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IONOSPHERIC DATA IN JAPAN

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CONTENTS

COMMUNICATIONS RESEARCH LABORATORY
MINISTRY OF POSTS AND TELECOMMUNICATIONS
TOKYO, JAPAN

PREFACE

July, 1988

Ionospheric sounding in Japan dates back to 1931. Results of the work have been published monthly as "Ionospheric Data in Japan" since 1946. Observation, data coordination, and publication have been carried out successively by various organizations as dictated by reorganizations of government offices. Several progressive changes have been made in the observing system and data processing method.

Communications Research Laboratory, formerly Radio Research Laboratory, which has been operating ionospheric observatories since 1952, has just completed a new full-automatic system attached to traditional ionosondes for data collecting and processing of ionospheric observation. After extensive comparison of automatically-scaled parameters with manually-scaled values, it was decided to publish monthly reports based on the data processed with the new system beginning June 1988.

At present, the number of ionospheric parameters to be published is restricted to five because values of other parameters processed by the new system are not reliable. New daily plots called Summary Plots, made from quarter-hourly digital ionograms are published to present general ionospheric conditions. With respect to data obtained at Kokubunji, fourteen manually-scaled parameters are, as heretofore, being inserted along with *f*-plots to supplement those automatically-scaled.

We intend to improve the system to extend the ability of automatic scaling and to provide, on request, various digital data including ionograms in computer-readable form.

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Ministry of Posts and Telecommunications

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

NOV. 1988

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	47	51	48	47	58	48	68	87	109	116	127	132	126	114	114	115	114	94	80	63	49	49	44	44
2	49	47	40	35	38	36	60	111	120	128	126	132	124	117	123	118	103	88	68		67		52	51
3	46	44	38	40	35	33	43	110	118	121	146	148			133	128	106	86	67	50	50	41	36	38
4	38	38	44	41	37	35	61	90	111	126	120	122	120	107	117	118	107	68	62	59	49	53	55	41
5	37	46	52	48	43	32	42	88	106	112	122	125	117	108	120	114	100	73	59	52		46	52	38
6	40	38		42	38	36	61	96	124	128	127	126	115	102	118	101	84	90	65	48	42	35	38	34
7	35	40	36	39	36	36	48	89	111	125	133	128	122	122	123	115	103	79	51	52	54	52	58	54
8	51	53	52	38	43	40	41	90	103	120	127	141	135	102	120	108	92	71	64	52	43	49	46	44
9	41	42	38	40	35	34	60	96	101	137	139	144	135	132	115	111	102	75	67		43		44	49
10	53	52	45	50	44	48	46	82	110	123	136	130	122	118	118	97	89	71	66	51	38		33	36
11	32	35	33	35	36	32	44	90	116	114	117	120	108	97	104	101	90	63	52	38	34	35	30	34
12	35	32	32	32	34	40	37		114	111	137	132	119	121	121	111	103	83	70	66	44	36	36	36
13	37	35	35	35	40	41	39	98	97	124	127	140	132	120	113	92	92	82	65	49	42	42		36
14	37	38	39	42	42	39	49	105	99	125	131	130	126	112	106	94	92	82	66	56	51	43	43	38
15	43	36	48		43	42	53	100	113	120	127	131	126	121	126	112	96	76	68	56	54	54	48	42
16	46	37	42	46	43	45	47	88	118	117	116	124	123	118	116	103	98	72	71	53	34	36		40
17			42	36	38	42	40	80	115	114	117	122	109	116	120	112	86	81	86	64	58	56		A
18	A	37	38	42	40	38	46	83	97	114	112	131	122	114	114	93	88	74	32		38	38	35	35
19	33	36	39	40	35	34	41	91	92	112	114	114	117	110	101	97	93	58	52	42	36	36	35	31
20	36	41	35	39	44	34	36	92	92	97	97	102	107	113	100	93	74	65	50	44	32	32	31	32
21	32	30	31	35	36	35	38	60	94	92	118	114	113	98	90	86	72	60	44	43	28	A	32	32
22	37	33	33	33	36	36	40	73	86	92	96	98	94	94	96	90	76	52	60	52	38	35	31	35
23	33	38	36	36	40	40	49	83	94	98	106	111	101	98	92	87	72	63	58	51	41	36	32	
24	40	48	42	42	41	42	47	94	91	97	103	116	95	93	87	84	64	51	43	44	43	39	36	32
25	30	33	36	36	37	40	38	65	89	90	115	95	97	98	96	88	73	59	52	47	37	31	34	35
26	38	34	35	34	35	32	28		94	101	110	126	119	100		88	83	77	56	48	36	34	30	33
27	41	36	35	33	30	31	35	75	101	92	115	114	110	103	91	92	72	58		36	30	35	32	32
28	38	33	37	37	33	37	34	64	86	105	120	124	108	94	97	97	62		41	35	35	31	31	32
29	31	35	36	38	31	30	32	57	82	103	105		91	98	94	88	65	58	44	43	37	31		
30	34	34	37	38	38		29	71		98	100	90	97	84	86	92	70	63	47	32		29	26	32
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	28	29	29	29	30	29	30	28	29	30	30	29	29	29	29	30	30	29	29	27	28	26	26	27
MED	38	37	38	38	38	36	42	88	101	114	119	125	117	108	114	97	90	72	60	50	42	36	36	36
U Q	42	43	42	42	42	40	49	95	113	123	127	131	123	117	120	112	100	81	67	53	49	46	44	41
L Q	34	34	35	35	35	34	38	77	93	98	112	114	107	98	96	92	73	61	50	43	36	35	32	32

COMMUNICATIONS RESEARCH LABORATORY, JAPAN

HOURLY VALUES OF FES AT WAKKANAI

NOV. 1988

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

HD	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
1	G	G	G	G	G	G	78	G	38	G	G	G	G	G	G	44	55	76	38	100	G	G	G	G
2	G	G	G	G	G	G	G	G	72	G	G	G	G	G	G	G	G	33	37	68	73	58	G	31
3	31	G	G	G	G	G	G	45	60	41	G	G			G	G	G	G	G	60	34	G	G	G
4	G	G	G	26	28	30	75	82	G	G	G	G	G	G	G	G	31	30	G	G	G	G	G	G
5	G	G	G	G	G	G	G	67	G	G	G	G	G	G	G	G	G	G	28	G		G	G	G
6	G	G		G	G	G	G	36	36	G	G	G	G	G	G	G	G	32	G	G	G	G	G	G
7	G	G	G	G	G	G	G	G	G	41	G	G	G	G	G	G	34	G	G	G	G	G	G	G
8	G	G	G	G	G	G	G	53	43	64	G	G	G	G	37	G	29	39	G	32	G	G	G	G
9	G	G	G	G	G	G	G	G	G	G	G	G	62	G	G	G	36	66	37		28	37	G	G
10	G	G	G	G	G	G	G	50	G	G	G	G	G	G	G	G	G	G	G	G	G		G	G
11	G	G	G	G	G	G	G	34	G	40	G	G	G	G	36	G	G	G	G	G	26	G	G	G
12	G	G	G	G	G	G	G		G	G	G	G	G	39	G	41	G	40	43	38	35	38	G	G
13	28	30	G	G	G	G	28	G	G	G	G	G	G	G	G	G	G	G	26	G	G	38	34	G
14	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G
15	G	G	G		G	G	G	G	G	G	G	41	G	G	G	G	G	32	28	30	28	G	G	G
16	G	G	26	26	G	G	G	G	41	G	43	G	G	G	G	G	58	50	G	G	32	G	39	31
17	36	37	30	G	G	G	G	41	39	64	G	G	G	G	G	G	G	G	G	G	G	G		35
18	38	G	G	G	G	G	G	G	G	37	G	G	G	G	G	G	G	28	36	44	58	40	G	G
19	G	G	38	G	G	34	25	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G
20	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	38	28	G	G	39	57	G	G	G
21	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	26	G	G	41	G	G
22	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	32	33	G
23	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	28
24	G	G	G	G	G	G	G	G	G	52	G	G	G	G	G	G	G	G	G	G	G	G	G	G
25	G	G	G	G	G	G	G	28	G	45	39	G	G	G	G	G	G	G	G	G	G	G	G	G
26	G	G	G	G	G	G	G		G	G	46	40	43	46		G	G	G	G	24	31	G	G	G
27	G	G	G	G	G	G	G	36	52	G	G	G	G	G	G	G	G	23		G	36	27	G	G
28	G	G	G	G	G	G	G	G	G	G	G	G	G	54	G	G	G		G	G	G	G	G	G
29	G	G	G	G	G	G	G	G	40	44	47		44	50	G	G	G	G	G	25	28	28	39	38
30	G	G	G	G	G		G	G		G	44	G	G	G	G	G	G	G	G	G		G	G	G
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	30	30	29	29	30	29	30	28	29	30	30	29	29	29	29	30	30	29	29	29	28	29	29	30
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	G	G	G	G	G	G	G	36	38	40	G	G	G	G	G	G	G	32	27	31	31	30	G	G
L Q	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G

COMMUNICATIONS RESEARCH LABORATORY, JAPAN

HOURLY VALUES OF FMIN AT WAKKANAI

NOV.1988

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

HOURLY VALUES OF FOF2 AT AKITA

NOV. 1988

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	44		47	46	42	48	62	88	102	112	117	118	126	116	117	114	105		78	61			49	35
2	37		38	29	33	36	64	103	107	120	121	121	121	120	124	112	95	85	84	60	59	58	52	
3	A		46	48	36	43	48	86	121	129	120	140	134	130	136	134	110		71	66		A	A	A
4	39	A	43	49	37	A	53	73	104	124	130	128	118	110		112	101	81	67	54	53	51		
5	44	46	42	44	37	35	45	87	111	105	117	130	120	106	108	109	88	67	57	53	46	48	47	A
6	42	40	39	44	35	38	46	88	124	111	120	122	113	106	107	111	85	79	66	56		34	35	35
7	31	32	38	33	37	38	50		111	118	121	128	116	116	120	113	102	77		52	53	52	36	
8		43	44	33	39	40	53	85	99	121		137	136	126	112	112	86	72	60	60	43	35	40	42
9	A	36	A	31	32	34	42	88	111	132	135	137	137	130	127	111	98	86	67	63	A	A	A	A
10	A	A	37	A		37	50	85	109	137	131	128	110	126	117	113	85	66		66	52	33	31	39
11	34	32	38	35	38	32	48	88	108	94	112	118	122	111	111	99	90	63	53	A	A	A	A	31
12	31		34	31	36	34	47	102	110	108	114	129	122	121	N	112	103	88	74	66	49	A	A	40
13	A	40	34	35	39	43	46	84	104	113	115	127	121	114	104	103	94	82	66	52	48	42	37	
14	37	40		40	38	36	48	87	106	114	130	138	128	114	112	106	97	82	70	62	48	42	31	38
15	37	43	42	38	38	30	48	87	106	121	121	129	128	120	122	112	93	78	68	69	53	52		41
16	38	39	43	42	43	43	47	88	109	107	112	121	124	116	117	112	102	81	76	66		35	44	41
17	36	34	31	34	36	40	32	88	88	90	102	112	115	111	111	111	90	76	86	74	58		42	34
18	43	40	37	40	38	35	48		100	110	114	114	121	112	112		86		64	52	42	42	31	35
19	30	A	34	35	35	32	39	83	104	101	108	108	114	112	107	88	86	63	49	51	42	32	34	30
20	31	34	34	34	32	32	32	72	86	104	105	110	90	105	106	103	84	58	47	49	42		30	31
21	31	34	31	32	37	34	26	78		102	121			108	85		77	53	56	51		A		
22	34		31	32	34	32	35	80	102	104	111	103	98	97	85	84	84	52	51		41	32	N	
23	31	34	30	31		31	42	79	104	98	107	112	102	99	85	87	76	52	64	54	38	30		31
24	30	N	28	31	32	34	43	86	97	105	102	107	103	98	86	81	77	58	42	47	53	37	30	30
25	31	32		31	32		26	74	87	97	112	106	106	99	86	90	74	48	48	52	31	32	31	34
26	34	31	31	25	38	30	34	64	102	104	108	118	120	121	88	85	84	76	72	A	40	34		34
27		36	34	37	32	30		80	N	112	121	111	111	110	103	92	88	55	54	45	40	28	35	A
28	37	36	36	38	35	34	31	64	80	84		118	113	99	100	101	82	66	43	31	34	30		A
29		30	35	36	36	31	35	80	79	88	112	105	84	102	103	88	84		52	40	40	33	32	
30		31	34	31	34	30		72	79	85	95	85	99	112	82	86	86	43	52	47	33	29	42	67
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	21	27	29	28	28	28	28	28	30	28	29	29	30	28	28	30	26	28	27	23	22	19	18
MED	35	36	36	35	36	34	46	85	104	108	114	118	118	112	108	108	87	70	64	54	43	34	35	35
U Q	38	40	42	40	38	38	48	88	109	118	121	128	123	120	117	112	97	81	70	63	53	42	42	40
L Q	31	32	34	31	34	32	35	78	98	101	109	110	108	106	94	89	84	58	52	51	40	32	31	31

COMMUNICATIONS RESEARCH LABORATORY, JAPAN

HOURLY VALUES OF FES AT AKITA

NOV. 1988

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	30	41	G	G	30	24	29	36	G	44	G	44	74	53	58	38	G		G	58	56	58	30	30
2	30	30	26	G	G	G	G	G	G	G	44	G	90	G	G	G	91	73	90	37	45	85	32	49
3	50	38	34	32	30	G	29	34	40	45	71	43	43	42	40	G	G	51	58	50	36	38	34	32
4	32	32	28	25	G	40	39	G	G	G	G	G	G	55		G	33	34	G	G	29	G		30
5	G	G	G	G	G	G	29	G	G	G	G	G	G	G	G	G	38	29	G	G	G	32	30	36
6	G	36	G	G	G	G	G	G	G	G	G	G	G	G	G	G	30	40	24	G		G	G	G
7	G	G	G	G	G	G	G		G	G	43	G	G	G	G	G	G	G		30	30	G	28	29
8	30	28	G	G	G	G	G	G	55	G		G	G	G	40	38	G	G	G	G	G	G	G	G
9	38	G	36	G	G	G	G	G	G	41	50	61	G	G	G	G	40	G	44	38	69	42	58	92
10	45	44	32	32	G	29	34	68	66	51	41	G	G	44	44	G	G	G		G	29	23	G	G
11	G	G	G	G	G	G	G	G	G	68	G	45	44	55	55	58	50	44	89	72	57	38	32	25
12	G		G	28	G	G	G	G	G	G	G	G	G	45	G	49	29	G	G	G	G	57	30	G
13	33	G	24	27	28	G	G	G	G	41	G	G	42	G	G	G	35	33	G	G	31	30	G	32
14	33	G	27	G	31	G	G	32	G	44	41	G	48	59	G	58	36	30	31	30	30	G	G	G
15	G	G	G	G	G	G	G	G	36	G	G	G	43	G	54	37	44	30	G	36	54	40	31	G
16	G	27	G	G	G	G	G	G	35	G	49	47	59	G	55	37	45	33	37	28		G	G	G
17	G	G	G	G	G	G	G	G	G	59	44	G	G	G	51	G	G	G	32	27	30		G	G
18	G	G	G	26	G	G	G		35	39	G	42	44	43	47		38		40	26	G	G	30	26
19	G	30	26	G	G	G	G	28	45	58	58	46	G	55	46	G	G	G	G	30	G	G	G	G
20	G	G	G	G	G	G	G	G	G	41	G	G	G	40	G	G	32	24	G	G	G		G	G
21	G	G	G	G	26	G	G	29	54	G	G			50	G		G	G	G	G	32	28	25	25
22	G	27	G	G	G	G	G	29	34	G	G	G	G	G	G	G	G	G	24		G	G	G	G
23	G	G	G	G		G	G	G	36	G	40	41	G	40	37	G	31	G	G	G	G	G		G
24	G	G	G	29	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G
25	G	G		G	G		G	30	G	G	44	57	50	49	44	G	43	28	G	24	28	G	G	G
26	G	G	G	G	G	G	G	29	G	G	50	54	G	40	G	G	G	G	G	34	G	29		G
27		G	G	G	G	G	G	G	G	39	41	57	G	42	G	34	43	G	G	G	G	G	46	34
28	G	G	G	G	G	G	G	29	48	40		G	47	G	54	33	G	G	G	G	G	G		29
29	G	G	G	G	23	G	G	G	35	G	40	51	58	G	G	G	G	32	26	G	G	G	G	28
30	30	G	G	G	G	G		G	G	G	45	46	G	G	42	37	32	G	G	G	G	G	G	G
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	29	29	29	30	29	29	29	28	30	30	28	29	29	30	29	28	30	28	28	29	28	28	26	30
MED	G	G	G	G	G	G	G	G	G	G	40	G	G	20	G	G	30	G	G	G	14	G	G	G
U Q	30	29	25	G	G	G	G	29	36	41	44	46	45	45	46	37	38	32	31	32	31	35	30	30
L Q	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G

COMMUNICATIONS RESEARCH LABORATORY, JAPAN

HOURLY VALUES OF FMIN AT AKITA

NOV. 1988

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

COMMUNICATIONS RESEARCH LABORATORY, JAPAN

HOURLY VALUES OF FOF2 AT KOKUBUNJI

NOV. 1988

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	40	44	43	46	46	42	61	95	114	103	115	123	130	127	123	112		94	78		54	50	50	47
2	40	42	41	36	40	43	70	104	116	121	127	121	125	128	126		97	93	91	71	60	59	52	52
3	52		44		42	42	64	102	126	133	137	144	133		138	135	114	86	80	81	56	52	46	47
4	46		47	56	38	38		105	127	127	132	131	126	126		118	107	84	67	68	58		50	47
5	46			46	35	30	57	92	101	118	125	124	123	116	106	120	95	77	59	55	54	54	54	51
6	47	42	38	44	38		51	98	125	127	120	128	125	114	103	112	101	85	73	64	44	42	41	39
7	38	44	38	36	35	39	50	97	120	124	128	131	125	124	132	105	102	84	68		52	54	44	41
8	42	50	42	38	40	38	54	91	117	118	137	138	136			108	94	78	74	72	51	41	42	42
9		38	41	N	38	38	47		126	135	136	135	139	144	131	119	101		68	64	52		37	36
10	40		38	41	47	42	55	88	117	132	137	124	131	130	130	126	102	73	64	65	57		38	42
11	47	46	46	37	36	36		100	120	116	117	117	123	122	N	115	100	67	60	52		37		31
12	32	34	49	35	38	36	48	102	107		111	126	134	128	118	114	108	97	76	64	63	54	44	45
13	40	42	32	38	37	41				108	116	124		112	112	106					53	41	39	46
14	37		40	39		34	44	91	109	118	138	136	136	115	118	124	104	83		46		41	41	43
15	41	42	N	40	35	36	59	86	106	119	132	128	131	120	118		106	90	81	72		58	50	47
16	42	36	38	36	36	32	52	92	106	110	118	117	120	130	126	126	112	98	77	96	89	50	47	43
17		42	37	38		38	53	93	102	102	110	130	114	115	117	116	104	87	82	81	58	51	50	48
18	38	42		37	29	36	42	102	108			118		120	111	110	92	78	69	62	52	42	38	34
19	36		38	38	30	35	48	94	112	106	127	117	129	121		114	86		66	58	52	49	40	34
20	38		32	37	33	30	40	72	92	93	97	111	106	105	109	114	99	56	60	50	47	39	35	31
21		32		34		34	39	93	99		117	130	108	107	114	89	72		57	54	40	38	32	32
22		35	34	36	36		48	86	103	118	121	106	103	105	101	106		75	48	45	54	44	34	32
23	30		32	40		32	49	90	103		104	103	107	110	112	92	80	83	55	63	43	34		N
24	35	31	37	42	40	38		85	100	105			100	101	93	87	78	67	50	53	60	46	39	35
25	40	36	36	34	37		49	83	104			116	118	107	106	104	96		50			42	36	36
26	35	37	46	37	37	41		77	99	118		111	136	136	N	100	85	81	80				37	
27	38	42	40	32			51	93	104	113	118	106		118	117	115	87	57	57	55		33	36	
28	35	33	31	35	29	36		77	93	96		116	113	116		104		76	52	41	39	43	31	
29			43		34	43	49	93	76	91	113	102	104	102	100	102	85	84	53	61	42	43		33
30	38		33	44	49	34	48	82	95	87	95	92	99	106	106	96	92	70						54
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	25	20	26	27	25	26	24	28	29	25	25	29	27	28	24	28	26	25	27	24	23	25	26	26
MED	40	42	38	38	37	37	50	92	106	118	120	123	125	117	116	112	98	83	67	62	53	43	40	42
U Q	42	42	43	41	40	41	54	97	117	122	132	130	131	126	124	117	104	86	77	69	58	51	47	47
L Q	36	35	36	36	35	34	48	86	100	104	114	113	108	108	106	104	87	74	57	53	47	41	37	34

