0331.7	19.1	550	-	-
	500	46 C	0426.3	0426.5	1.2	150	-	WL
	100	41 F	0432.9	0438.9	15.2	220	-	-
	500	46 C	0443.0	0444.5	16.5	260	-	WL
	200	46 C	0444.2	0444.6	1.3	240	-	WR
	500	42 SER	0603.0	0603.2	6.0	1300	-	O
17	100	44 NS	2142E	0312	580D	230	58	-
	200	44 NS	2142E	0600	580D	160	6	SR
	500	23 GRF	2235	2345	170	18	4	MR
18	100	42 SER	0049.5	0050.8	4.6	1000D	-	-
	500	46 C	0152.0	0152.5	3.7	16	-	WR
	500	20 GRF	0200	0248	78	8	5	WR
	100	42 SER	0227.7	0237.0	14.5	1000D	-	-
	500	46 C	0513.2	0515.0	2.5	46	-	WR
	100	41 F	0514.2	-	4.0	1000D	-	-
	100	46 C	0606.2	0607.7	3.2	440	-	-
	500	46 C	0606.4	0608.4	3.8	18	-	WR
	100	44 NS	2143E	2224	420D	170	110	-
	200	44 NS	2143E	0350	440D	310	108	SR
19	100	42 SER	0115.0	0202.0	63	450	-	-
	100	42 SER	0236	0312	79	550	-	-
	500	46 C	0435.2	0435.9	2.5	170	-	ML
	100	24 R	0438.3	0603.0	165D	950	450	SUNSET
	200	24 R	0456.0	0513.0	145D	430	340	WR SUNSET
	200	44 NS	2142E	2250	580D	120	41	SR
20	100	46 C	0630.4	0630.5	1.5	1000	-	WL
	100	46 C	0705.1	0706.5	2.8	2700	-	WR
21	200	8 S	0021.6	0021.6	0.5	160	-	SR
	500	46 C	0441.5	0442.5	3.0	54	-	O
22	200	46 C	0002.6	0015.8	68.6	210	14	O
				0023.5		45		WR
				0106.6		190		ML
	500	42 SER	2237.0	2253.3	18.1	23	-	O
	500	46 C	2309.7	2312.5	10.3	106	14	O
	100	42 SER	2311.5	2314.9	16.4	1900	-	WL
	200	42 SER	2311.5	2319.8	13.9	1100	-	O
23	500	8 S	0038.9	0039.5	1.0	3300	-	O
	100	46 C	0544.2	-	1.8	1000D	-	-
24	500	46 C	0254.5	0256.0	3.0	33	-	O
	200	42 SER	2147E	2249.5	100D	730	-	SL
25	100	42 SER	0006.4	0011.7	7.4	1000	-	-
	200	42 SER	0008.8	0011.9	4.9	460	-	SL
	100	41 F	0047.5	0048.8	13.2	630	-	-
	200	41 F	0048.5	0050.8	4.2	68	-	ML
	500	41 F	0049.0	0050.0	4.0	24	-	WL
	500	41 F	0147.0	0148.8	20	15	-	WL
	100	41 F	0234.6	-	7.9	1000D	-	-
	200	41 F	0235.0	0235.4	7.3	1300	-	ML
	100	46 C	0250.6	0251.6	2.1	670	-	-
	200	42 SER	0251.2	0253.2	6.8	110	-	ML
	200	42 SER	0508.3	0513.9	26.4	160	-	WL
	100	42 SER	0504.0	0531.0	31.7	905	-	-
	100	42 SER	0603.3	0604.6	45.0	980	-	-
	200	42 SER	0604.4	0604.6	33.8	44	-	ML
	200	44 NS	2146E	0340	580D	21	7	ML
	100	42 SER	2307.3	2314.5	19.8	170	-	-
	200	42 SER	2309.9	2314.5	33.0	80	-	ML
	500	42 SER	2313.9	2314.5	10.5	52	-	WL
26	200	42 SER	0015.8	0019.0	20.6	154	-	ML
	500	41 F	0014.7	0016.5	4.7	23	-	WL
	100	41 F	0016.5	0017.2	5.3	160	-	-
	100	42 SER	0145.7	0150.6	64	1000D	-	-
	200	46 C	0150.2	0150.2	1.3	270	-	ML
	500	42 SER	0150.4	0150.9	16.7	18	-	WL
	100	42 SER	0324.4	0327.3	35.6	840	-	-
	100	41 F	0502.6	0511.2	14.5	1000D	-	-
	200	41 F	0509.6	0509.9	7.9	230	-	O
	500	42 SER	0509.6	0513.9	4.7	32	-	WL
	200	24 R	2147E	0130	580D	30	19	ML
	100	44 NS	2147E	0230	580D	80	39	-
27	500	45 C	0217.5	0218.2	1.1	297	-	SL
29	200	44 NS	2147E	2233	520D	41	12	ML
30	500	41 F	0456.5	0458.0	7.5	22	-	O

C. RADIO PROPAGATION

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

DEC 1990 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	-1	-1	2	4	ES -11	ES -22	ES -22	ES -22	ES -22	ES -23	ES -23	ES -23	ES -23	ES -23	ES -23	ES -23	ES -23	ES -23	ES -23	ES -23	ES -23	ES -23	1	-8
2	-1	5	6	ES -22	ES -22	ES -22	ES -22	ES -22	2	ES -22	ES -22	ES -22	ES -22	ES -22	ES -22	ES -22	ES -22	ES -22	ES -22	ES -22	ES -23	-8	1	4
3	3	13	6	10	-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	ES -24	ES -24	ES -24	-4	10	7
4	11	12	1	19	23	24	12	ES -24	-3	ES -24	ES -25	ES -25	ES -24	ES -24	ES -24	ES -24	ES -24	ES -24	ES -24	ES -24	ES -24	3	11	10
5	7	4	5	19	3	ES -24	ES -24	ES -24	ES -24	ES -25	ES -25	-6	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	1	7	4
6	7	12	15	18	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	-3	2	0
7	0	6	9	14	4	-4	ES -25	-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	-12	-6	-3
8	-1	7	7	14	3	ES -24	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	-2	2
9	7	8	4	9	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	-1	3	-2
10	-1	2	5	5	-6	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	-7
11	ES -25	ES -25	-5	-1	ES -25	ES -25	ES -26	ES -26	12	ES -9	ES -9	ES -9	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -24	ES -24	1	-4
12	-7	5	5	4	3	ES -25	ES -26	ES -26	ES -26	ES -26	ES -26	ES -26	ES -26	ES -26	ES -26	ES -26	ES -26	ES -26	ES -26	ES -26	ES -26	ES -26	-7	4	4
13	7	14	12	20	17	11	15	1	3	-26	-26	-26	ES -26	ES -26	ES -26	ES -26	ES -26	ES -26	ES -26	ES -26	ES -24	ES -24	2	5
14	12	18	15	22	ES -24	-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	ES -24	2	14	17
15	11	12	14	12	ES -26	ES -26	ES -26	ES -26	ES -26	S	S	S	S	S	ES -26	ES -26	ES -26	ES -26	ES -26	ES -26	ES -26	5	12	10
16	8	6	12	4	ES -26	ES -26	ES -26	ES -26	ES -26	ES -26	ES -26	ES -26	ES -26	ES -26	ES -26	ES -26	ES -26	ES -26	ES -25	ES -25	ES -25	9	12	11
17	7	10	10	1	ES -25	ES -25	ES -25	-4	-7	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	5	11	9
18	6	11	17	9	27	ES -26	ES -26	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 -23	2	3	3
19	7	8	12	8	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	0	8	8
20	13	14	20	-8	ES -23	ES -23	ES -23	ES -23	ES -23	ES -23	ES -23	ES -23	ES -23	ES -23	ES -23	ES -23	ES -23	ES -23	ES -23	ES -23	ES -23	-8	12	12
21	16	16	16	13	ES -23	ES -23	ES -23	ES -23	0	ES -23	ES -23	ES -23	ES -23	ES -23	ES -23	ES -23	ES -23	ES -23	ES -23	ES -23	ES -23	8	15	13
22	12	12	8	ES -23	ES -23	ES -23	ES -23	ES -23	ES -23	ES -23	ES -23	ES -23	ES -23	ES -23	ES -23	ES -23	ES -23	ES -23	ES -23	ES -23	ES -23	-8	11	ES -23
23	4	9	18	ES -23	-1	ES -23	ES -23	ES -23	ES -23	ES -23	ES -23	ES -23	ES -23	ES -23	ES -23	C	C	C	C	C	C	C	C	C
24	C	C	C	20	ES -23	ES -23	ES -23	ES -23	ES -23	ES -23	ES -23	ES -23	ES -23	ES -23	ES -23	ES -23	ES -23	ES -23	C	C	C	C	C	C
25	C	C	3	15	16	ES -23	ES -23	ES -23	ES -23	ES -23	ES -23	ES -23	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	-11	-7	2	-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	-10	0
28	2	9	6	5	ES -24	ES -23	ES -23	ES -23	ES -24	ES -24	ES -24	-24	ES -24	ES -24	ES -24	ES -24	ES -24	ES -24	ES -24	ES -24	ES -24	-9	2	2
29	6	7	11	7	1	ES -23	ES -23	ES -23	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 -23	-9	7	7
30	6	7	10	6	ES -24	ES -24	ES -24	-3	-9	ES -24	ES -24	ES -24	ES -23	ES -23	ES -23	ES -23	ES -23	ES -23	ES -23	ES -23	ES -23	ES -23	-1	4
31	-5	5	3	13	-6	ES -23	ES -23	ES -23	-1	ES -23	ES -23	ES -23	ES -22	ES -22	ES -22	ES -22	ES -22	ES -22	ES -22	ES -22	ES -22	-10	-1	3
CNT	28	28	29	30	30	30	30	30	30	29	29	29	28	28	29	28	28	28	27	27	27	27	27	27
MED	6	8	8	8	US -22	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	-8	3	4
UD	12	14	17	20	17	-4	ES -22	-4	2	ES -23	ES -23	ES -22	ES -23	ES -23	ES -23	ES -23	ES -23	ES -23	ES -23	ES -23	ES -23	5	12	12
LD	-7	-1	2	ES -22	ES -25	ES -26	ES -26	ES -26	ES -26	ES -26	ES -26	ES -26	ES -26	ES -26	ES -26	ES -26	ES -26	ES -26	ES -26	ES -26	ES -25	ES -24	-2	-7