COMMUNICATIONS RESEARCH LABORATORY, JAPAN

HOURLY VALUES OF FES AT KOKUBUNJI

NOV. 1988

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	26	G	29	31	34	25	G	G	37	G	44	48	51	48	51	G	35	25	G	G	29	42	33	28
2	G	G	G	G	G	G	25	G	43	46	46	53	G	G	48	50	66	60	57	44	25	G		G
3	58	38	31	36	31	G		34	43	57	49	58	56	G	47		81		60	59	47	35	26	24
4	G	G	G	G	G	G		57	37	50	G	G	G	G		G	33	28	G	G	G		G	G
5	36	25	G	G	G	G	26	42	G	G	G	G	G	G	G	G	34	30	G	G	116	G	G	G
6	G	25	G	G	G		24	G	G	G	G	G	G	G	G	G	31	33	27	G	G	G	G	G
7	G	G	G	G	G	G	G	31	G	G	44	G	G	G	45	G	34	30	27	28	23	G	G	G
8	28	24	G	G	G	G	G	48	40	40	42	44	G			37	G	33	28	G	G	G	G	G
9	G	G	27	G	G	26	G	G	G	44	G	46	G	G	G	G	G	31	51	42	49	57	30	28
10	G	G	G	G	21	24		54	59	48	94	60	46		G	57	47		G	33	G	34	30	29
11	26	33	G	G	G	G		33	G	45	44	48	50	47			34		44	G	30	32	38	G
12	G	G	G	G	26	28	G	34	38	G	G	G	61	61	43	G	46	23	G	G	G	G	33	29
13	G	G	G	G	G	32				G		G	47	46	G		32	41	G	35	G	31	G	G
14	G		G	G	G	G	G	33	37	48	50	58		51	G	46	37	29	29	G	G	G	G	G
15	G	G		G	G	G		G	G	43	G	44	47	G	40	37	33	30	33	33	30	32	G	26
16	G	G	G	G	G	G	G	G	48	44	G	54	43	G	G	36	38	37	31	25	G	G	G	G
17		G	G		G	G	G		G	41	43	45	48	48	44		43	33	G	31	32	G	28	G
18	36	G	G	28	G	G	G	G	37		43	47		46	58	G	32	11	23	G	G	G	G	G
19	G	51	29	28	G		G	G		53	58	62		42	G		G	40	26	G	G		G	G
20	G	G	G	G	G	G	G	G	49	42	G	G	46	G	44	36	G		G	G	G	G	G	G
21	G	G	G	G	G	G	G	33	37	46	44	43	G	42	G	G	G	G	40	29	23	G	G	G
22	G	G	G	G	G		G		G	G	G	46	G	G	G		29	28	G	G	G	G	G	G
23	G		G	G		G	G	30	35		41	G	G	44	G	G	34	27	34	31	G	23	G	G
24	G	G	G	G	G	G		G	G	G	G		44	G	G	G	48	24	G	G	G	G	G	G
25	G	G	G	G	G	G	G	G	G	G		46	46	42	G	G	30		G	34	45	26	G	G
26	G	G	G	G	G	G	G	29	35	G	46		48	G		57	34	28	G	44	37	46	G	G
27	G	G	G	G	G	G	G	29	35		44	G	50	G	40	45	G	G	G		30	29	30	
28	24	G	G	G	G	G	G	34	G	G		45	47	48		35	G	G	28	30	24	G	28	
29	G	G	G	G	24	25	G	G		G	G	57	46	46	44	G	G	G	G	G	G	G		G
30	28		G	G	G	G	G	G	G	39	G	46	51	49	42	37	33	28	38	33	36	G	34	G
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	29	27	29	29	29	27	23	27	27	27	27	28	27	28	25	24	30	25	30	29	30	28	28	28
MED	G	G	G	G	G	G	G	29	35	40	42	46	46	22	G	G	33	28	24	25	12	G	G	G
U Q	25	G	G	G	G	G	G	34	38	46	44	50	48	46	44	37	37	33	33	33	30	31	29	G
L Q	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	23	G	G	G	G	G	G

COMMUNICATIONS RESEARCH LABORATORY, JAPAN

HOURLY VALUES OF FMIN AT KOKUBUNJI

NOV. 1988

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

COMMUNICATIONS RESEARCH LABORATORY, JAPAN

HOURLY VALUES OF FOF2 AT YAMAGAWA

NOV. 1988

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	43	41	42	48	23	37	40	85	100	106	120	118	128	140	140	136	129	131	117	103	88	81	76	68
2	66	52	49	44	26	34	43	83	104	121	127	122	127	135	138	135	117	110	111	109		71	58	64
3	59	43	47	30	36	33	52	88	111	130	130	133	129	134	141	136	116	110	90	108	88	80	53	65
4	63	54	64	67	42	26	35	86	114	120	122	129	137	144	134	121	125	115	87	85	88	87		64
5	52	51	53	N	N	N	25	71	102	122	137	134	136	136	132	123	108	99	84	80	82	80	66	62
6	53	48	47	35	48	29	37	77	121	122	133	137	141	133	124	131	120	108	103	84	77	67	52	46
7	48	52	44	36	34	37	40	82	100	111	127	124	128	141	146	126	116	114	105	83	77	66	42	34
8	43	49	46	41	40	37	46	77	115	128	138	154	142	151	152	141	125	105	106	88	81	52	42	32
9	52	52	32	40	N		32	80	123	118	134	146	151	160	153	138	122	112	96	78	77	69	53	42
10		43	37	42	41	44		85	107	129	140	131	133	145	149	143	138	119	83	77	82	79	53	46
11	43	41	43	44	35	35	37	81	107	111	122	131	134	145	144	138	127	107	87	A	84	72	38	34
12	34	31	31	37	37	N	30	70	121	104	108	131	133	130	122	122	122	116	103	80	86	86	53	43
13	42	43	31	40	36	N	28	67	107	122	121	133		122	134	134	121	121	103	86	86	73	52	43
14	40	46	42	43	36	23	32	72	108	126	139	145	138	148	166	169	157	142	142	125	103	75	62	53
15	42	52	56	46	31	38	42	78	102	106	124	134	137	132	131	134	128	122	107	89	79	85	66	48
16	40	36	N	38	38	36	34	73	88	99	116	130	122	135	150	154	146	144	143	137	129	86	78	66
17	43		50	33	37	44	54	75	87	104	125	126	122	122	122	126	116	113	103	91	87	64	58	44
18	31	46	30	35	36	31	30	78	102	111	128	117	118	119	129	136	126	117	103	88	89	79	66	42
19	32	34	44	46	30	N	30	71	109	109	124	144	146	144	140	126	129	124	111	88	86	77	66	63
20	54	52	32	40	40	24	N	61	82	106	104	111	123	115	121	140	128	108	97	67	77	70	42	30
21	36	28	28	30	33	A	26	63	90	111	118	135		120	136	127	108	90	65	69	84	61	42	34
22	36	36	31	36	32	32	31	54	94	111	124	125	130	133	142	135	131	122	86	78	90	80	43	29
23	30	28	36	35	31	31	32	63	93	105	107	111	107	127	135	122	109	99	73	65	64	59	52	46
24	49	N	41	38	37	30	25	62	88	105	113	114	117	114	117	114	111	92	84	73	71	67	32	32
25	32	35	38	34	34	36	31	61	88	103	122	129	116	126	128	127	116	100	97	67	72	62	58	C
26	32	48	42	42	48	31	30	57	88	124	115	110	138	148	138	126	120	102	87	71	64		25	27
27	42	32	30	37	35	29	30	68	86	112	101	101	111	135	133	126	120	96	81	83	77	62	30	26
28	31	30	30	29	24	28	32	52	78	86	97	110	116	117	130	119	114	104	67	58	58		25	
29	A	A		40	26	30	30	63	90	86	108	115	120	118	116	122	115	106	86	80	71	67	59	48
30	25	23	32	35	37	30	25	52	87	87	88	99	105	112	112	107	110	110	104	111	162	144	128	110
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	28	27	28	29	28	24	28	30	30	30	30	30	28	30	30	30	30	30	30	29	29	28	29	28
MED	42	43	42	38	36	32	32	72	101	111	122	129	128	134	134	129	120	110	97	83	82	72	53	45
U Q	50	51	46	42	37	36	38	80	108	122	128	134	137	144	142	136	128	119	105	90	88	80	64	62
L Q	33	34	31	35	31	29	30	63	88	105	113	115	119	122	128	123	116	104	86	75	77	66	42	34

COMMUNICATIONS RESEARCH LABORATORY, JAPAN

HOURLY VALUES OF FES AT YAMAGAWA

NOV. 1988

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	32	25	G	G	G	43	70	48	54	55	48	44	61	71	38	G	G	25	G	G
2	G	G	G	G	G	108	G	G	G	43	48	60	56	62	62	60	42	G	G	38	23	G	G	G
3	G	G	G	25	26	24	G	31	40	46	50	48	G	58	48	57	55	68	40	44	34	G	G	23
4	24	G	26	27	G	G	G	G	47	62	G	G	G	51	G	43	G	32	24	G	45	G		24
5	24	26	G	G	G	G	G	32	G	40	43	48	50	G	45	G	G	29	G	28	G	G	24	G
6	G	G	G	26	G	G	G	G	G	42	G	G	G	G	G	G	40	31	49	G	G	G	G	G
7	G	G	G	G	G	G	G	G	G	G	55	48	46	45	58	G	38	G	G	G	G	G	G	G
8	G	G	G	G	G	G	G	G	G	G	G	G	50	54	68	65	G	28	40	G	G	G	G	G
9	G	G	G	31	26	26	G	G	G	39	G	G	G	G	42	39	40	G	G	G	G	G	G	G
10	G	G	G	30	24	G	33	31	G	G	47	G	44	G	50	42	46	47	41	25	G	G	G	G
11	G	G	G	G	G	G	G	G	G	G	72	46	50	46	46	45	43	37	44	33	G	G	G	G
12	G	G	G	G	G	G	G	G	G	G	46	44	50	44	78	G	104	46	30	24	G	G	G	G
13	G	G	G	G	G	G	G	28	G	42	48	49	48	52	G	G	G	G	G	G	G	G	G	G
14	G	G	G	G	G	G	G	G	G	G	43	G	49	46	65	39	G	G	G	G	G	G	G	G
15	G	G	G	G	G	G	G	G	G	G	G	49	52	68	43	50	39	G	24	30	G	G	G	G
16	G	G	G	G	G	G	G	G	36	G	G	47	G	G	G	49	48	G	29	30	36	G	G	G
17	G		G	G	26	26	33	G	G	43	G	46	48	G	50	43	G	28	G	29	G	G	G	G
18	G	G	G	G	G	G	G	G	G	G	G	49	50	55	42	G	G	29	G	G	G	G	G	G
19	28	26	28	26	G	G	G	G	G	46	G	46	49	44	G	G	G	32	26	G	G	G	G	G
20	G	G	G	G	G	G	G	G	G	G	G	45	52	48	48	42	G	G	38	G	G	G	G	G
21	G	G	G	G	G	28	G	G	G	39	41	71	G	43	44	40	34	G	G	G	G	G	G	G
22	G	G	G	G	G	G	G	G	G	G	55	G	44	46	44	50	35	G	31	G	G	G	G	G
23	G	G	G	G	G	G	G	G	G	G	G	70	46	G	45	38	G	34	36	32	33	29	G	G
24	G	G	G	G	G	G	G	G	G	G	45	47	45	45	43	G	G	G	G	G	G	G	G	G
25	G	G	G	G	G	G	G	G	G	G	G	47	48	G	G	42	36	G	G	G	G	G	G	C
26	G	G	G	G	G	G	G	68	G	G	G	46	G	47	58	38	G	G	G	32	34	39	34	29
27	G	24	G	G	G	G	G	G	G	G	G	G	G	G	G	G	50	40	G	23	G	27	G	G
28	G	G	G	G	G	G	G	G	G	G	44	57	60	76	65	56	G	G	G	G	24	34	30	26
29	37	24	32	G	G	G	G	24	33	G	G	53	G	72	58	47	G	G	29	30	G	G	G	G
30	G	24	G	G	G	G	G	20	G	G	G	50	G	G	56	49	42	G	24	33	24	G	G	G
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	30	29	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	29	29
MED	G	G	G	G	G	G	G	G	G	G	G	47	47	46	46	42	34	G	24	G	G	G	G	G
U Q	G	G	G	G	G	G	G	G	G	42	47	49	50	54	58	49	42	32	36	30	23	G	G	G
L Q	G	G	G	G	G	G	G	G	G	G	G	G	G	G	42	G	G	G	G	G	G	G	G	G

COMMUNICATIONS RESEARCH LABORATORY, JAPAN

HOURLY VALUES OF FMIN AT YAMAGAWA

NOV. 1988

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	17	17	18	22	24	28	24	23	18	17	16	15	15	15	16	15	15
2	15	15	15	15	15	15	15	15	16	18	23	29	27	24	24	18	16	18	15	15	15	16	15	15
3	16	15	15	16	15	16	15	15	16	16	18	23	21	22	23	20	15	15	15	15	15	15	15	15
4	16	15	15	16	15	15	15	20	15	16	17	20	22	21	20	16	15	15	15	15	15	16		15
5	16	15	15	15	15	17	15	16	15	18	20	20	18	18	21	20	16	18	15	15	18	15	15	15
6	15	15	15	15	15	16	16	21	16	16	20	21	22	20	23	18	16	16	15	15	15	15	15	15
7	15	15	15	15	15	15	15	16	15	16	18	18	21	23	21	17	16	22	15	15	15	15	15	15
8	15	15	15	15	15	16	15	15	16	18	22	22	21	24	18	18	15	16	15	15	15	15	15	15
9	15	15	15	15	15	15	15	17	15	16	22	22	22	21	20	17	16	16	15	15	15	15	15	15
10	16	15	15	15	15	15	15	15	16	15	16	21	23	21	16	15	17	16	15	15	17	15	15	15
11	15	15	15	15	15	15	15	15	15	16	17	21	23	23	20	20	17	15	15	15	15	15	15	15
12	15	15	15	15	15	15	16	15	16	16	17	17	26	23	22	20	17	16	15	16	15	15	15	15
13	15	15	15	15	15	15	15	15	16	16	21	30	27	22	23	36	17	22	15	15	15	15	15	15
14	15	15	15	15	15	15	16	15	18	22	20	43	21	18	16	16	15	15	15	15	15	15	15	15
15	15	15	15	15	15	15	15	22	15	16	18	23	27	22	20	17	17	16	15	15	15	15	15	15
16	15	15	15	16	15	15	15	21	16	20	22	23	26	23	36	20	16	15	15	15	15	15	16	15
17	15		15	15	15	15	15	15	15	17	20	21	20	22	20	20	15	16	15	15	15	15	15	15
18	16	15	15	15	15	15	15	21	16	15	20	21	21	20	21	21	15	16	15	15	15	14	15	15
19	15	15	15	15	15	15	15	15	17	17	18	20	22	20	20	18	15	16	15	16	15	15	15	15
20	15	15	15	15	15	15	15	15	16	16	18	17	22	20	21	16	15	21	15	15	15	15	15	15
21	15	15	15	15	15	16	16	18	15	16	18	23	21	22	20	16	15	20	15	15	15	15	15	15
22	15	15	15	15	15	15	15	16	18	15	21	18	21	21	21	20	16	15	15	15	15	15	15	16
23	15	15	15	15	15	15	15	17	15	15	16	18	17	20	16	17	15	15	15	15	15	15	15	15
24	15	15	15	15	15	15	15	17	16	15	16	16	17	21	18	16	15	16	15	15	15	15	15	15
25	15	15	15	15	15	15	15	16	16	16	16	20	18	21	18	17	16	15	16	15	15	15	15	C
26	15	15	15	15	15	15	15	20	16	17	17	20	18	20	17	17	16	21	15	15	15	15	15	15
27	16	15	15	15	15	15	15	17	15	17	17	20	23	18	18	16	15	15	15	15	15	15	15	15
28	15	15	15	15	15	15	15	17	18	15	17	17	24	18	16	16	16	20	15	15	15	15	15	15
29	15	15	15	15	15	15	15	16	16	16	17	20	18	18	17	16	16	15	16	15	15	15	15	15
30	15	15	15	16	15	15	16	17	15	15	16	21	18	20	20	16	16	21	15	15	15	16	15	15
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	30	29	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	29	29
MED	15	15	15	15	15	15	15	16	16	16	18	21	22	21	20	17	16	16	15	15	15	15	15	15
U Q	15	15	15	15	15	15	15	17	16	17	20	23	23	22	21	20	16	18	15	15	15	15	15	15
L Q	15	15	15	15	15	15	15	15	15	16	17	20	20	20	18	16	15	15	15	15	15	15	15	15

COMMUNICATIONS RESEARCH LABORATORY, JAPAN

HOURLY VALUES OF FOF2 AT OKINAWA

NOV. 1988

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	35	35	49	55	66	37	A	84	90	102	92	124		143	146	148	146	163	168	167	168	89	106	83
2	90	81	68	59	35	31	37	84	90	104	114	130	142	146	167	170	164	169	171	164	146	86	90	86
3	84	51	54	52	38	32	35	78	90	89		120	119	145					144	146	145	101	86	
4	80	79	82	81	44	29		78	104	92	103	129	146	146		130	124	142	122	103	109	144	141	86
5	84	88	62	42			28	66	91	79	132	140	141	146	146	145	N	146	131	74	83	106	80	83
6	67	53		53	44	34	34	66	108	108	112	144	145	158	144	145	147	143	112	N	103	81	90	80
7	79	84	67	49	30	34	36	83	90	108	106	137		146	146	129	130	144	163	144	90	103	84	
8	53	67	58	53	36	26	25	78	110	108	144	172	168	171	183	196	170	172	164	146	84	73	87	66
9	79	66	54	41	49	30	31	64	108	122	143	158	172	170	181	164	146	146	146	88	103	104		88
10	80	66	64	66	66		54	91	85	128	N	141	146	169	177	177	178	174	98	81	82	84	87	66
11	66	54	44	47	31	30	34	66	103	104	C	127	146	164	170	168	162	164	163	N	130	110	80	88
12	66	54	54	59	52	34		65	108	108	108	135	144	138	132		141	128	123	104	110	130	90	82
13	67	68	35	32	44			66	104	129	124	125	124	128	152	164	146	142	153	134	107	107	88	86
14	81	78	66	64	59	31	32	76	112	124	146		146	177	192	178		175	182	154	162	144	103	87
15	86	84	84	80	66	62	53	85	89	106	135	142	135	135	138	144	145	146	138		110	91	88	86
16	66	52	48	52	52	49	32	66	90	105	106	142		160	171	184	180	193	184		N	145	89	
17	87	77	68	60	51	49		66	90	121	124	128	119	124	133	134	134		136	103	111	106	88	85
18	65	66	48	40	39	26	32	62	91	111	121	137	122	122	132	158	162	172	177	177	161	170	133	88
19	70	66	62	66	44	31	31	72	110	137	144	162	170	177	177	167	177	176	177	163	162	144	126	90
20	84	88	83	72	66	38	34	63	88	101	109	112	130	144	132	141	163	160	165	131	112	110	89	85
21	61	53	32	41	37	25	28	54	94	120	141	124	147	162	176	187	N	145	108	84	120	110	78	65
22	66		53	46	32	32		52	94	120	126	142	162	169	171	170	170	171	162	111	128	141	89	66
23	61	62	59	63	43	37		54	90	116	111	117	121	N	147	161	158	145	108	85	88	84	82	76
24	66	64	59	42	44	32	27	60	86	111	124	127	139	144	161	174	146	133	130	108	88	88	78	64
25	60	54	50	42	31	27	28	58	90	103	128	142	144	158	160	151	146	144	143	108	88	90	87	88
26	83	70	66	63	58	32	32	66	84	121	120	111	145	163	162	171	170	162	145	130	103	90	90	80
27	53	66	66	55	57	44	30	66	111	N	128	106	126	158	171	160	171	166	145	146	132	108	87	83
28	71	62	52	51	44	32	35	62	77	93	93	96	113	130	138	147	163	145	127	87	77	88	72	56
29	32	A	46	43	A			54		92	103	115	144	144	126	148	162	163	171	145	128	108	90	86
30	67	62	56	52	46	44	26	62	90	90	94	88	108		112	110	122	142	158	192		N	176	131
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	30	28	29	30	28	26	22	30	29	29	27	29	27	28	28	28	26	28	30	26	28	29	29	27
MED	67	66	58	52	44	32	32	66	90	108	121	129	144	146	156	160	160	153	146	130	110	106	88	85
U Q	81	77	66	63	54	37	35	78	106	120	132	142	146	163	171	170	170	170	165	146	131	120	90	87
L Q	65	54	49	43	37	30	28	62	90	101	106	118	124	143	138	145	146	144	130	103	89	88	85	76