C. RADIO PROPAGATION

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

DEC 1990 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	15	7	13	22	20	26	30	22	25	16	ES -23	ES -23	ES -23	ES -23	ES -23	ES -23	ES -23	ES -23	ES -23	7	19	11	17	6
2	9	16	22	19	27	13	19	32	20	ES -22	ES -22	ES -22	ES -22	ES -22	ES -22	ES -22	ES -22	ES -22	ES -22	ES -22	15	16	18	15
3	17	16	19	22	23	29	24	22	13	-4	ES -24	ES -24	ES -24	ES -24	ES -24	ES -24	ES -24	ES -24	ES -24	ES -24	14	14	8	12
4	6	9	14	16	24	28	33	10	-3	-9	0	-6	-1	-5	ES -24	ES -24	ES -24	ES -24	ES -24	ES -24	12	12	13	10
5	9	15	18	19	22	21	20	27	23	24	25	14	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	11	1	6	11
6	13	11	20	17	24	24	20	21	23	16	-1	-1	ES -24	-12	ES -24	ES -24	ES -24	ES -24	ES -24	ES -24	16	16	14	9
7	4	10	16	20	18	29	28	23	15	11	-3	-12	-12	-12	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	10	7	11	7
8	7	7	16	16	25	26	26	20	18	14	-5	-12	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	9	13	12	8
9	1	4	3	17	21	25	26	29	17	9	-12	-13	-12	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	13	15	3	2
10	2	12	12	14	28	24	22	25	23	22	4	-1	-6	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	9	5	2	-1
11	8	9	12	16	26	27	31	17	34	34	ES -9	ES -9	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	-4	12	12	7
12	3	12	10	16	21	27	17	24	10	5	-6	-8	-11	-14	ES -26	ES -26	ES -26	ES -26	ES -26	ES -26	3	11	11	16
13	8	12	22	22	18	30	28	26	21	-26	-26	-26	ES -26	ES -26	ES -26	ES -26	ES -26	ES -26	ES -26	ES -26	18	15	18	12
14	11	16	21	21	22	32	37	31	26	21	-1	-2	-2	ES -24	ES -24	ES -24	ES -24	ES -24	ES -24	ES -24	16	15	17	17
15	16	11	19	21	28	29	27	27	14	S	S	S	S	S	ES -26	ES -26	ES -26	ES -26	ES -26	ES -26	8	17	15	13
16	7	11	12	22	24	29	19	17	7	-8	ES -26	ES -26	ES -26	ES -26	ES -26	ES -26	ES -26	ES -26	-12	-12	18	19	20	18
17	11	15	16	21	28	25	29	31	17	ES -25	-5	-10	-10	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	ES -25	12	13	15	10
18	15	13	15	19	27	30	28	26	15	-3	-9	ES -24	ES -24	ES -24	ES -24	ES -24	ES -24	ES -24	ES -24	ES -24	14	18	14	9
19	12	6	-23	19	28	23	23	26	16	1	ES -24	ES -24	ES -24	ES -24	ES -24	ES -24	ES -24	ES -24	ES -24	ES -24	13	19	14	14
20	-22	15	20	22	29	25	19	31	19	-8	ES -23	-11	-2	ES -23	ES -23	ES -23	ES -23	ES -23	ES -23	ES -23	11	21	18	16
21	14	14	20	22	30	25	24	23	20	3	ES -23	ES -23	ES -23	ES -23	ES -23	ES -23	ES -23	ES -23	ES -23	ES -23	10	23	7	10
22	13	17	19	17	30	26	23	16	19	ES -23	ES -23	ES -23	ES -23	ES -23	ES -23	ES -23	ES -23	ES -23	ES -23	ES -23	7	13	ES -23	11
23	14	18	23	29	26	24	25	23	19	-4	ES -23	ES -23	ES -23	ES -23	ES -23	C	C	C	C	C	C	C	C	C
24	C	C	C	30	24	31	30	29	18	1	ES -23	ES -23	ES -23	ES -23	ES -23	ES -23	ES -23	ES -23	C	C	C	C	C	C
25	C	C	15	20	28	27	30	23	9	1	-1	-8	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	6	13	14	17	20	27	20	30	23	ES -24	ES -24	ES -24	ES -24	ES -24	ES -24	ES -24	ES -24	ES -24	ES -24	ES -24	15	18	16	11
28	11	11	18	16	22	31	12	30	22	0	-12	-24	ES -24	ES -24	ES -24	ES -24	ES -24	ES -24	ES -24	ES -24	14	17	18	11
29	7	14	14	18	26	23	24	26	14	-6	ES -24	ES -24	ES -24	ES -24	ES -24	ES -24	ES -24	ES -24	ES -24	ES -24	11	13	13	10
30	7	12	15	14	18	32	19	22	9	19	2	ES -24	ES -23	ES -23	ES -23	ES -23	ES -23	ES -23	ES -23	ES -23	7	13	10	18
31	5	10	18	22	25	26	28	21	26	-5	-11	ES -23	ES -22	ES -22	ES -22	ES -22	ES -22	ES -22	ES -22	ES -22	6	8	5	4
CNT	28	28	29	30	30	30	30	30	30	29	29	29	28	28	29	28	28	28	27	27	27	27	27	27
MED	8	12	16	19	24	26	24	24	18	1	US -12	ES -23	ES -23	ES -24	ES -24	ES -24	ES -24	ES -24	ES -24	ES -24	12	15	13	11
UD	15	16	22	22	29	31	31	31	26	22	2	-1	-2	-12	ES -23	ES -23	ES -23	ES -23	ES -22	ES -22	18	19	18	17
LD	2	7	10	16	18	23	19	17	9	ES -24	ES -24	ES -24	ES -25	ES -25	ES -26	ES -26	ES -26	ES -26	ES -26	ES -26	6	7	3	4

C. Radio Propagation

C2. Radio Propagation Quality Figures at Hiraiso

Hiraiso

Time in U.T

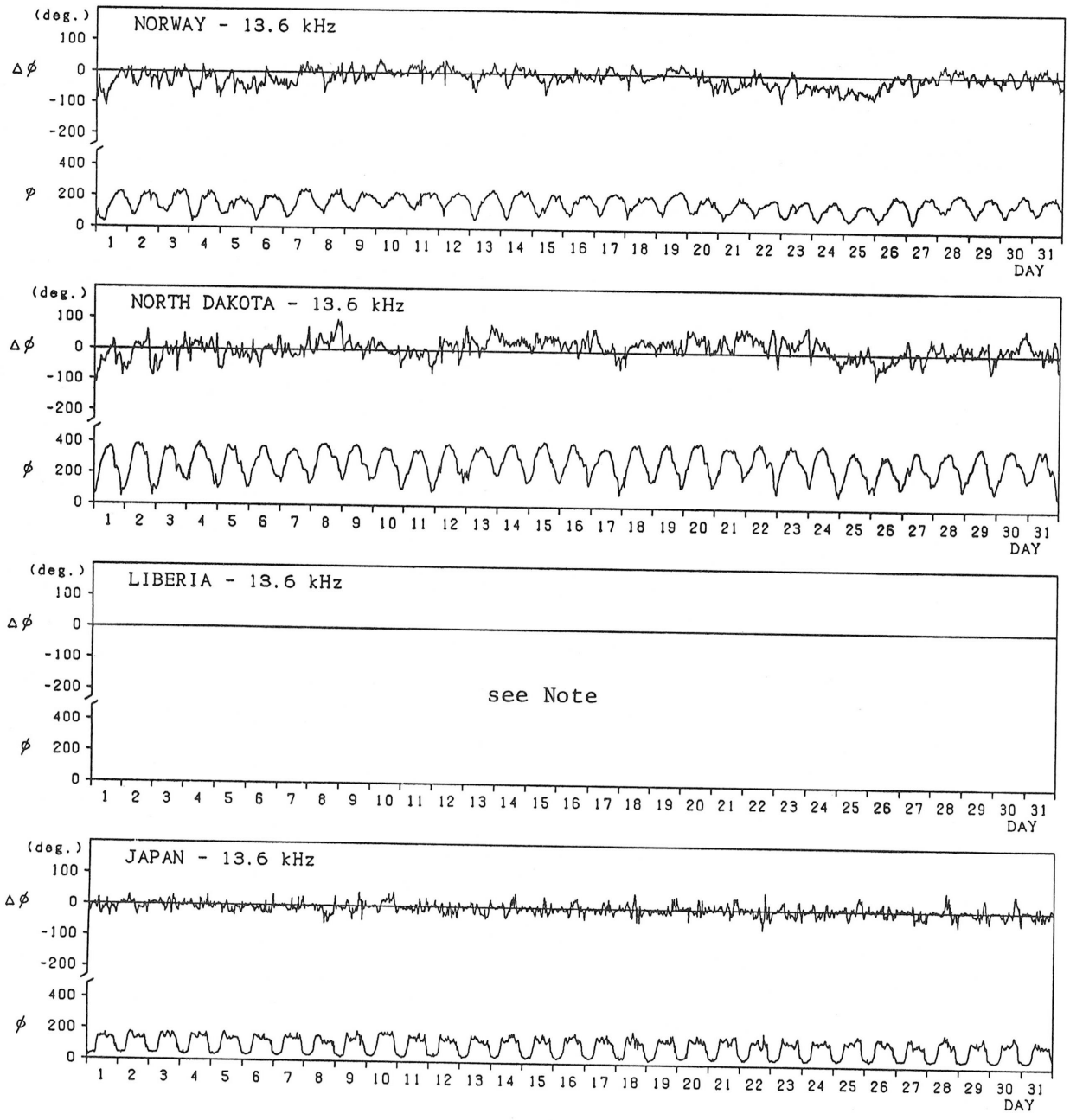
Dec. 1990	Whole Day Figure	W W V 00 06 12 18 | | | | 06 12 18 24	W W V H 00 06 12 18 | | | | 06 12 18 24	Conditions 00 06 12 18 | | | | 06 12 18 24	Principal Geomagnetic Storms Start h m	End h	Range nT
1	4-	3 S S 4U	4 4 S 4	N N N N			
2	4-	3U S S 4	4 3U S 4	N N N N			
3	4-	4 S S 4	4 3 S 4	N N N N			
4	4+	4 5U S 5	4 4 S 4	N N N N			
5	4o	4 S S 4	4 4 S 4	N N N N			
6	4o	4 S S 4	4 4 S 4	N N N N			
7	4o	4 S S 3	4 5 S 4	N N N N			
8	4-	4 S S 3U	4 4 S 4	N N N N			
9	4-	4 S S 4	4 4 S 3	N N N N			
10	4-	4 S S 2	4 5 S 3	N N N N			
11	3+	2U S S 3U	4 4 S 3	N N N N			