COMMUNICATIONS RESEARCH LABORATORY, JAPAN

HOURLY VALUES OF FES AT OKINAWA

NOV. 1988

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

D \ H	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
1	G	G	G	G	G	33	32	28	G	G	G	45	G	50	51	51	38	32	39	33	30	28	G	G
2	G	G	G	G	G	G	G	G	G	G	47	G	45	50	48	59	50	40	32	G	32	32	G	G
3	G	G	G	G	G	G	G	28	39	42	55	51	49	50	G	41	G	G	25	29	G	29	G	G
4	G	G	G	G	G	G	G	G	G	46	48	57	50	G	G	G	G	45	28	G	31	32	41	31
5	G	G	G	G		G	G	29	G	G	G	49	59	51	47	50	42	G	G	G	G	G	G	G
6	G	G	G	G	G	G	G	G	G	40	G	G	G	G	G	G	79	G	37	31	G	G	G	G
7	G	G	G	G	G	G	G	32	G	G	49	G	G	G	G	G	G	G	G	G	G	G	G	G
8	G	G	G	G	G	G	G	29	37	G	G	G	G	47	G	46	68	72	52	33	28	G	G	32
9	G	G	G	G	G	G	29	G	G	G	G	G	G	45	46	G	G	31	29	G	G	G	G	G
10	G	G	G	G	G	32	G	G	G	G	G	G	47	G	G	G	G	G	G	G	G	G	G	G
11	G	G	G	G	G	G	G	G	G	G	C	G	G	142	55	51	37	31	G	G	29	G	G	G
12	G	G	G	G	G	G	G	33	G	G	G	G	50	49	49	47	38	G	G	29	G	G	G	G
13	G	G	G	G	G	G		G	G	G	G	G	44	G	G	G	37	G	G	G	G	G	G	G
14	G	G	G	G	G	G	G	G	G	G	G		49	49	46	44		68	32	G	G	24	G	G
15	G	G	G	G	G	G	G	G	G	G	G	G	44	62	G	43	G	30	G	G	G	G	G	G
16	G	G	G	G	G	G	G	G	48	G	G	48	57	G	G	47	G	36	G	27	36	G	G	G
17	G	G	G	G	G	G	28	29	36	G	G	G	G	G	G	41	61	30	G	34	31	G	G	G
18	G	G	G	G	G	G	G	G	G	G	42	G	47	55	51	56	41	G	34	30	32	G	G	G
19	G	G	11	G	G	G	G	32	G	G	G	G	G	47	46	51	36	G	30	31	28	G	G	G
20	G	G	G	G	G	G	G	G	G	G	G	G	49	50	G	G	42	G	G	G	G	G	28	G
21	G	G	G	G	24	G	G	G	G	G	G	G	G	G	G	41	41	G	G	G	G	G	G	G
22	G		G	G	G	G		G	34	40	42	44	56	48	51	41	G	G	G	33	40	33	G	G
23	G	G	G	G	G	G	G	G	G	G	G	46	G	G	49	41	G	G	37	39	29	G	30	G
24	G	G	G	G	G	G	G	G	G	G	G	50	G	56	42	G	G	32	28	33	25	G	G	G
25	G	G	G	28	30	G	23	G	G	G	G	G	46	G	G	48	G	G	G	G	G	G	G	G
26	G	G	G	G	G	28	G	G	G	G	G	G	44	G	G	G	G	G	G	G	24	G	G	G
27	29	G	24	G	G	G	G	G	G	G	G	G	G	G	G	G	37	G	G	24	24	26	G	G
28	G	G	G	G	G	G	G	24	G	G	G	G	51	84	66	44	57	G	G	40	G	G	G	G
29	G	48	23	37	32	G	G	G	G	G	G	48	G	G	G	40	G	33	28	28	32	G	G	G
30	G	G	G	G	G	G	G	23	G	G	G	G	G	G	52	52	39	36	G	G		G	37	30
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	30	29	30	30	29	30	28	30	30	30	29	29	30	30	30	30	29	30	30	30	29	30	30	30
MED	G	G	G	G	G	G	G	G	G	G	G	G	44	46	G	41	37	G	G	12	24	G	G	G
U Q	G	G	G	G	G	G	G	28	G	G	G	45	49	50	49	48	41	32	30	31	30	G	G	G
L Q	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G

COMMUNICATIONS RESEARCH LABORATORY, JAPAN

HOURLY VALUES OF FMIN AT OKINAWA

NOV. 1988

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	15	15	15	15	15	15	23	22	22	28	24		26	26	22	21	16	14	15	15	15	17	15
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	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
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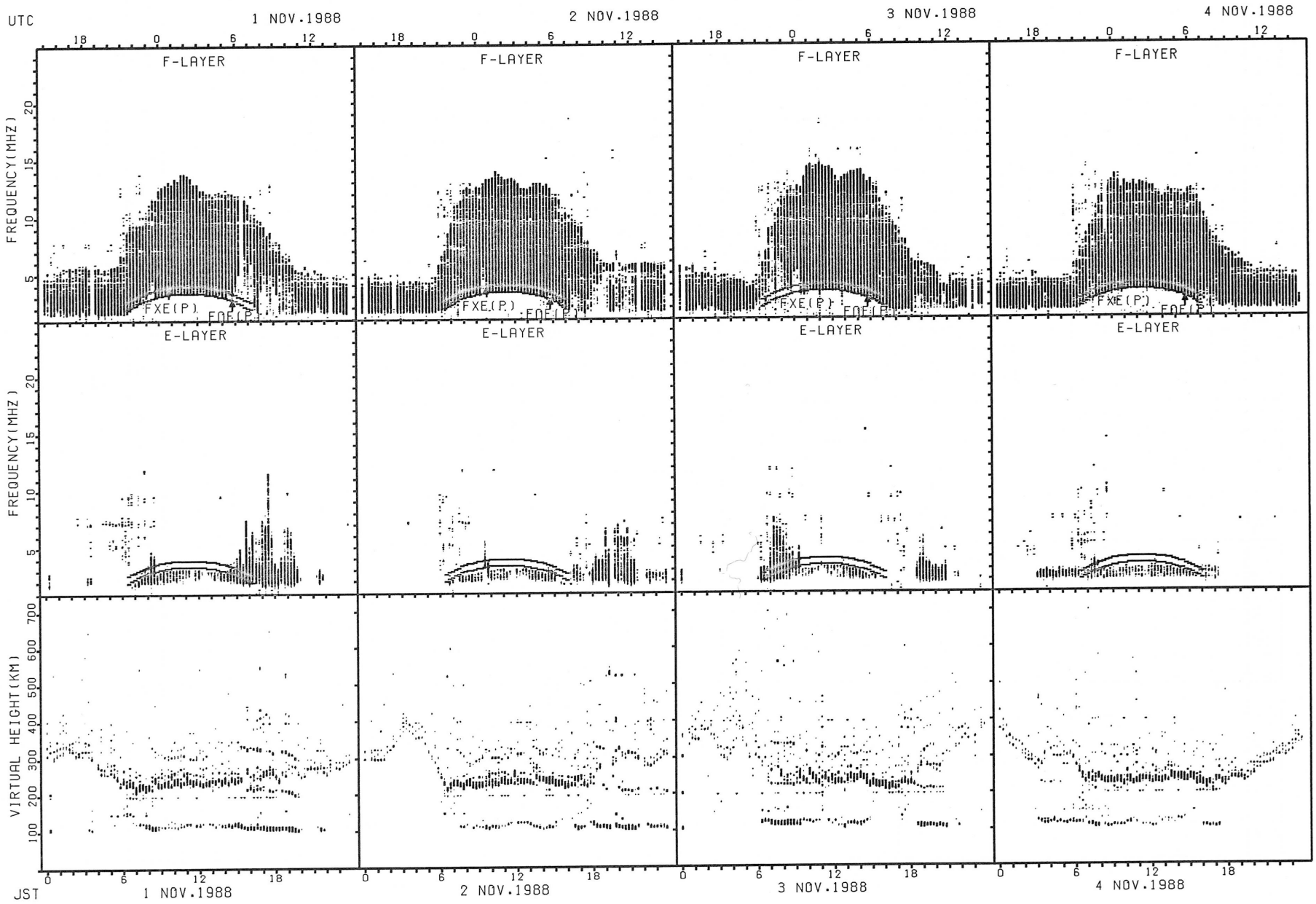
MED	15	15	15	15	15	15	15	19	16	20	22	23	24	26	24	22	18	15	15	15	15	15	15	15
U Q	15	15	15	15	15	15	15	20	18	21	23	25	27	26	26	23	20	18	15	15	15	15	15	15
L Q	15	15	15	15	15	15	15	16	15	17	21	22	24	23	23	21	16	15	15	15	15	15	15	15

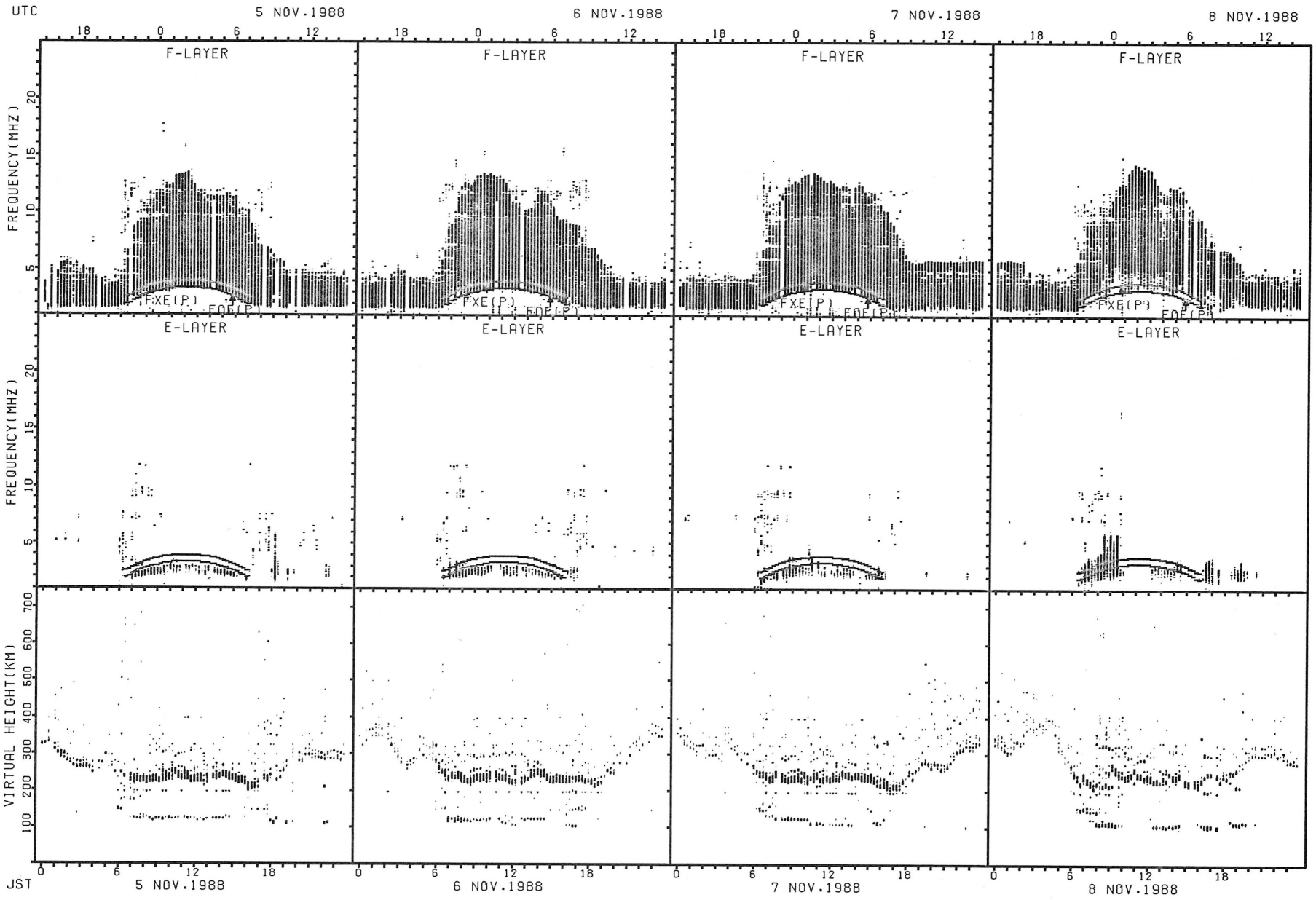
COMMUNICATIONS RESEARCH LABORATORY, JAPAN