12	4o	4 S S 4	4 4 S 4	N N N N			
13	4o	5 5U S 4U	4 3 S 4	N N N N			
14	5-	5 S S 5	4 5 S 4	N N N N			
15	4o	4 S S 5	4 4U S 4	N N N N	none		
16	4+	4 S S 5	4 3 S 5	N N N N			
17	4+	4 5U S 4	4 5 S 4	N N N N			
18	4o	4 S S 4	4 4 S 4	N N N N			
19	4o	4 S S 4	4 4 S 4	N N N N			
20	4+	4 S S 5	4 4 S 4	N N N N			
21	4+	5 S S 5	4 4 S 4	N N N N			
22	4-	4U S S 3	4 3U S 3	N N N N			
23	4+	4 S C C	5 4 C C	N N N N			
24	4o	4U S S C	4 4 S C	N N N N			
25	4o	4U S C C	4 4 C C	N N N N			
26	C	C C C C	C C C C	N N N N			
27	3+	3 S S 3	4 3U S 4	N N N N			
28	4o	4 S S 4	4 4 S 4	N N N N			
29	4o	4 S S 4	4 4 S 4	N N N N			
30	4-	4 S S 3	4 4 S 4	N N N N			
31	4-	4 S S 4	4 4 S 3	N N N N			