SUMMARY PLOTS AT WAKKANAI

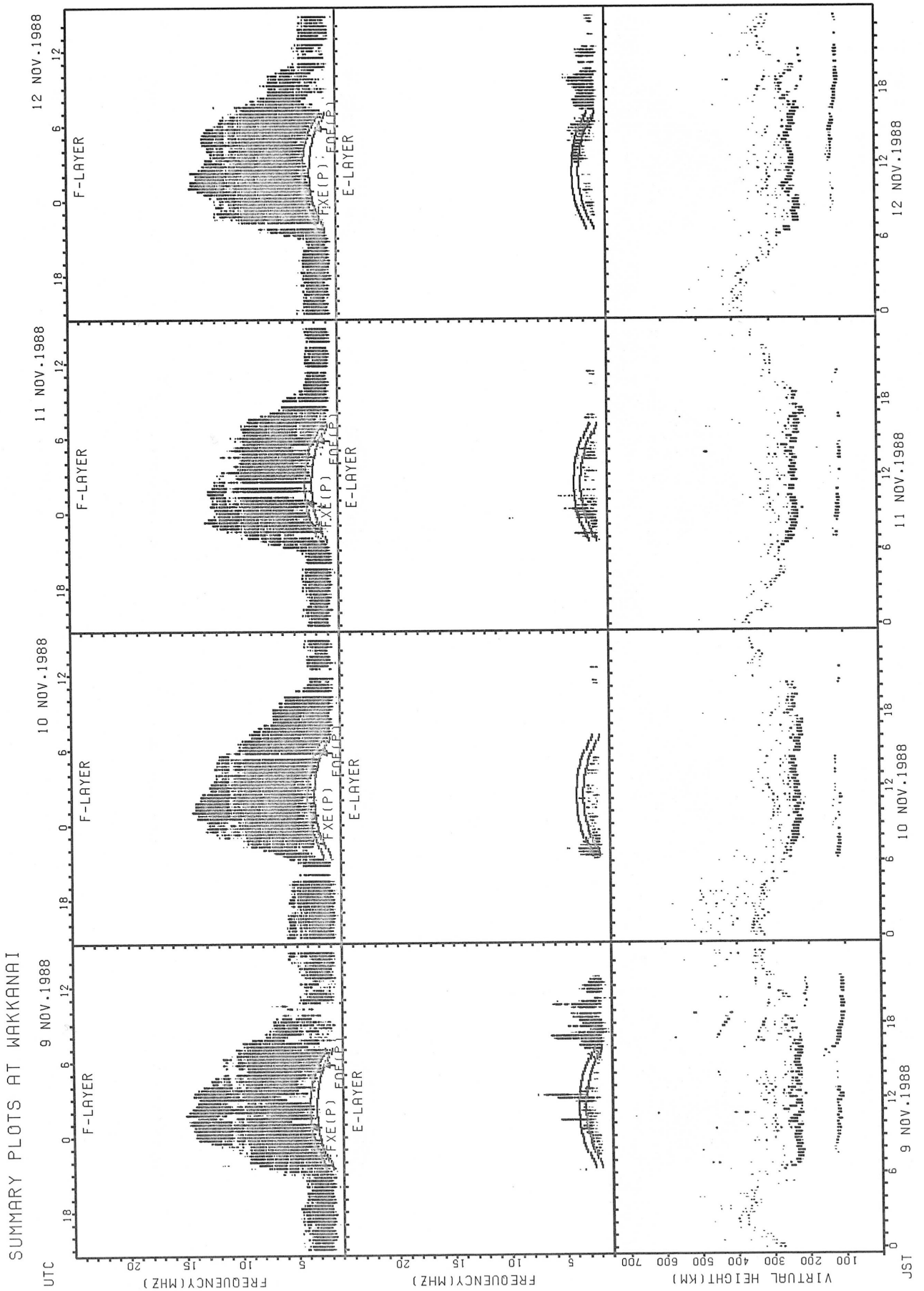


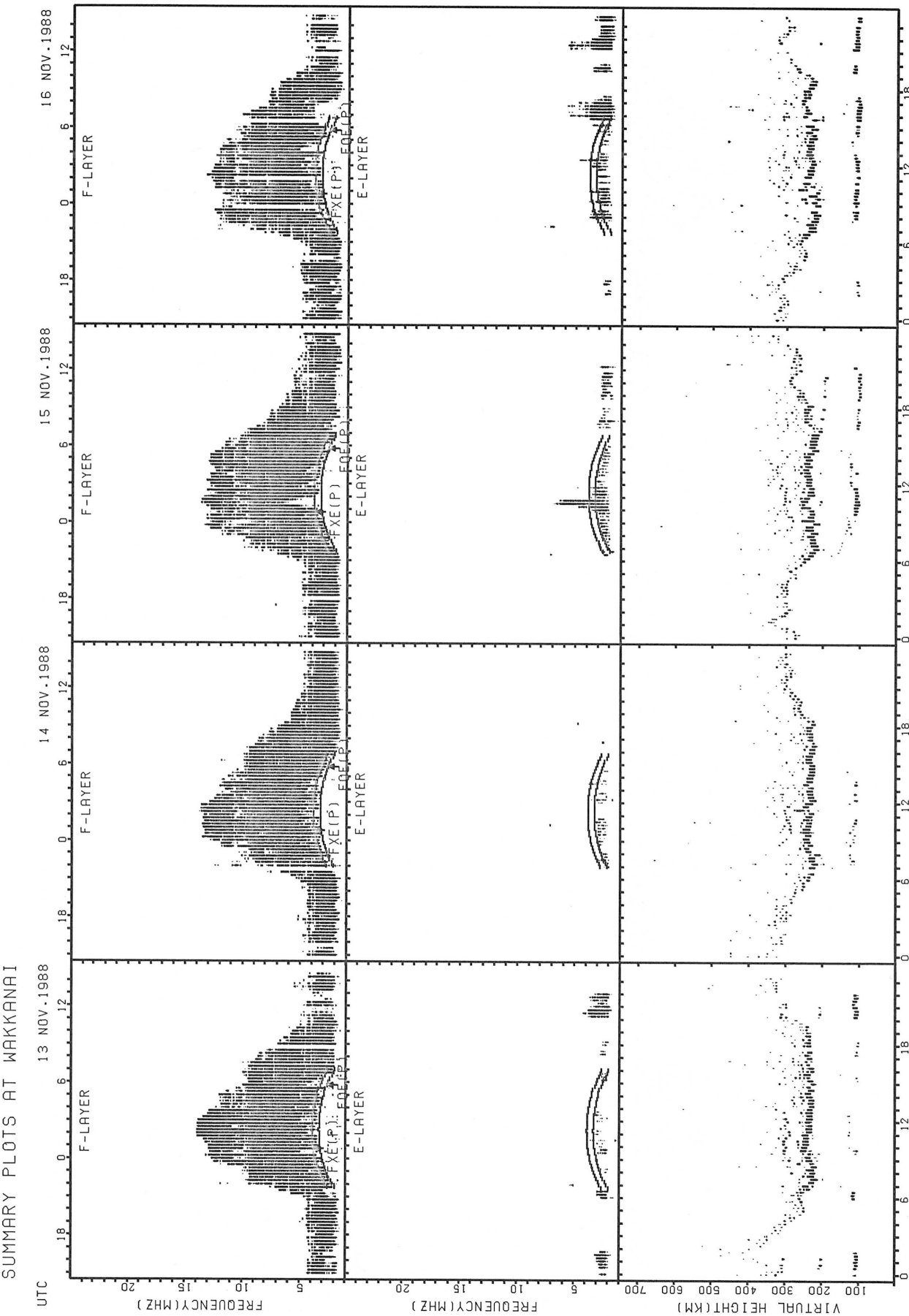
FXE(P); PREDICTED VALUE FOR FXE
FOE(P); PREDICTED VALUE FOR FOE

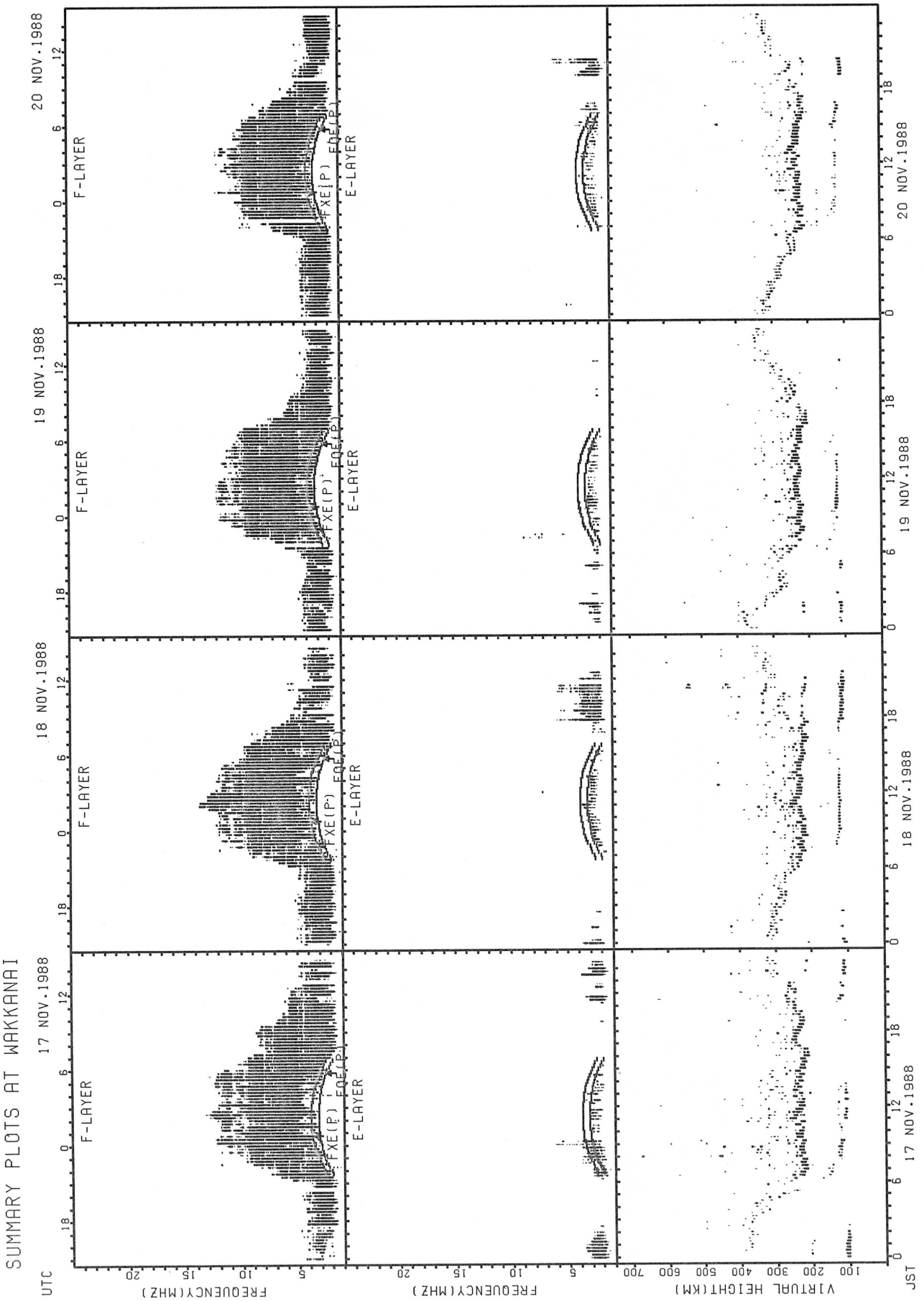
SUMMARY PLOTS AT WAKKANAI



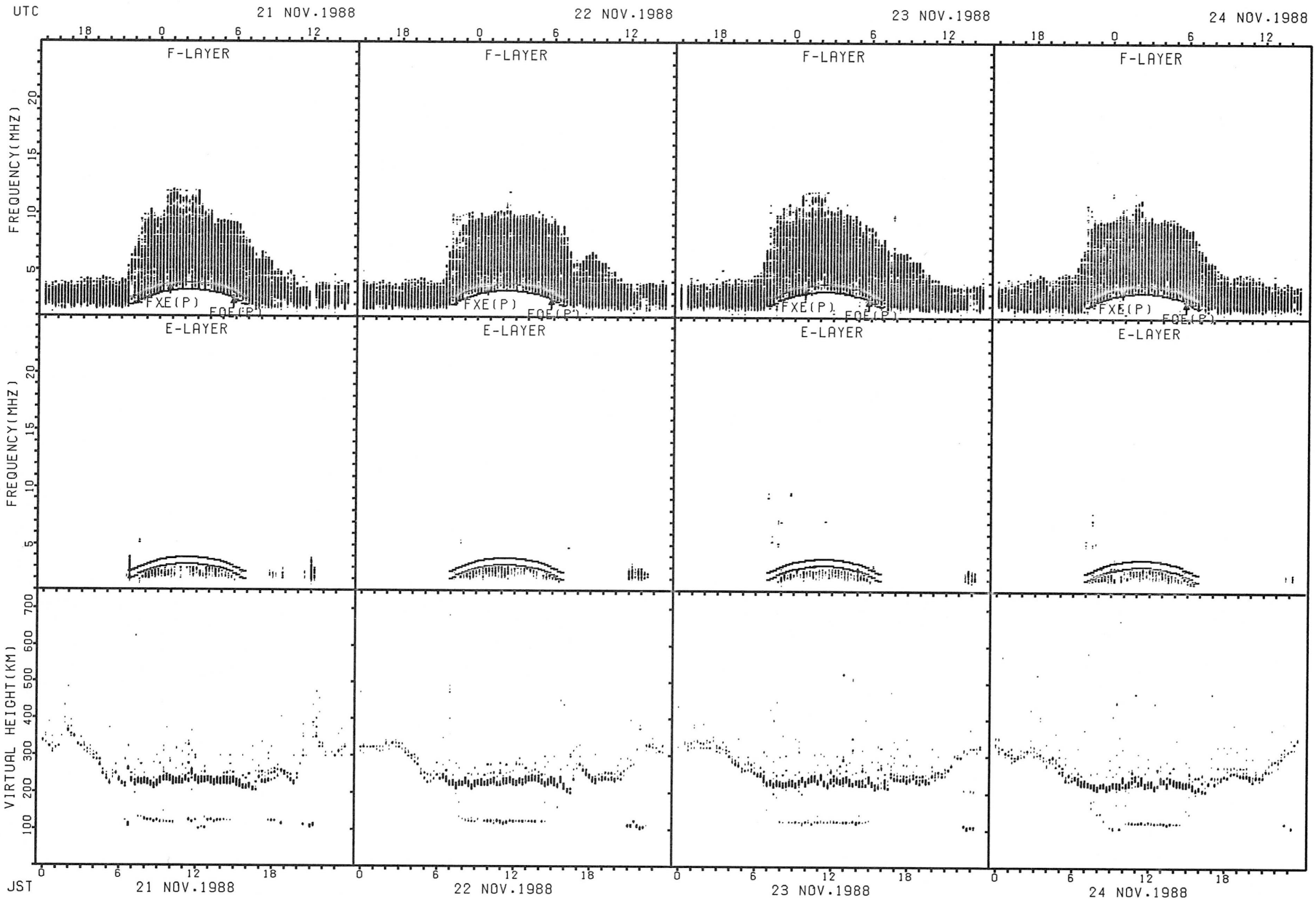
FXE(P); PREDICTED VALUE FOR FXE
FOE(P); PREDICTED VALUE FOR FOE


SUMMARY PLOTS AT WAKKANAI
9 NOV.1988
10 NOV.1988
11 NOV.1988
12 NOV.1988
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

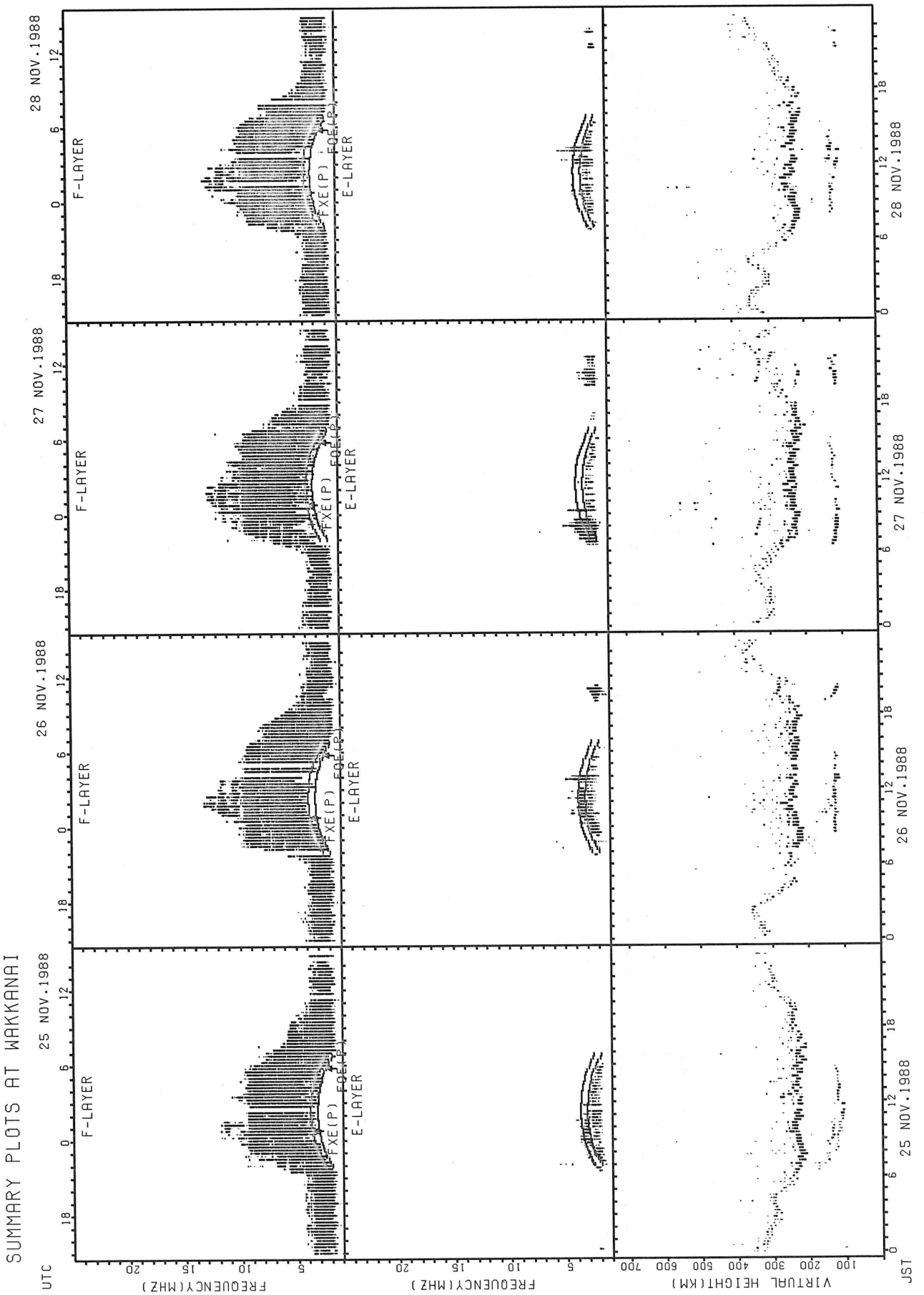

SUMMARY PLOTS AT WAKKANAI
UTC
13 NOV.1988
14 NOV.1988
15 NOV.1988
16 NOV.1988
F-LAYER
E-LAYER
FXE(P)
FOE(P)
FREQUENCY(MHZ)
VIRTUAL HEIGHT(KM)
JST
FXE(P): PREDICTED VALUE FOR FXE
FOE(P): PREDICTED VALUE FOR FOE


SUMMARY PLOTS AT WAKKANAI
UTC
17 NOV.1988
18 NOV.1988
19 NOV.1988
20 NOV.1988
F-LAYER
E-LAYER
FXE(P)
FOE(P)
FREQUENCY(MHZ)
VIRTUAL HEIGHT(KM)
JST
FXE(P): PREDICTED VALUE FOR FXE
FOE(P): PREDICTED VALUE FOR FOE

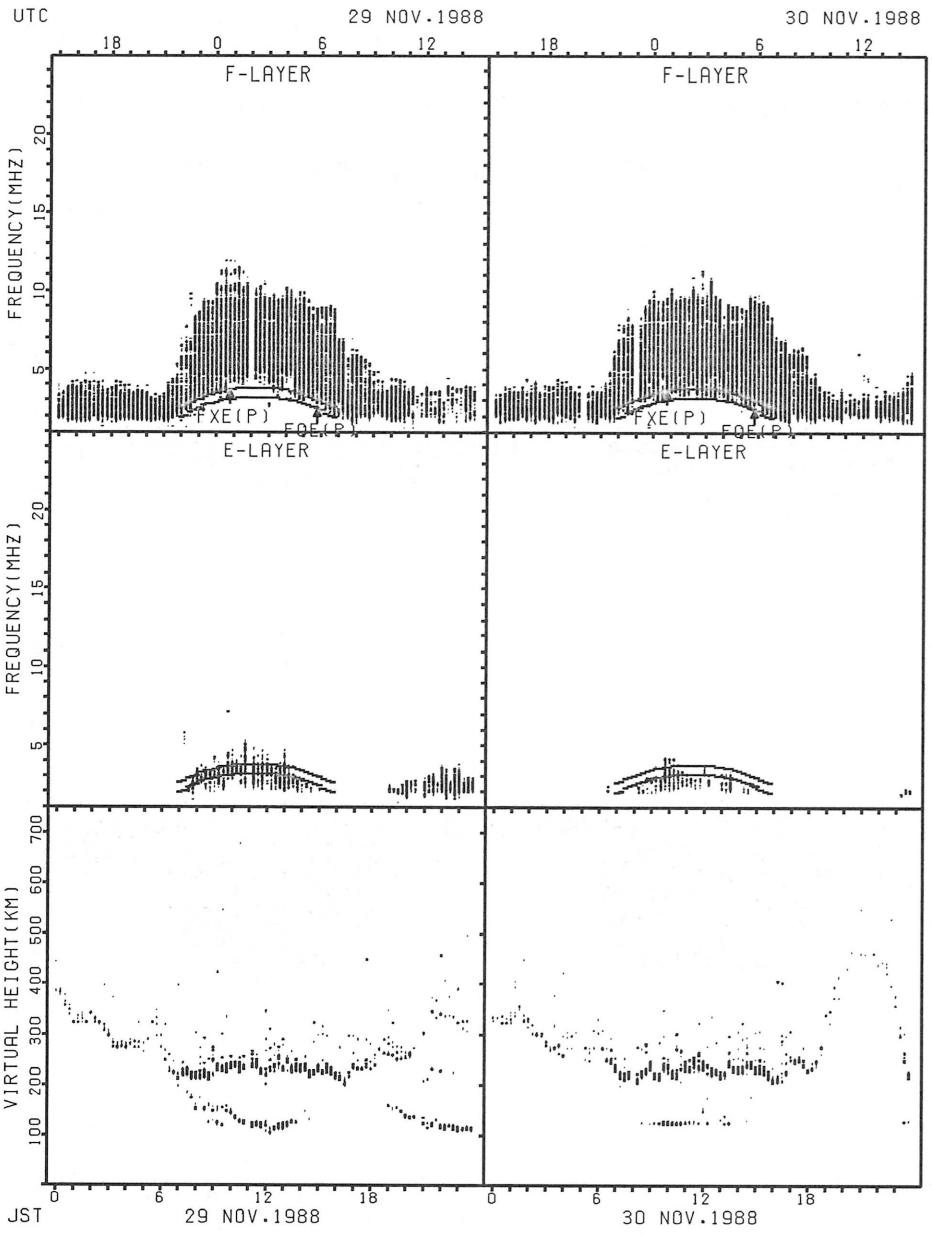
SUMMARY PLOTS AT WAKKANAI



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

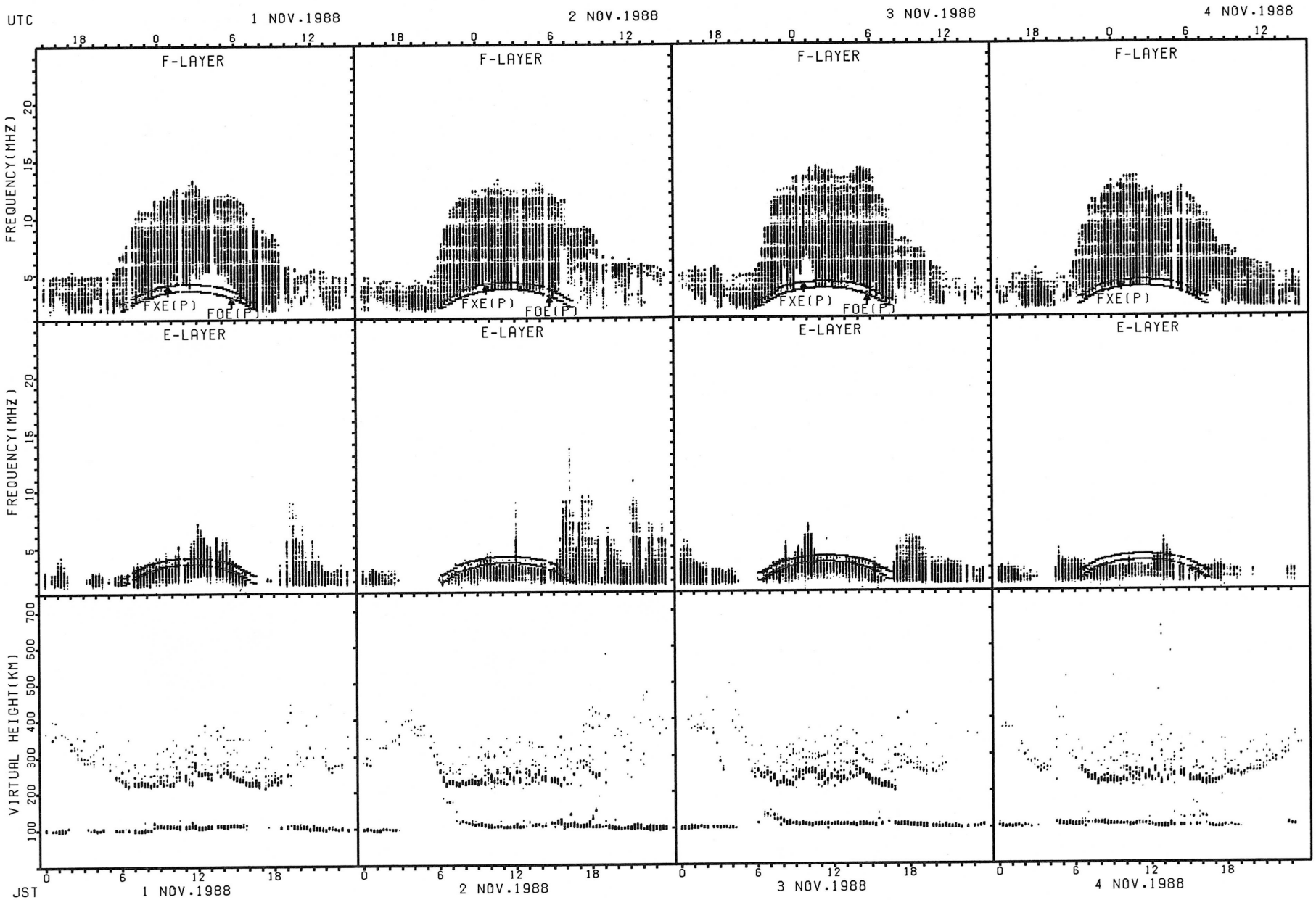

SUMMARY PLOTS AT WAKKANAI
UTC
25 NOV.1988
26 NOV.1988
27 NOV.1988
28 NOV.1988
F-LAYER
E-LAYER
FXE(P)
FOE(P)
FREQUENCY(MHZ)
VIRTUAL HEIGHT(KM)
JST
FXE(P): PREDICTED VALUE FOR FXE
FOE(P): PREDICTED VALUE FOR FOE