C. Radio Propagation

C3. Phase Variation in OMEGA Radio Waves at Inubo

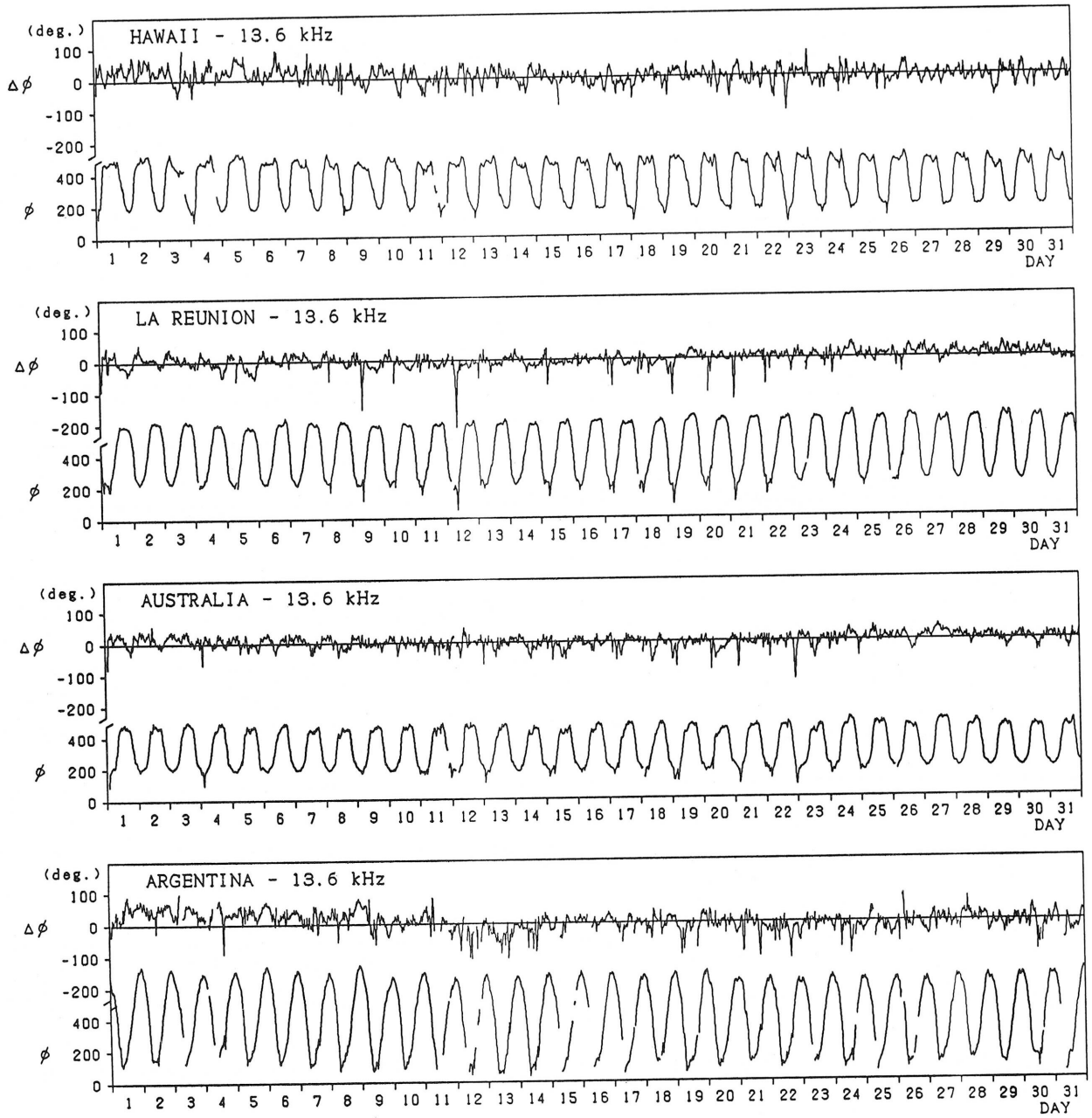
Inubo

December 1990



Inubo

December 1990



Note: As for LIBERIA - 13.6 kHz, no record during July 09 - December 31, due to the maintenance of transmitter.

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

Start (U.T.)	End (U.T.)	Max. (U.T.)	Max. Phase Deviation (negative value, deg.)
Dec.23/0940	Dec.24/1608D	Dec.23/1142	75.6
Dec.24/1608E	Dec.26/1400	Dec.24/2006	97.2

C. Radio Propagation

C4. Sudden Ionospheric Disturbance

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

Hiraiso

Time in U.T.

Dec. 1990	S W F								Correspondence	
	Drop-out Intensities(dB)					Start	Duration	Type	Imp.	Solar Flare	Solar Noise
	CO	HA	1)	2)	3)						
1		21	16			0050	27	G	1+		
2			7			0046	21	G	1-	x	
4	38	49	44	16	6	0200	30	S	3+		x
11			9			0503	22	SL	1-	x	
11		38				2042	50	SL	3+	x	
11	14	16				2254	52	G	2	x	
13	12		16			0111	52	SL	1+		
13			12		6	0204	24	SL	1		
13			15			0411	35	S	1	x	x
15			15			0541	12	S	1	x	
16			7			0212	6	S	1-	x	
16			6			0442	8	S	1-	x	
17			9			0310	20	G	1-	x	x
17			11			0335	20	SL	1-	x	x
17			8			0639	24	SL	1-	x	
18	x	x	33			0149	17	SL	3-	x	x
18			17			0252	13	SL	1+	x	
18			8			0514	17	SL	1-	x	
19			17			0406	67	G	1+	x	
20			15			0709	32	SL	1	x	x
21	40	x	25			0319	63	SL	2		
21			10			2230	13	SL	1-	x	
22			14			0319	32	SL	1	x	
22			18			2226	16	SL	1+	x	x
24			14			0058	27	SL	1	x	
26			20			0214	28	SL	2-	x	