SUMMARY PLOTS AT WAKKANAI



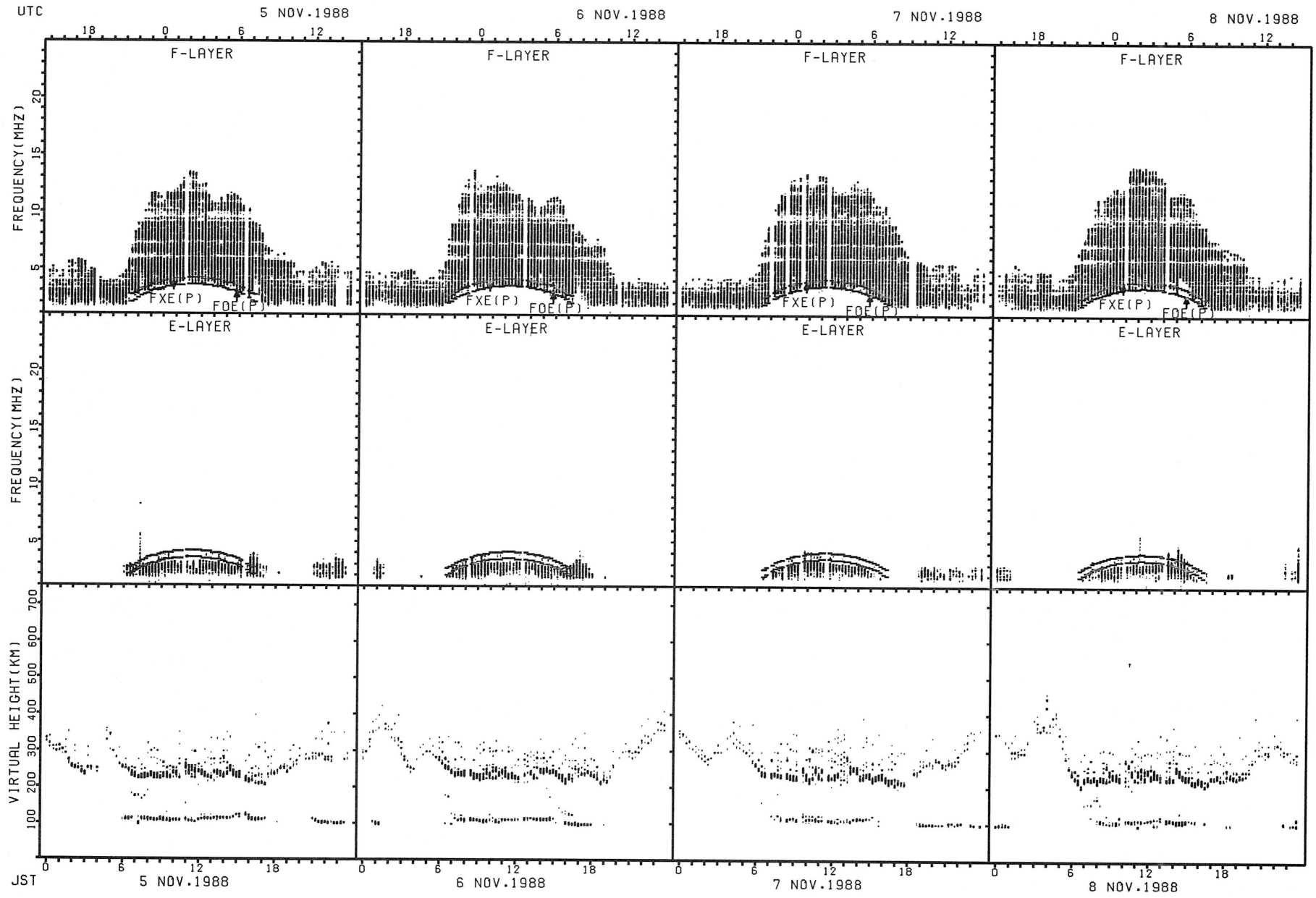
FXE(P): PREDICTED VALUE FOR FXE
FOE(P): PREDICTED VALUE FOR FOE

SUMMARY PLOTS AT AKITA

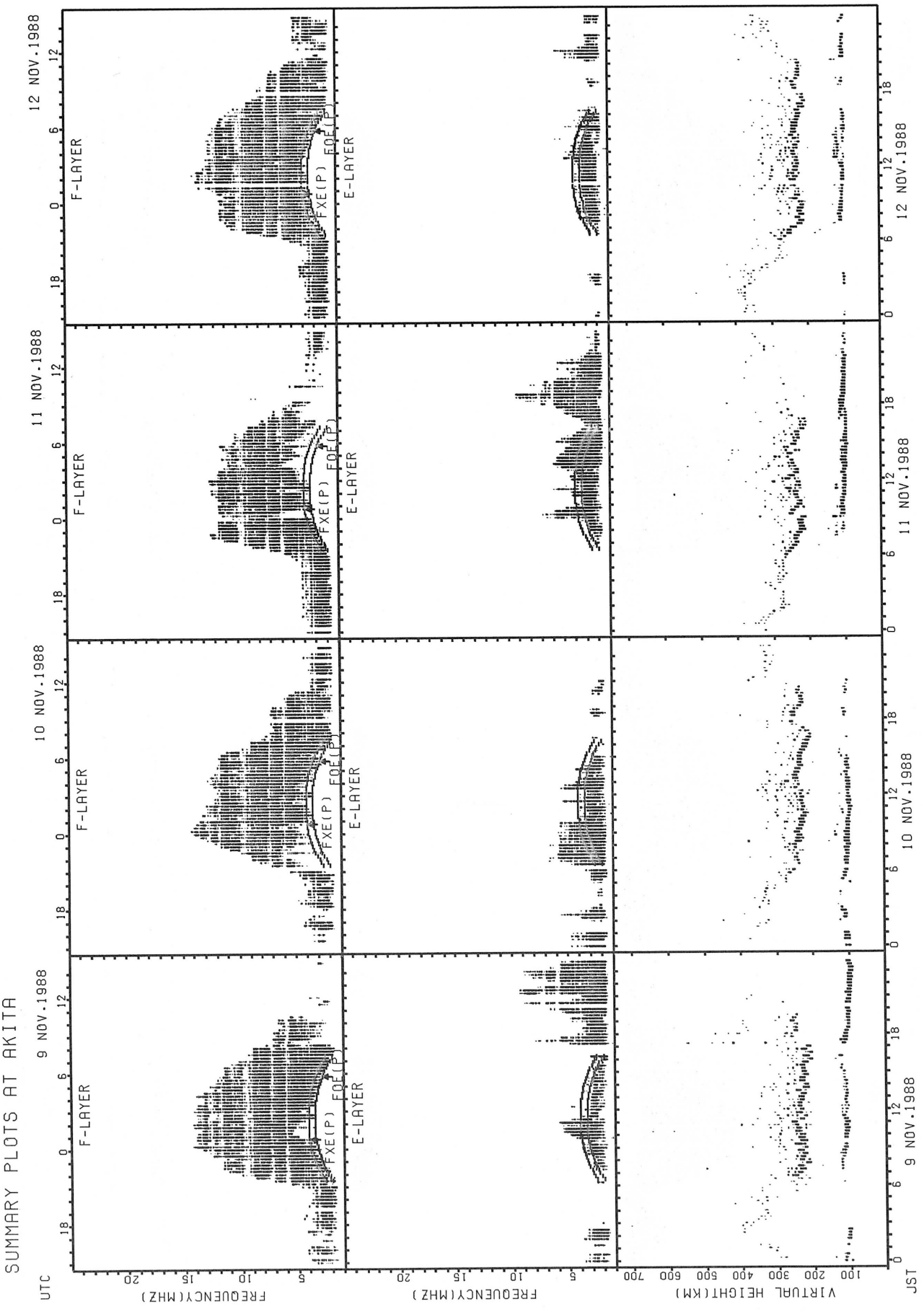


FXE(P); PREDICTED VALUE FOR FXE
FOE(P); PREDICTED VALUE FOR FOE

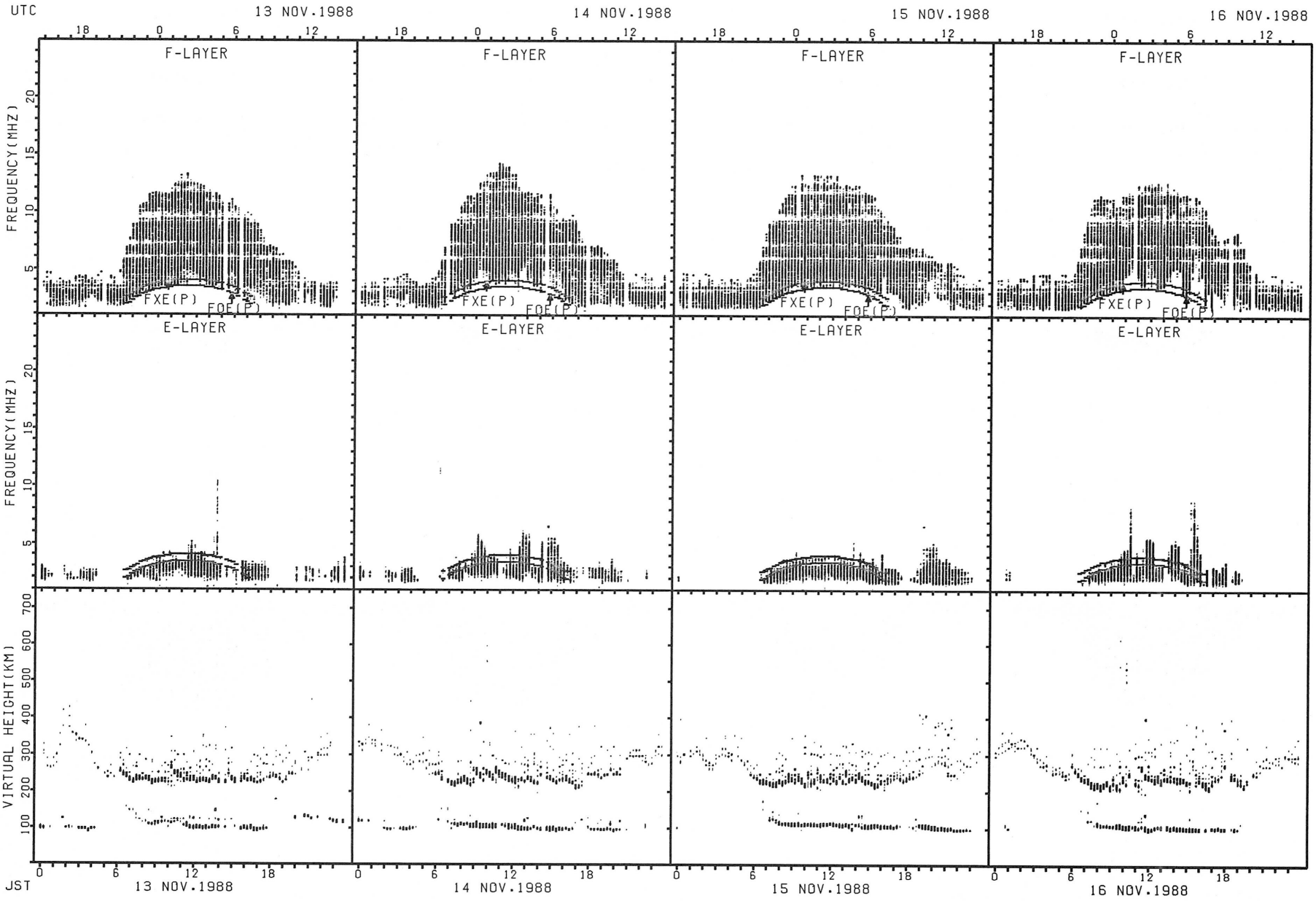
SUMMARY PLOTS AT AKITA



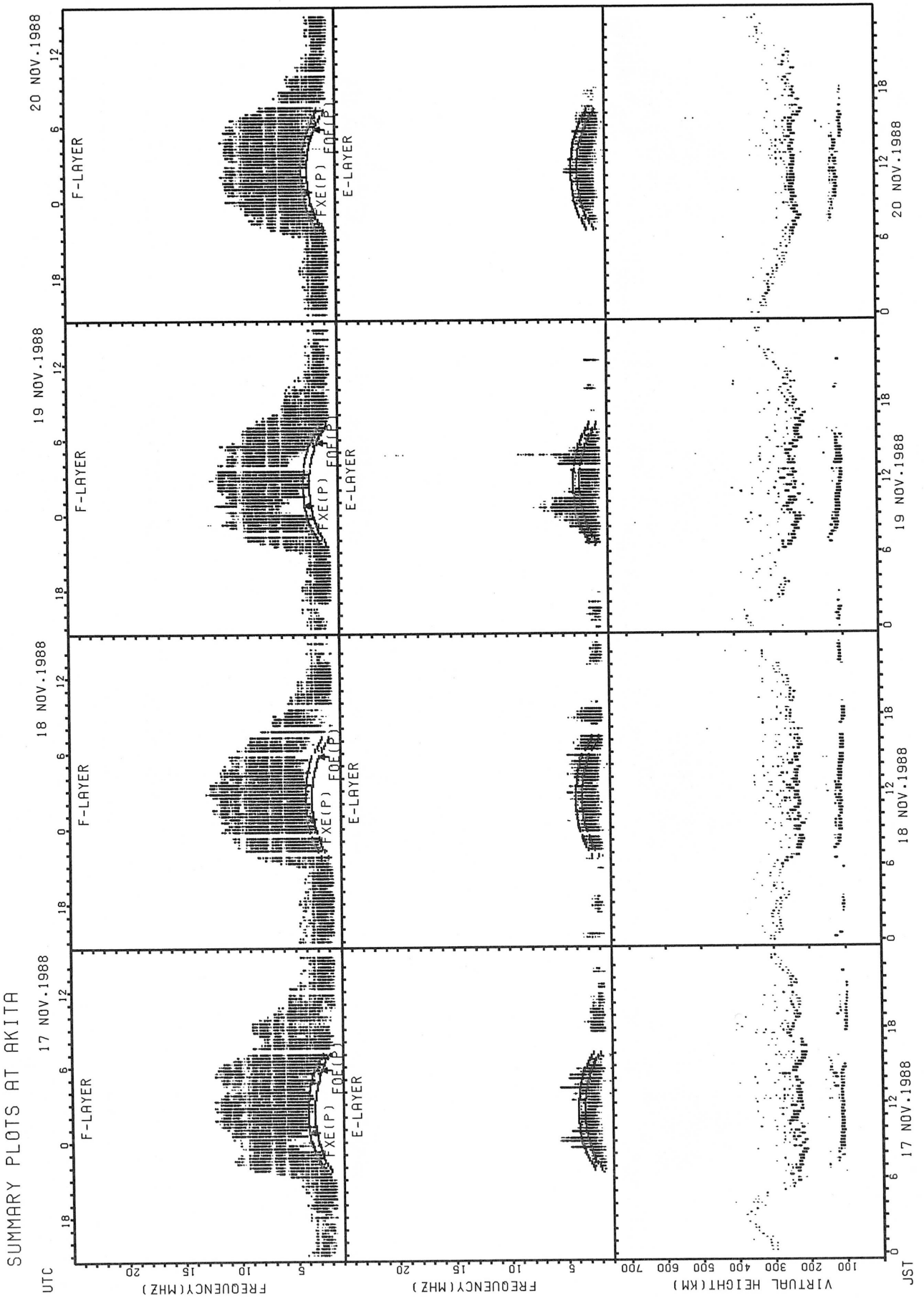
FXE(P): PREDICTED VALUE FOR FXE
FOE(P): PREDICTED VALUE FOR FOE


SUMMARY PLOTS AT AKITA
UTC
9 NOV.1988
10 NOV.1988
11 NOV.1988
12 NOV.1988
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

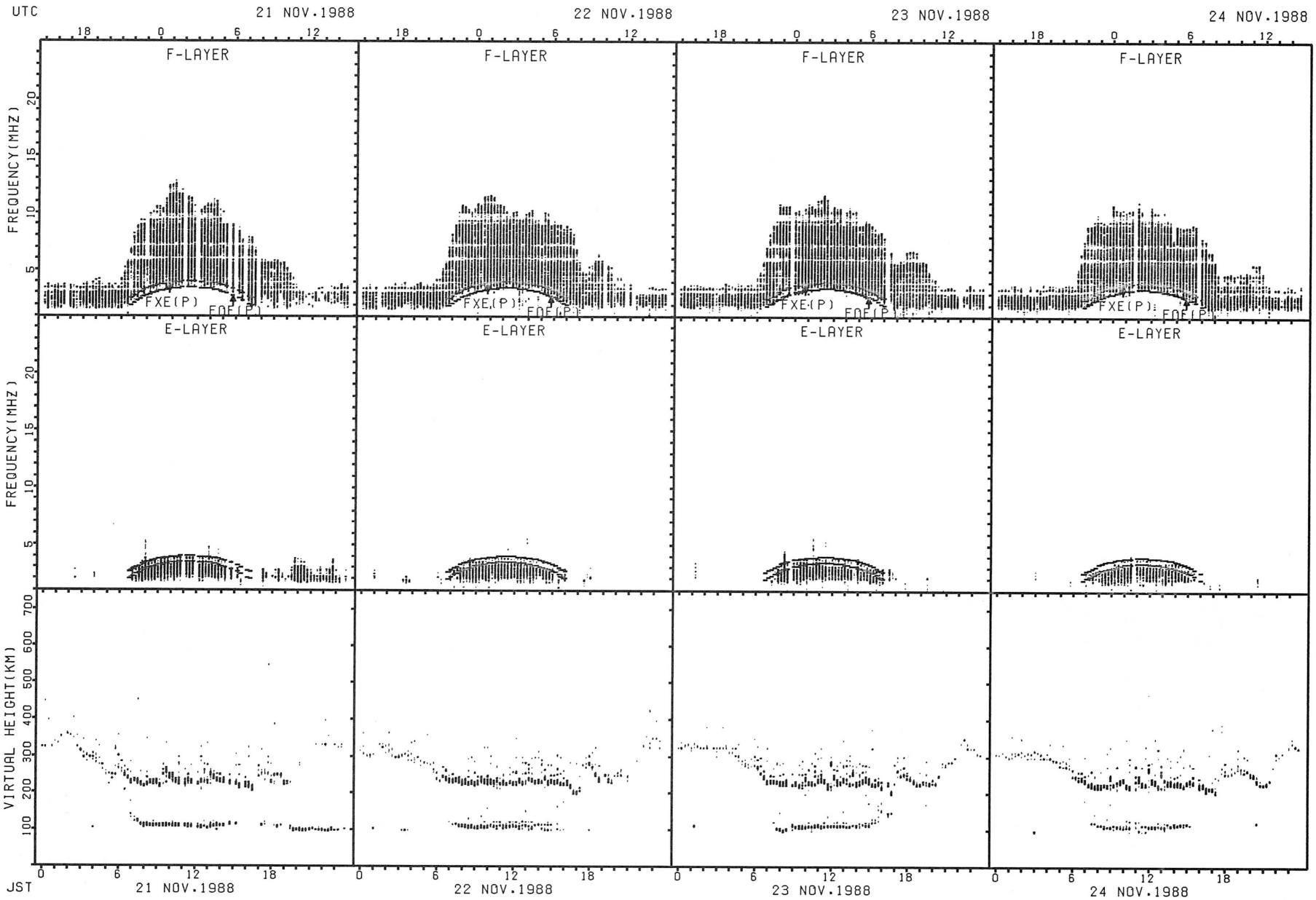
SUMMARY PLOTS AT AKITA



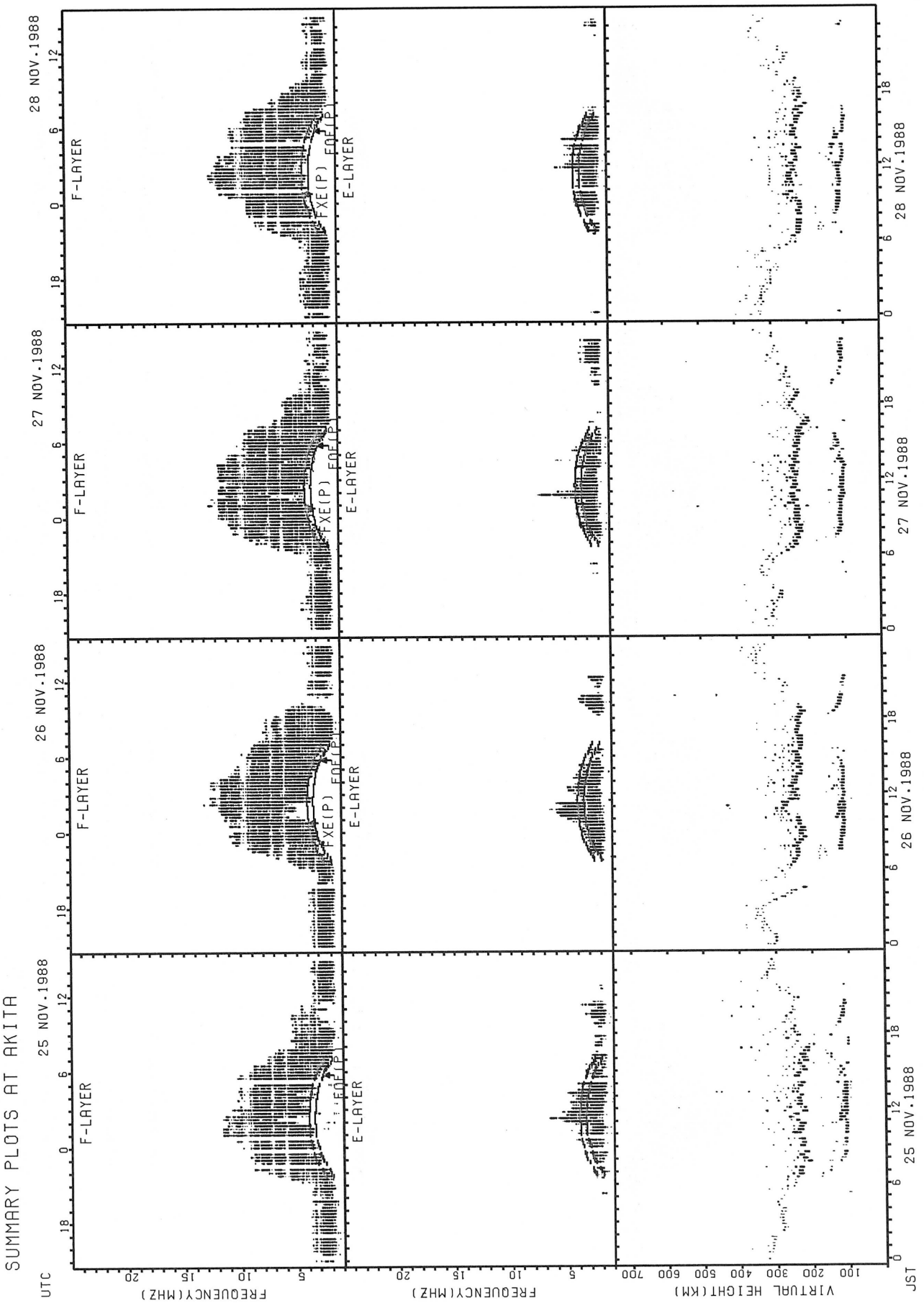
FXE(P): PREDICTED VALUE FOR FXE
FOE(P): PREDICTED VALUE FOR FOE


SUMMARY PLOTS AT AKITA
UTC
17 NOV.1988
18 NOV.1988
19 NOV.1988
20 NOV.1988
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

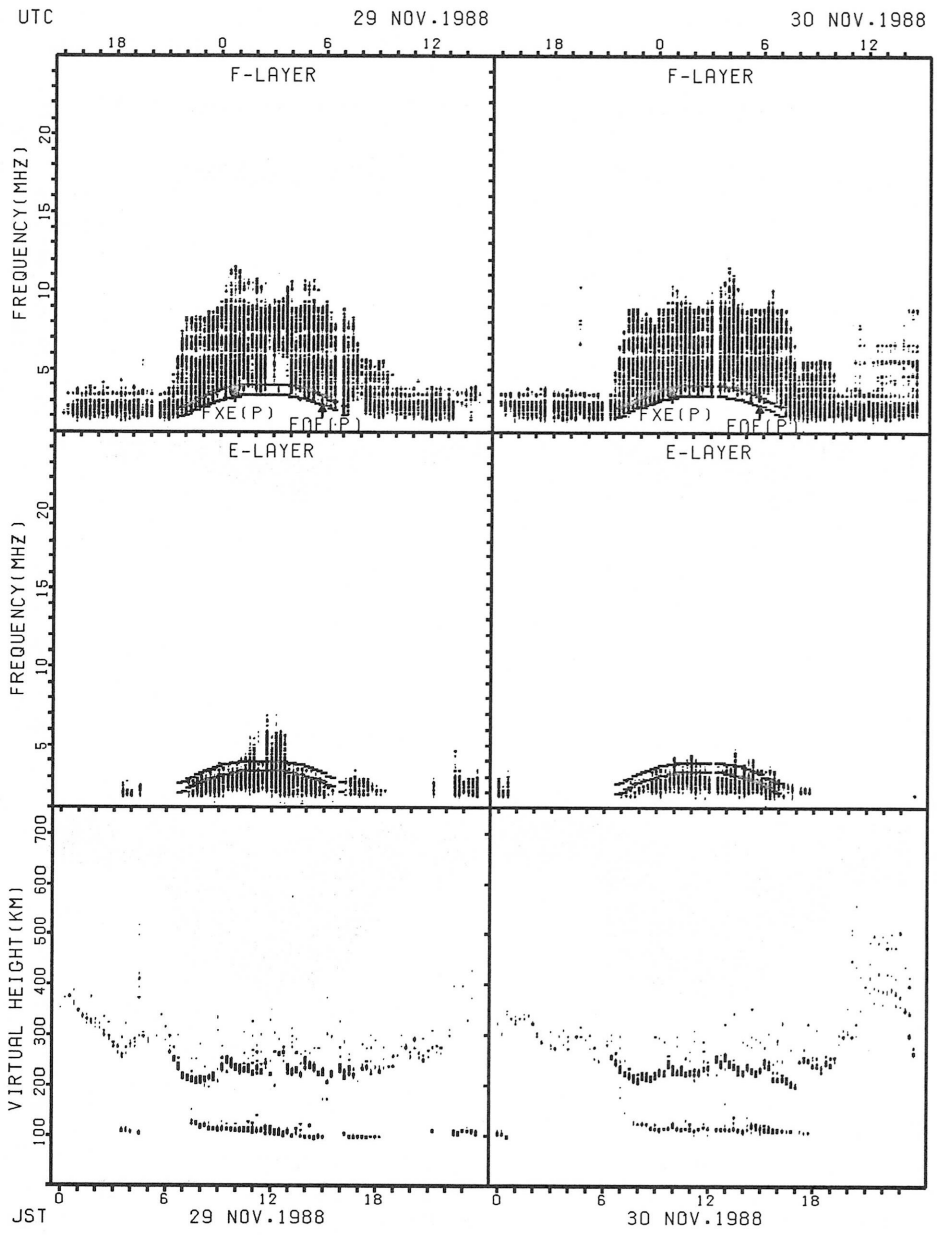
SUMMARY PLOTS AT AKITA



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

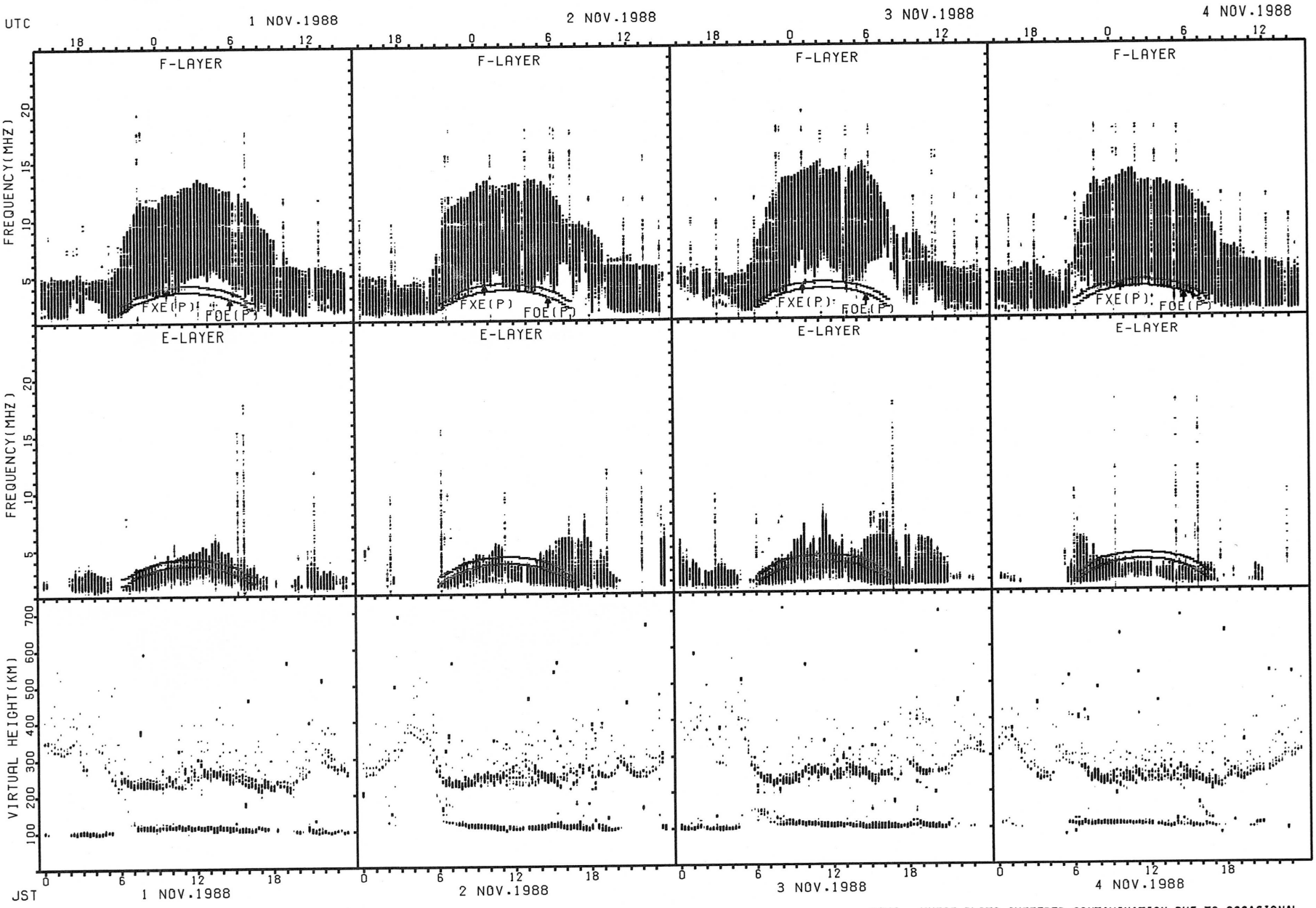

SUMMARY PLOTS AT AKITA
UTC
25 NOV.1988
26 NOV.1988
27 NOV.1988
28 NOV.1988
F-LAYER
E-LAYER
FXE(P)
FOE(P)
FREQUENCY(MHZ)
VIRTUAL HEIGHT(KM)
JST
FXE(P): PREDICTED VALUE FOR FXE
FOE(P): PREDICTED VALUE FOR FOE

SUMMARY PLOTS AT AKITA



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

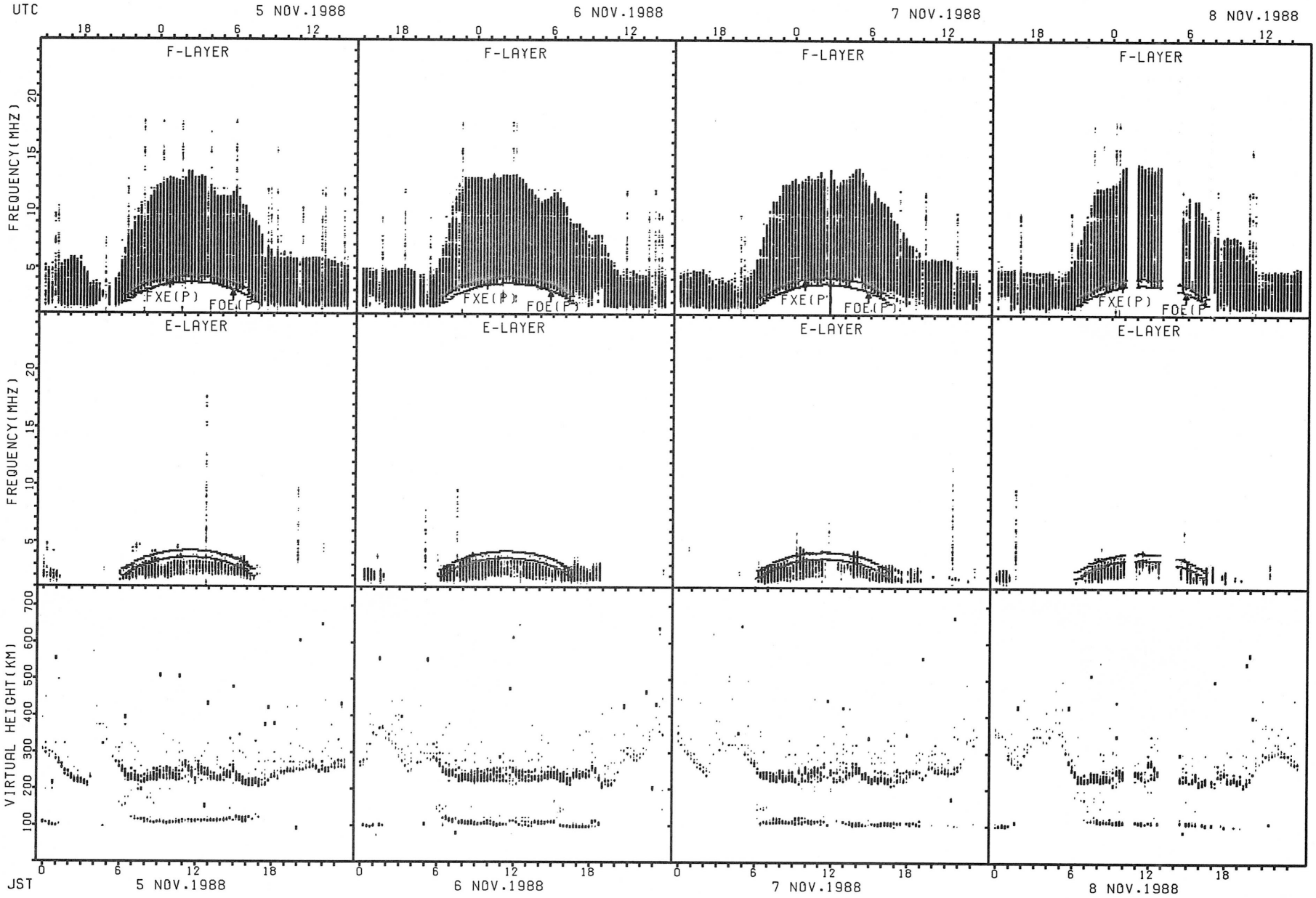
SUMMARY PLOTS AT KOKUBUNJI TOKYO



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

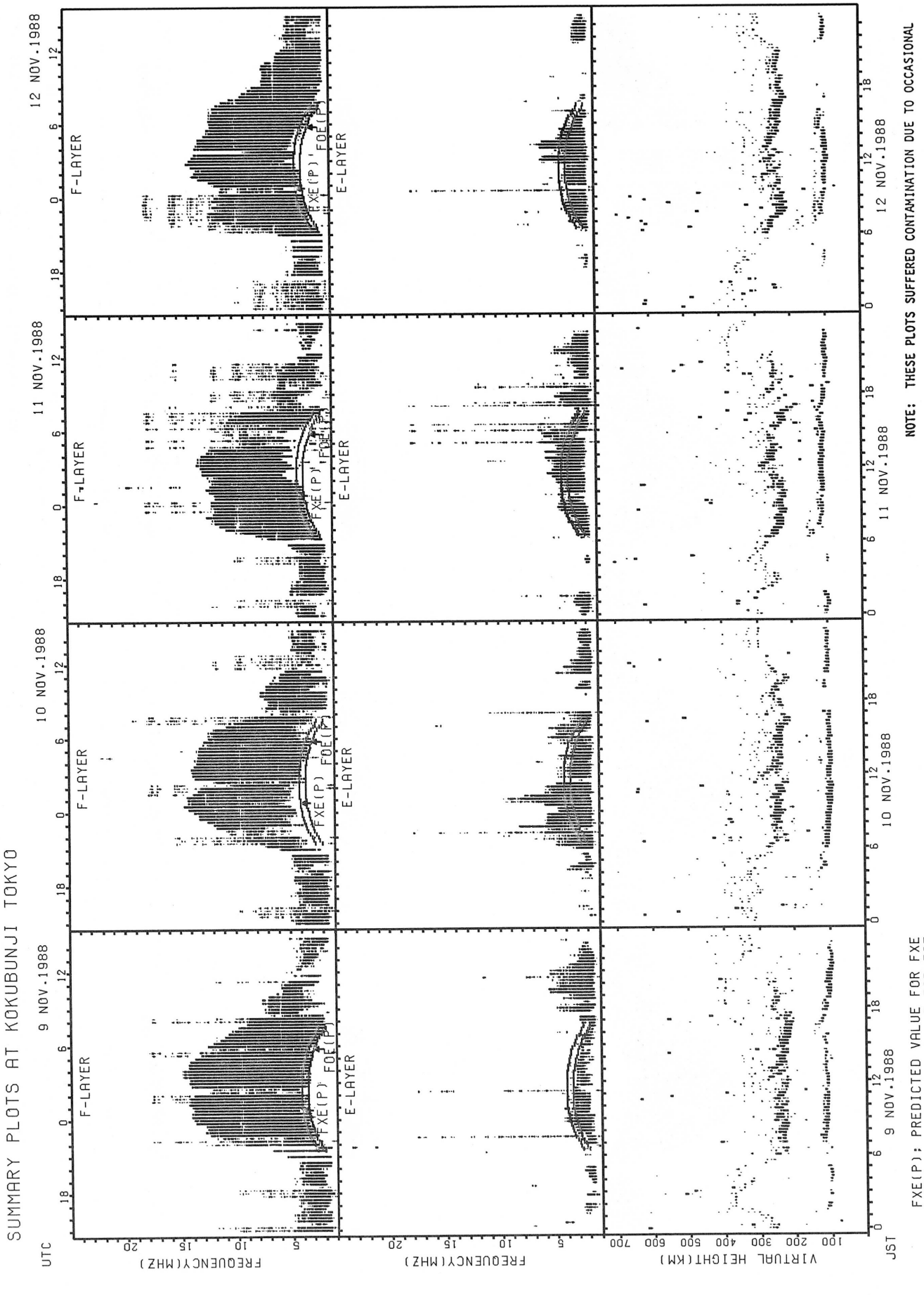
NOTE: THESE PLOTS SUFFERED CONTAMINATION DUE TO OCCASIONAL MALFUNCTION OF THE IONOSONDE AT KOKUBUNJI.

SUMMARY PLOTS AT KOKUBUNJI TOKYO

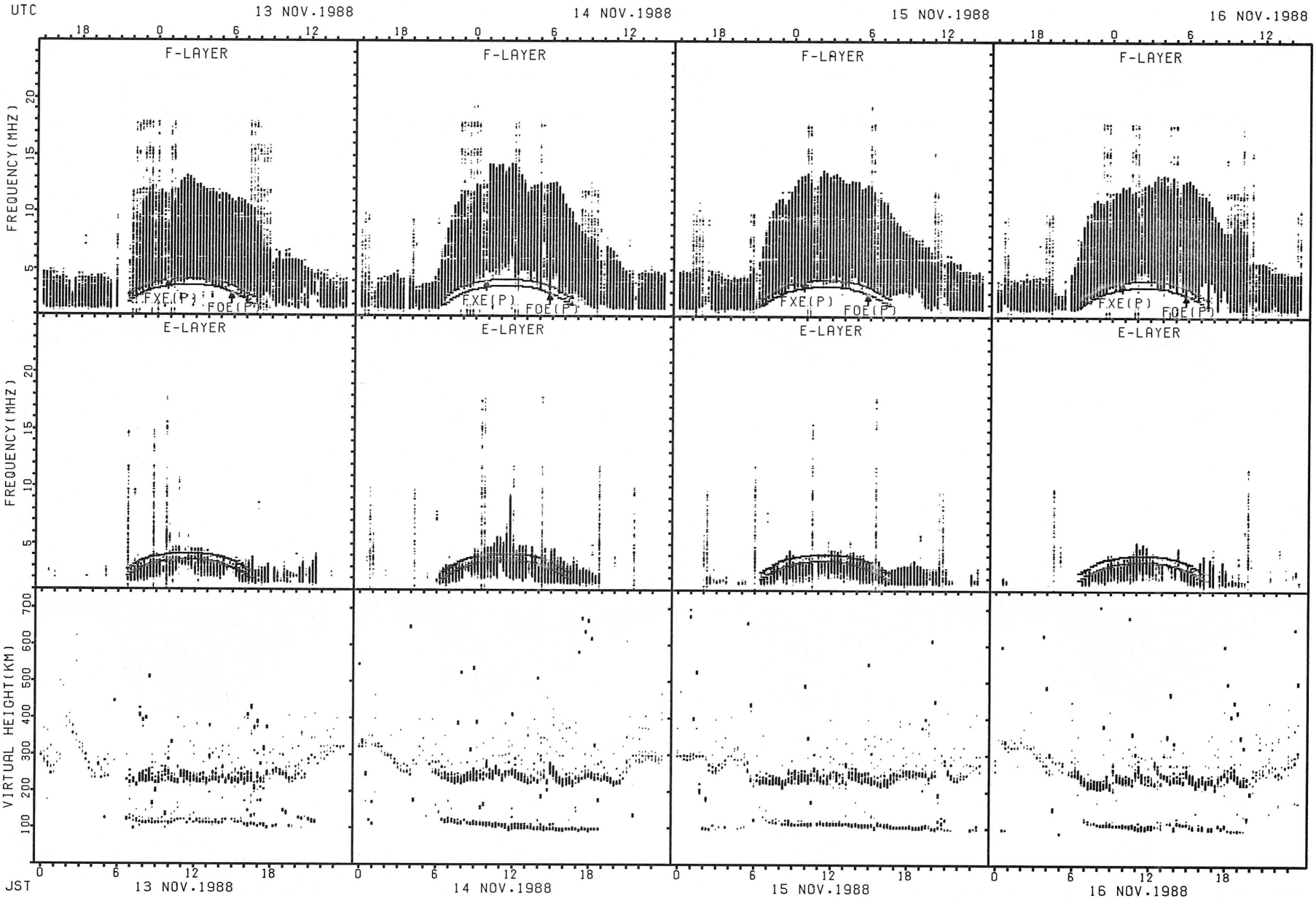


FXE(P): PREDICTED VALUE FOR FXE
FOE(P): PREDICTED VALUE FOR FOE

NOTE: THESE PLOTS SUFFERED CONTAMINATION DUE TO OCCASIONAL MALFUNCTION OF THE IONOSONDE AT KOKUBUNJI.