NOTES CO: Colorado(WWV) HA: Hawaii(WWVH) 1): Australia 2): Moscow 3): London

(b) Sudden Phase Anomaly (SPA) at Inubo

Inubo

Dec. 1990	S P A								
	Phase Advance (degrees)						Time (U.T.)		
Date	Ω/N	Ω/L	Ω/LR	NWC	Ω/H	Ω/ND	Start	End	Maximum
1	27	—	123	—	77	40	0048	0257	0114
1		—	58	36			0545	0728	0608
1		—			9		2303	2357	2317
2		—		26*	14*		0036	0148	0052
2		—	10				1120	1150	1125
3	25	—			5		2256	2328	2305
4		—		8	7	12	0007	0024D	0014
4		—		34	28	21	0024E	0130	0030
4	72	—	208	160	129	82	0157	0350	0207
4		—	39	18			0734	0809	0740
5		—	22	14			0537	0623	0544
5		—	169	74			0721	0910	0732
5		—			27		2100	2132	2111
6		—	11	10	5		0257	0317	0304
6		—	30	14			0630	0718	0638
6		—	7				0835	0904	0844
7		—		11	8		0020	0042	0026
7		—	16	16			0427	0513	0442
7		—	16	11			0728	0800	0736
7		—	8				0929	1002	0938
8		—		9			0140	0207	0147
8		—	80	35			0643	0811	0650
8		—	14				1002	1030	1010
9		—	28	28	9		0310	0353D	0324
9		—	21	19	17		0353E	0432	0403
9		—	9	7			0504	0534D	0516
9		—	11				0534E	0608	0547
9		—	21	8			0618	0650D	0632
9		—	26				0650E	0725	0653
9		—	165	44			0816	0923D	0827

Inubo

Dec. 1990	S			P			A		
	Phase Advance (degrees)						Time (U.T.)		
Date	Ω/N	Ω/L	Ω/LR	NWC	Ω/H	Ω/ND	Start	End	Maximum
9		—	31				0923E	1002	0932
9		—	13				1122	1154	1130
9	9	—	13	8	13		2302	2325	2312
10	7	—	26	—	9		0417	0519	0428
10		—	7	—			0538	0552D	0543
10		—	14	—			0552E	0642	0615
10		—	26	17			0655	0727D	0703
10		—	44	31			0727E	0742D	0734
10		—	226	90			0742E	0911	0759
10	21	—					1822	1859	1833
10		—			31		2150	2300D	2211
10		—		8	15		2300E	2324D	2306
10		—			24		2324E	2339D	2335
10		—		33	37		2339E	0049	2354
11		—	9		8		0156	0256	0202
11	16	—	57		36		0258	0430	0319
11	32	—	108	71	30		0501	0620D	0514
11		—	31	8			0620E	0708D	0634
11		—	38				0708E	0741D	0715
11		—	35				0741E	0808	0746
11		—			133	42	2042	2156	2054
11	21	—		68	77	59	2256	0022	2321
12		—	12	9			0157	0234	0211
12		—	17	14	7		0254	0318D	0304
12	66	—	239	144	122		0318E	0457D	0348
12		—	49	45			0457E	0558	0505
12		—	31	13			0626	0651D	0641
12		—	137	59			0651E	0747D	0712
12		—	204	75			0747E	0924	0805
12		—	51				1107	1215	1113
12		—	6				1246	1300	1249
12		—	9				1403	1437	1410
12		—			60		1921	2016	1942
13		—		7	5		0006	0023	0011
13	18	—	75	78	62	37	0111	0212D	0132
13		—	19	26	26		0212E	0240	0217
13		—	10	9*	14		0339	0412D	0355
13	18	—	64	47	27	17	0412E	0527	0418
13		—	15	6			0610	0719	0619
13		—	29				1018	1125	1037
14		—		5	3		0146	0159D	0150
14	9	—	15	19	8		0159E	0236	0205
14		—	14	13	6		0316	0345D	0325
14		—	12	10			0345E	0404D	0351
14		—	10	9		27	0404E	0432	0412
14		—	14	6			0634	0653	0640
14		—	13				0832	0906	0843
14		—	32				1120	1212	1128
14		—	15				1331	1420	1336
14		—			13		2111	2131	2118