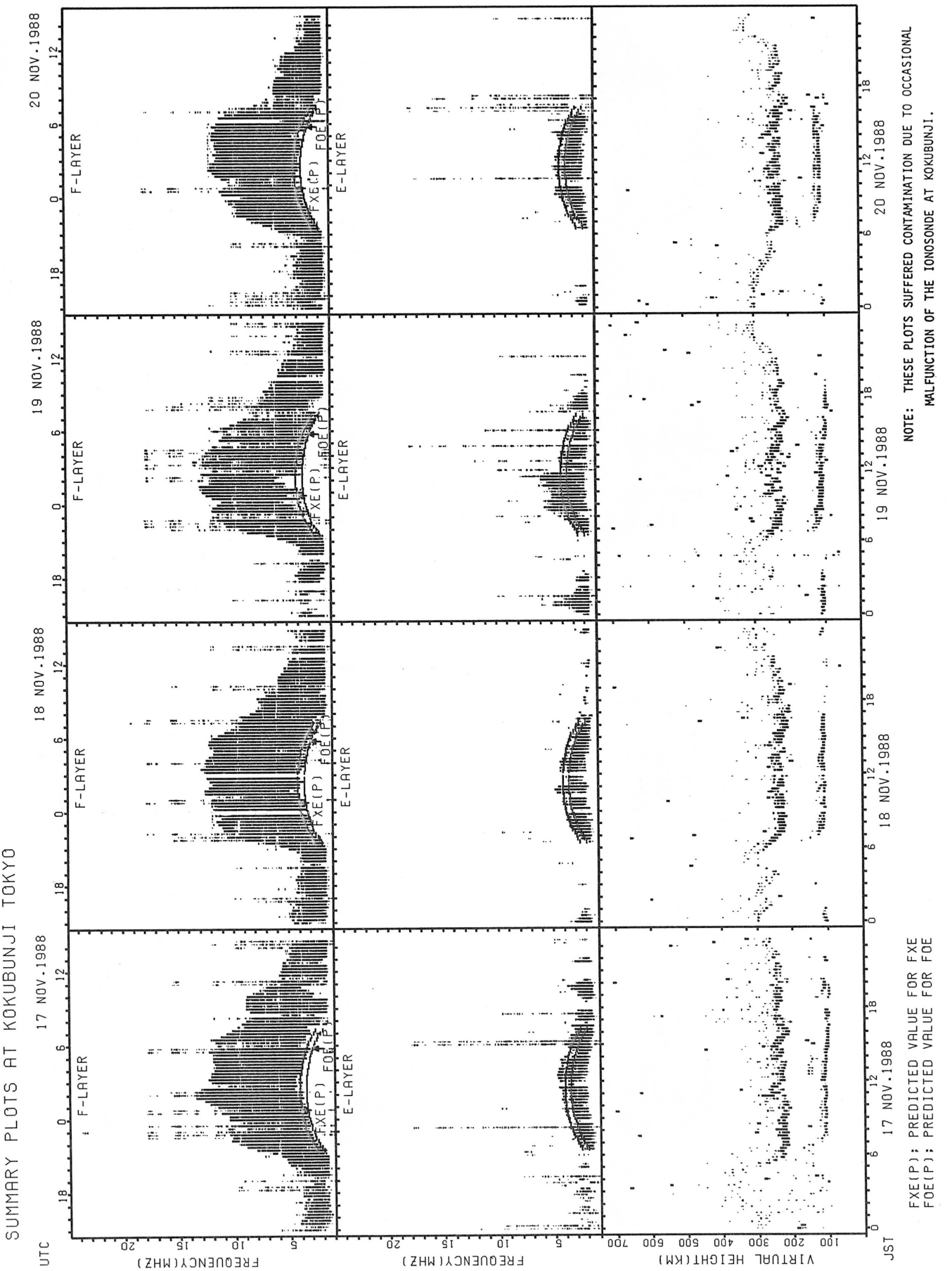

SUMMARY PLOTS AT KOKUBUNJI TOKYO
UTC
JST
9 NOV.1988
10 NOV.1988
11 NOV.1988
12 NOV.1988
F-LAYER
E-LAYER
FXE(P)
FOE(P)
FREQUENCY(MHZ)
VIRTUAL HEIGHT(KM)
FXE(P); PREDICTED VALUE FOR FXE
FOE(P); PREDICTED VALUE FOR FOE
NOTE: THESE PLOTS SUFFERED CONTAMINATION DUE TO OCCASIONAL
MALFUNCTION OF THE IONOSONDE AT KOKUBUNJI.

SUMMARY PLOTS AT KOKUBUNJI TOKYO

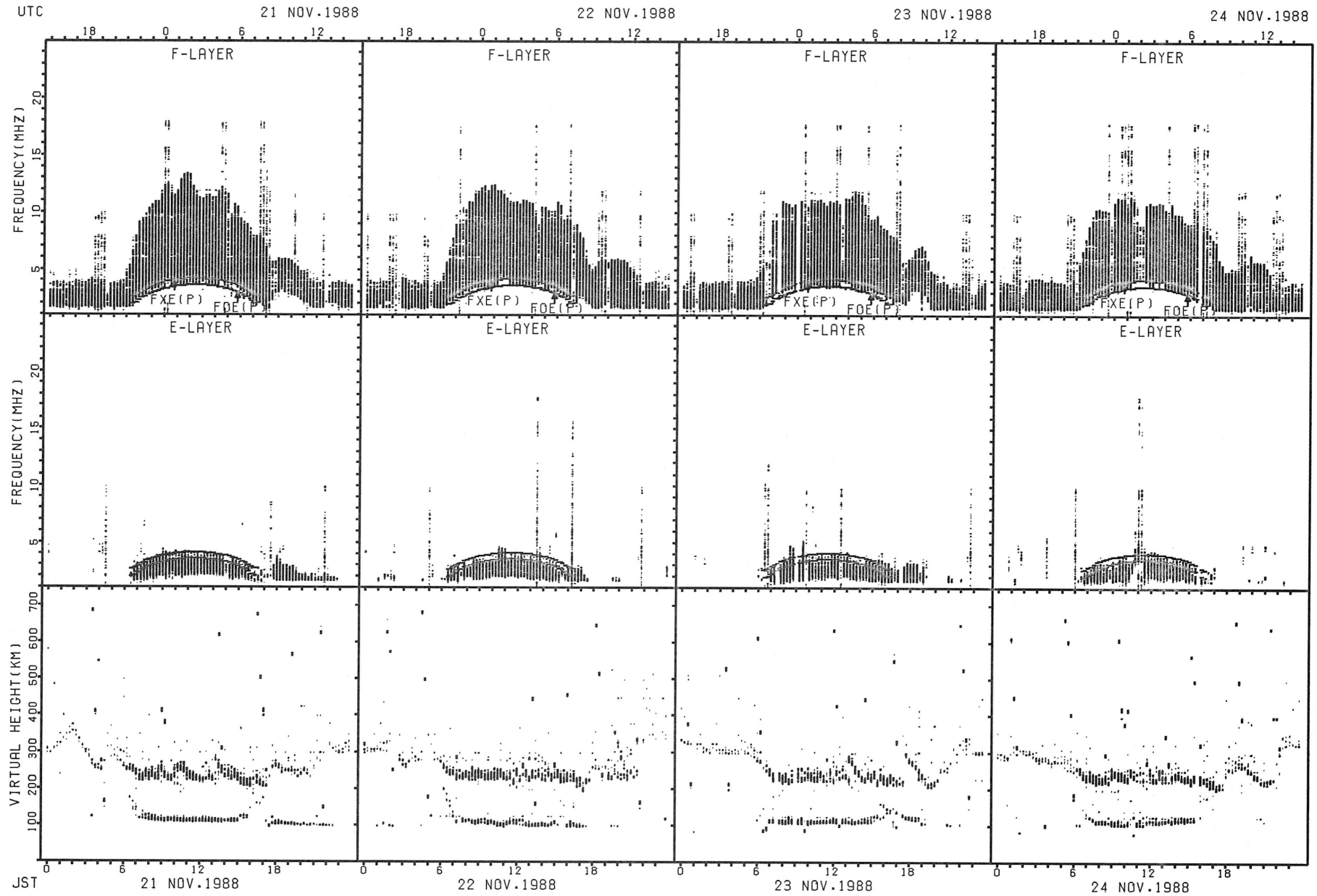


FXE(P): PREDICTED VALUE FOR FXE
FOE(P): PREDICTED VALUE FOR FOE

NOTE: THESE PLOTS SUFFERED CONTAMINATION DUE TO OCCASIONAL MALFUNCTION OF THE IONOSONDE AT KOKUBUNJI.


SUMMARY PLOTS AT KOKUBUNJI TOKYO
17 NOV.1988
18 NOV.1988
19 NOV.1988
20 NOV.1988
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
NOTE: THESE PLOTS SUFFERED CONTAMINATION DUE TO OCCASIONAL
MALFUNCTION OF THE IONOSONDE AT KOKUBUNJI.

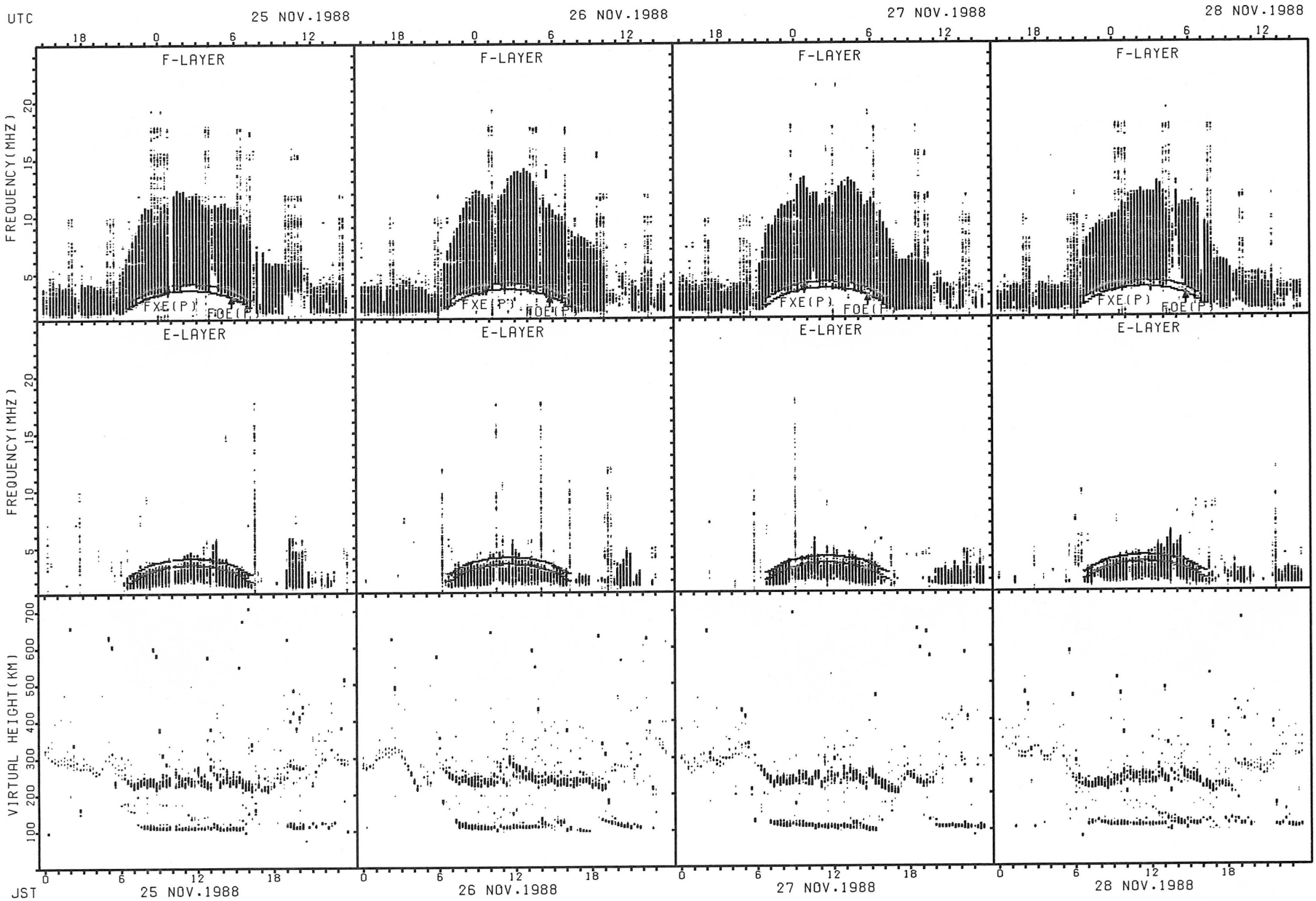
SUMMARY PLOTS AT KOKUBUNJI TOKYO



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

NOTE: THESE PLOTS SUFFERED CONTAMINATION DUE TO OCCASIONAL MALFUNCTION OF THE IONOSONDE AT KOKUBUNJI.

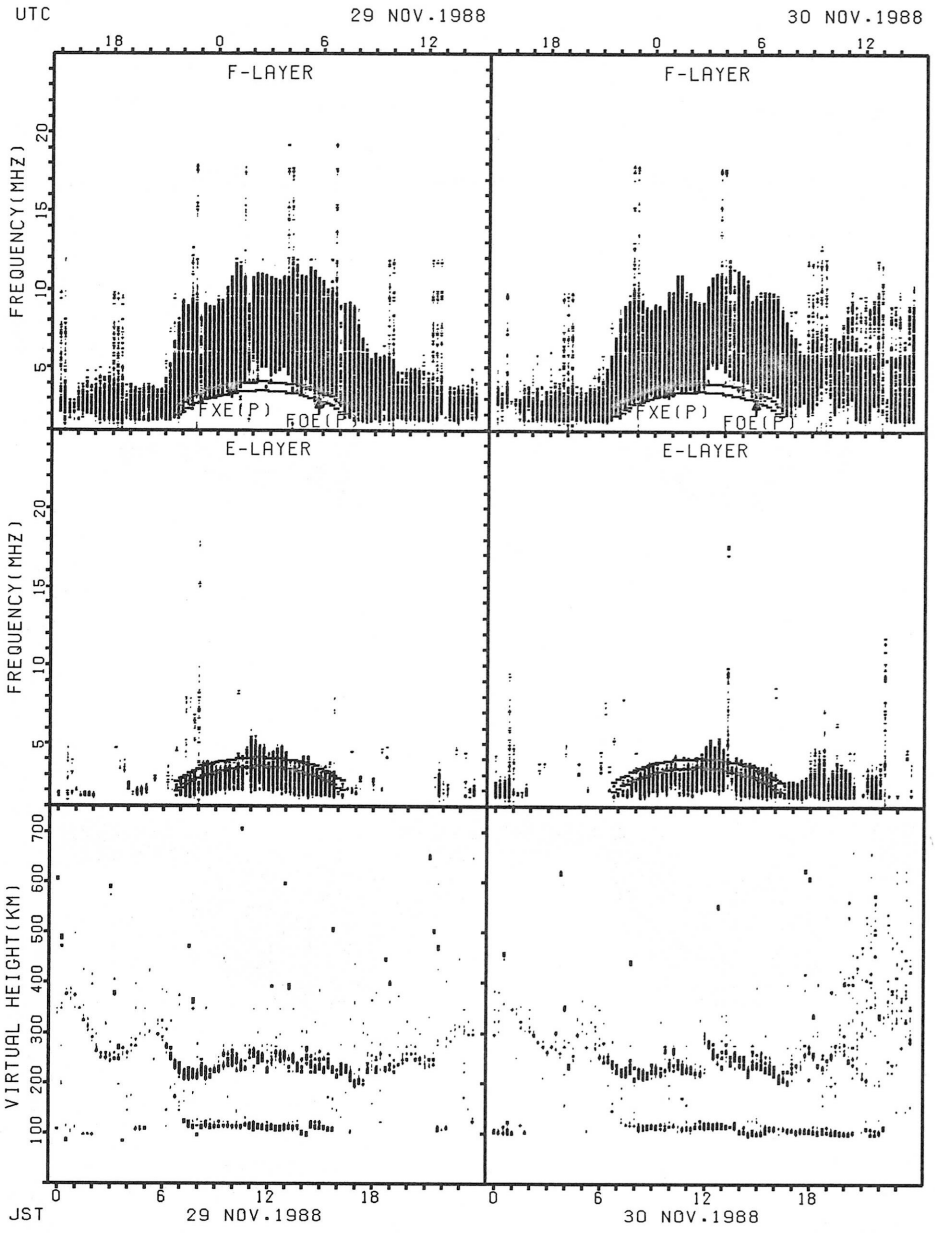
SUMMARY PLOTS AT KOKUBUNJI TOKYO



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

NOTE: THESE PLOTS SUFFERED CONTAMINATION DUE TO OCCASIONAL MALFUNCTION OF THE IONOSONDE AT KOKUBUNJI.