Inubo

Dec.	S			P		A		
1990	Phase Advance (degrees)						Time (U.T.)	
Date	Ω/N	Ω/L	Ω/LR	NWC	Ω/H	Ω/ND	Start	End	Maximum
14		—			27		2215	2244	2219
15	19	—	58	59	39	20	0200	0323	0216
15		—	8	9			0348	0405	0352
15	17	—	11	7			0410E	0435	0419
15	39	—	157	103	19	23	0540	0712D	0547
15		—	23	7			0712E	0758	0719
15		—	8				1153	1233	1158
15	15	—			8		2356	0017	0005
16		—		9	7		0043	0108D	0052
16		—	12	6	4		0108E	0123	0112
16	12	—	24	33	18	14	0205	0256	0214
16		—		10			0423	0442D	0430
16	15	—	57	47	33	12	0444	0532D	0449
16	13	—	25	14			0532E	0609D	0543
16		—	23	8			0609E	0639D	0611
16		—	14				0639E	0706	0646
16		—	9				1113	1145	1119
17	18	—	14	—	12	13	0316	0334D	0326
17	22	—	87	—	31	22	0334E	0431D	0346
17		—	23	—			0431E	0507D	0445
17		—	22	—			0507E	0535D	0516
17		—	17	—			0535E	0603	0538
17		—	118	—			0637	0824	0645
17		—	6	—			0925	0945	0927
18		—		11	10	13	0025	0043	0032
18		—		7	4		0108	0125	0116
18	47	—	132	111	81	66	0148	0253D	0158
18	12	—	58	60	35	19	0253E	0336	0259
18		—	5				0433	0449	0436
18	23	—	80	51		15	0508	0634	0523
18		—	46				1029	1127	1042
18	8	—			49		2039	2124	2048
18		—		8	5		2335	0000D	2346
19		—		8	6	12	0002	0027	0008
19		—	67	67	55	18	0100	0402D	0146
19	40	—	159	88	59	42	0402E	0628D	0445
19		—	27				0628E	0715	0635
19		—	17				1120	1156	1126
20		—	51	31	13		0100	0145D	0115
20		—	24	11			0148E	0211D	0155
20		—		11			0211E	0255	0221
20		—	26*	16*			0351	0507D	0413
20		—	54	20			0507E	0609	0513
20		—	227	107			0706	0856	0728
20		—	44				0933	1100	0948
20		—			41		2037	2145	2046
21	10	—	36	47	19	21	0154	0300	0214
21	34	—	140	75	57	37	0319	0548	0336
21		—	13	6			0627	0643	0634
21		—		9	59	48	2224	2338	2235

Inubo

Dec.	S			P		A		
1990	Phase Advance (degrees)						Time (U.T.)	
Date	Ω/N	Ω/L	Ω/LR	NWC	Ω/H	Ω/ND	Start	End	Maximum
22		—		14	9		0018	0105	0033
22	7	—	42	47	26	16	0150	0257	0203
22	26	—	113	70	49	13	0314	0438D	0337
22		—	31	18			0438E	0512D	0447
22	5	—	23	11			0512E	0558	0525
22		—	60	28			0632	0747	0639
22		—		57	117	92	2213	2312D	2246
22	16	—	26	74	103	79	2312E	2356D	2322
22	8	—	8	43	56	33	2356E	0037D	0000
23	12	—	23	26	34	18	0037E	0119D	0043
23		—	15	10	17		0117	0156	0129
23		—	5	6			0302	0324	0307
23		—	9				0548	0625	0557
23		—	203				0932	1149	0954
23		—			9		2233	2305	2242
23		—	13	—	5		2351	0004	2356
24	21	—	71	—	50	25	0057	0211	0109
24	8	—	35	—	8	11	0252	0405	0305
24		—	15	10			0410	0454	0421
24	14	—	89	51			0559	0738	0619
24		—	16	5			0747	0805	0754
24		—	19				1322	1401	1330
24		—			8	10	2238	2249D	2243
24		—		22	41	36	2249E	0018	2306
25		—		38	23	23	0050	0134D	0104
25		—		17	7		0134E	0155D	0137
25	16	—	36	41	18	15	0155E	0234D	0206
25		—	10	16			0234E	0250D	0237
25		—	12	16			0250E	0314	0254
25		—	6	6			0429	0500	0443
25		—	30	16			0521	0614	0535
25		—	14				0645	0722	0653
25		—	11				0739	0807	0742
25		—	12				0828	0858	0834
25		—			21		2159	2300	2213
26		—	8	10			0000	0047	0008
26	57	—	144	159*	87	50	0204	0420	0231
26		—	52	—			0701	0810	0724
26		—	48				1118	1219	1130
26		—	13				1358	1421	1403
27		—		—	5		0117	0152	0124
27		—	15				0650	0731	0701
27		—			12		2215	2254	2223
28		—		7	4		0138	0212	0149
28		—	22	14			0733	0759	0739
29		—	7				1002	1034	1009
30		—	18				1144	1222	1149
30		—	13				1318	1348	1322
31		—	9	—	4		0222	0239	0226

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