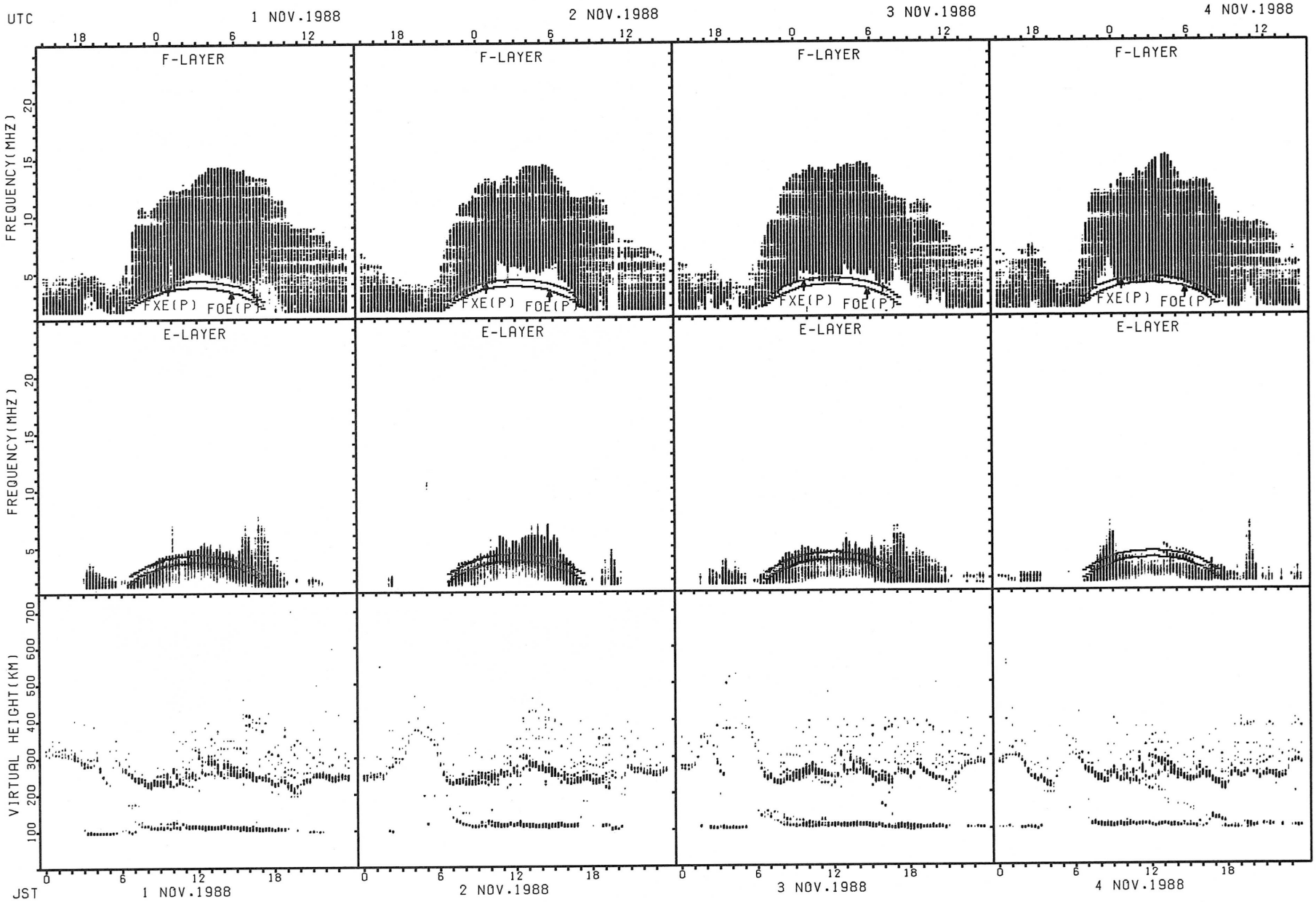
SUMMARY PLOTS AT KOKUBUNJI TOKYO



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

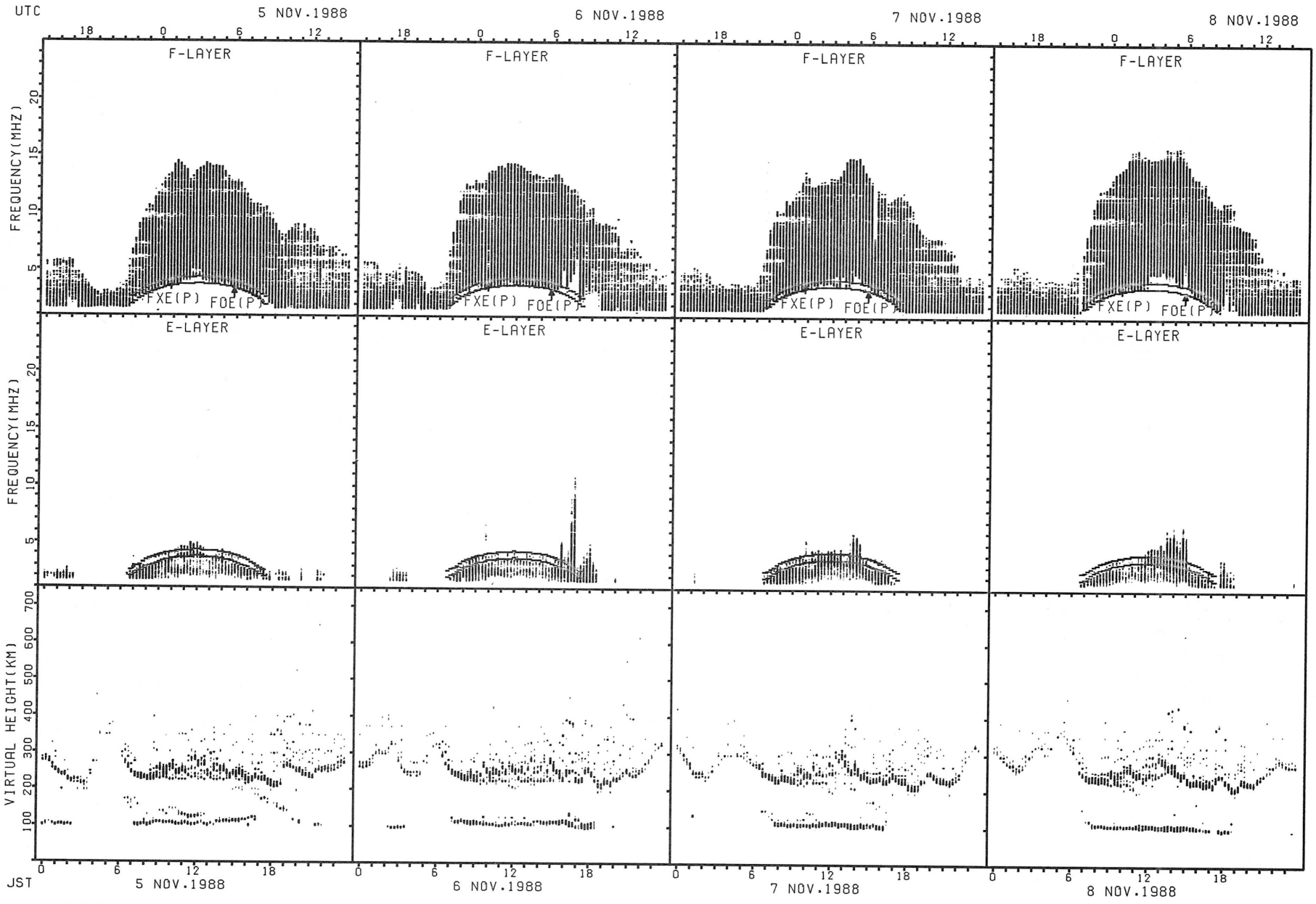
NOTE: THESE PLOTS SUFFERED CONTAMINATION DUE TO OCCASIONAL MALFUNCTION OF THE IONOSONDE AT KOKUBUNJI.

SUMMARY PLOTS AT YAMAGAWA



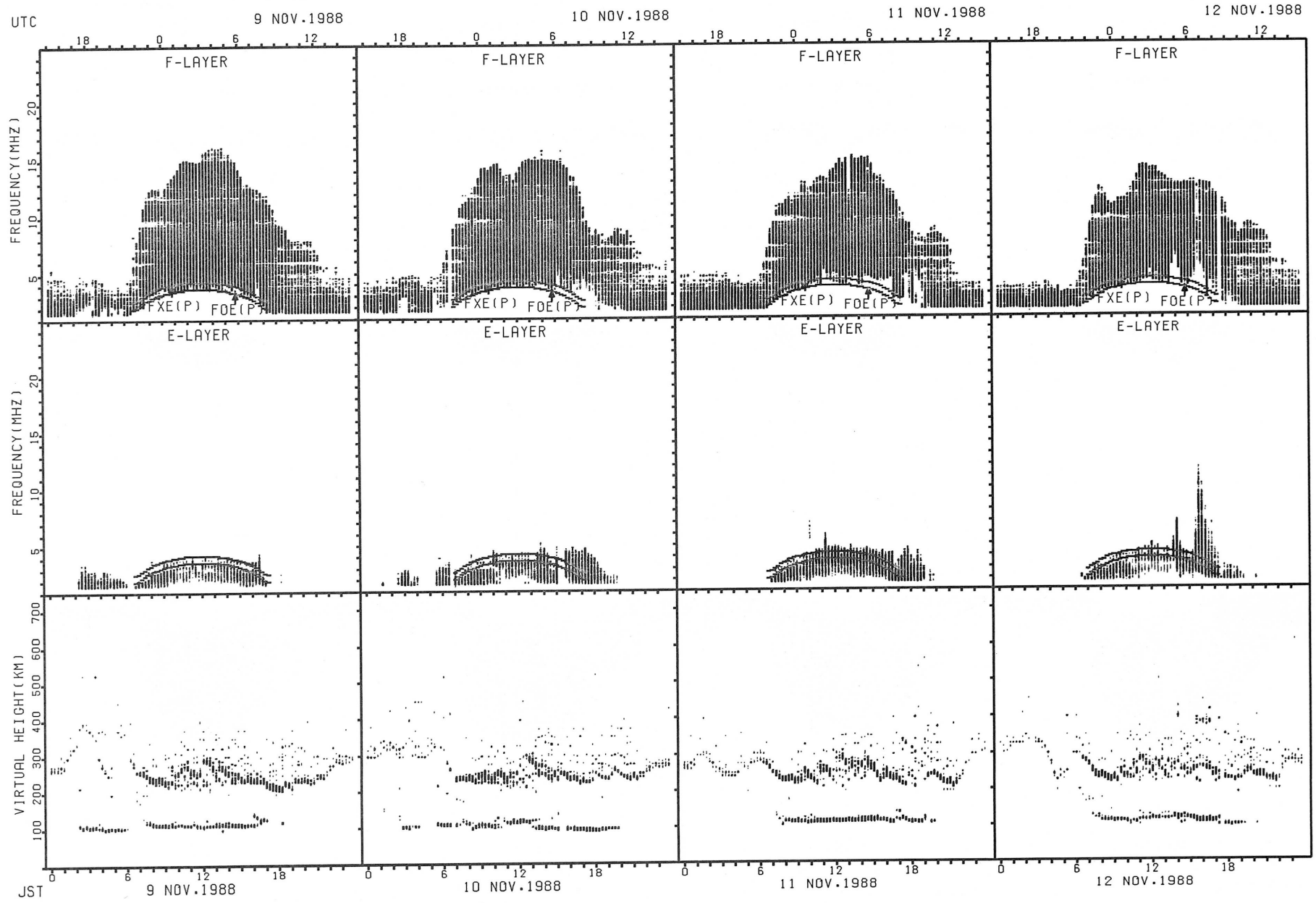
FXE(P); PREDICTED VALUE FOR FXE
FOE(P); PREDICTED VALUE FOR FOE

SUMMARY PLOTS AT YAMAGAWA



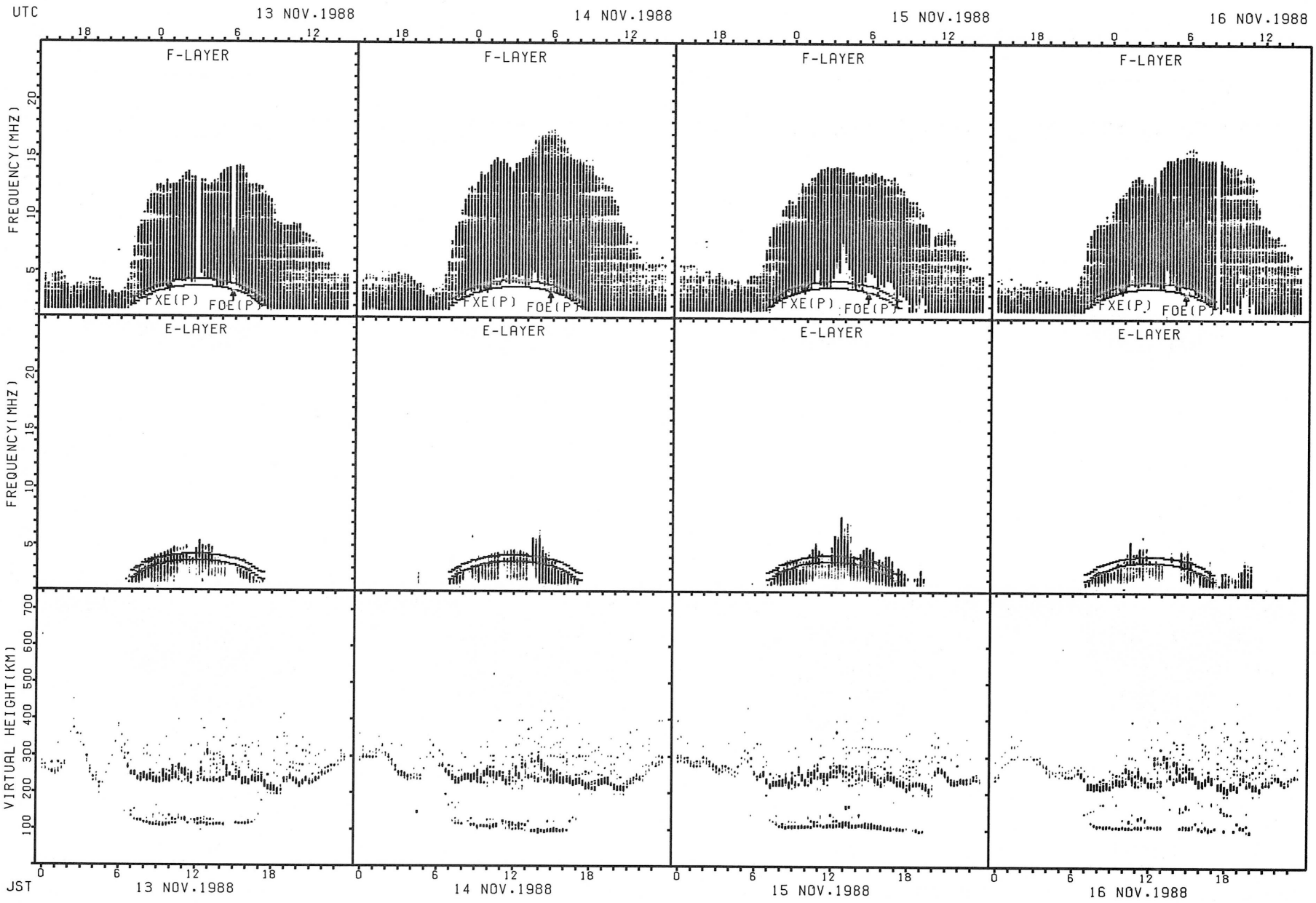
FXE(P): PREDICTED VALUE FOR FXE
FOE(P): PREDICTED VALUE FOR FOE

SUMMARY PLOTS AT YAMAGAWA

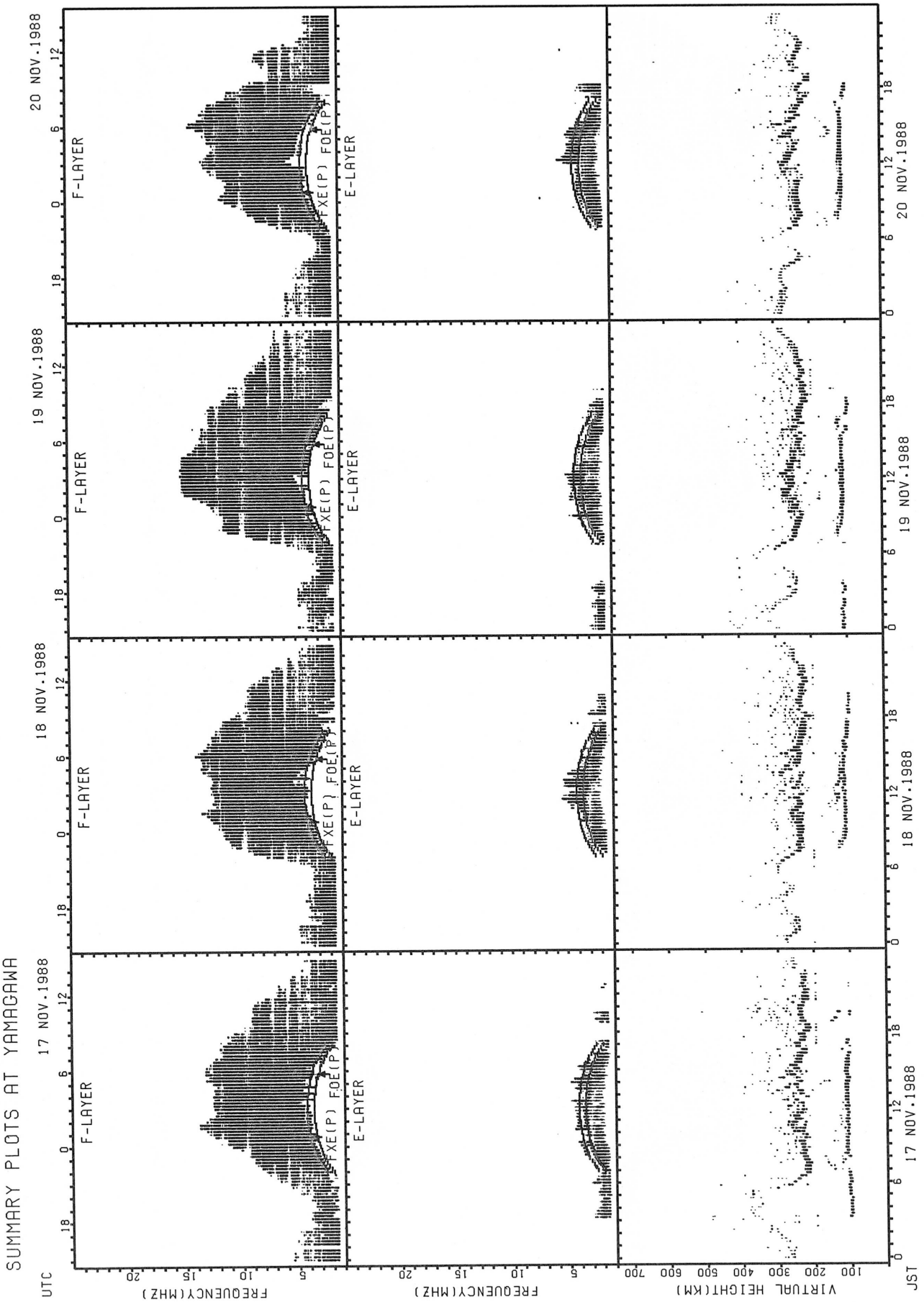


FXE(P): PREDICTED VALUE FOR FXE
FOE(P): PREDICTED VALUE FOR FOE

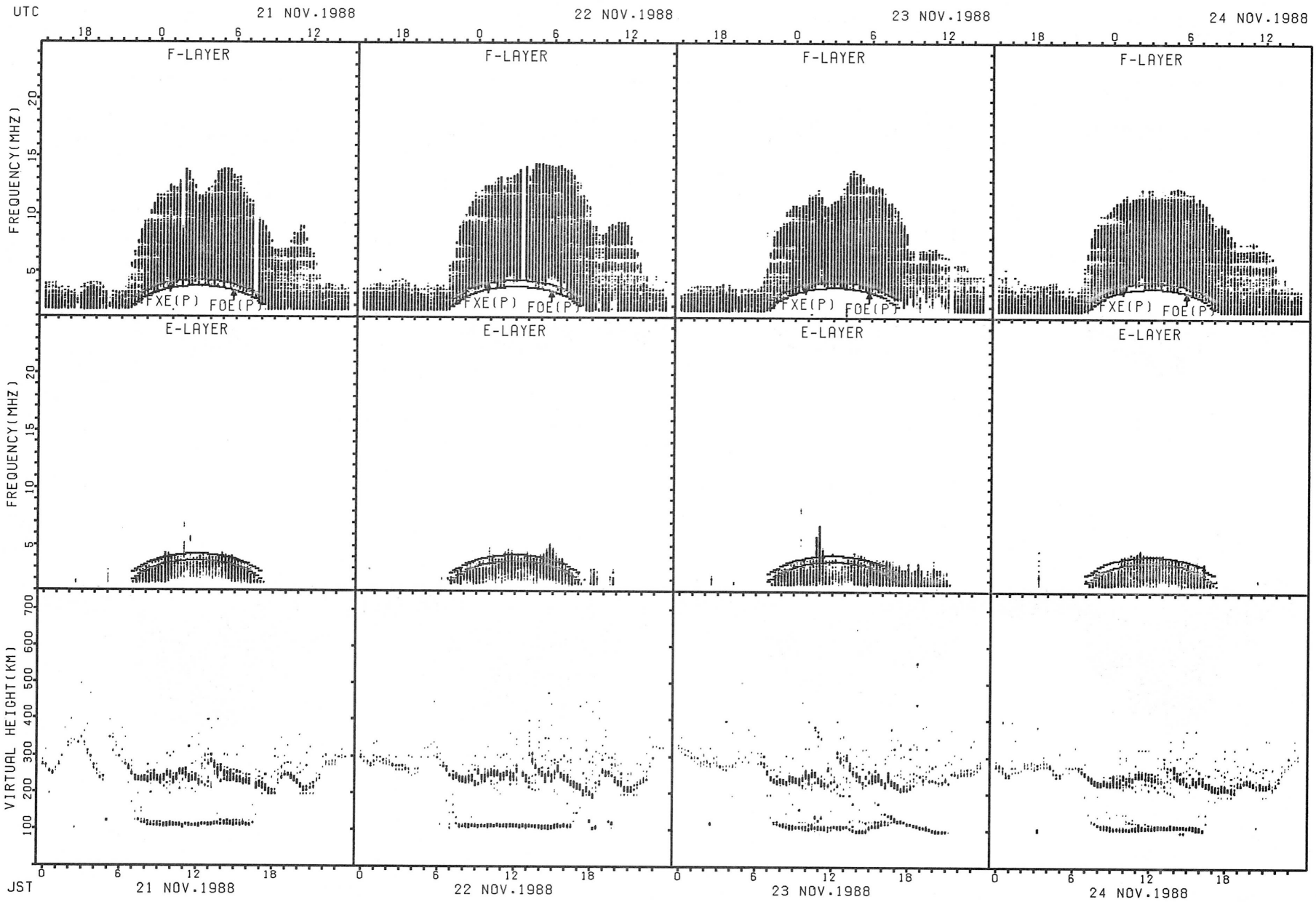
SUMMARY PLOTS AT YAMAGAWA



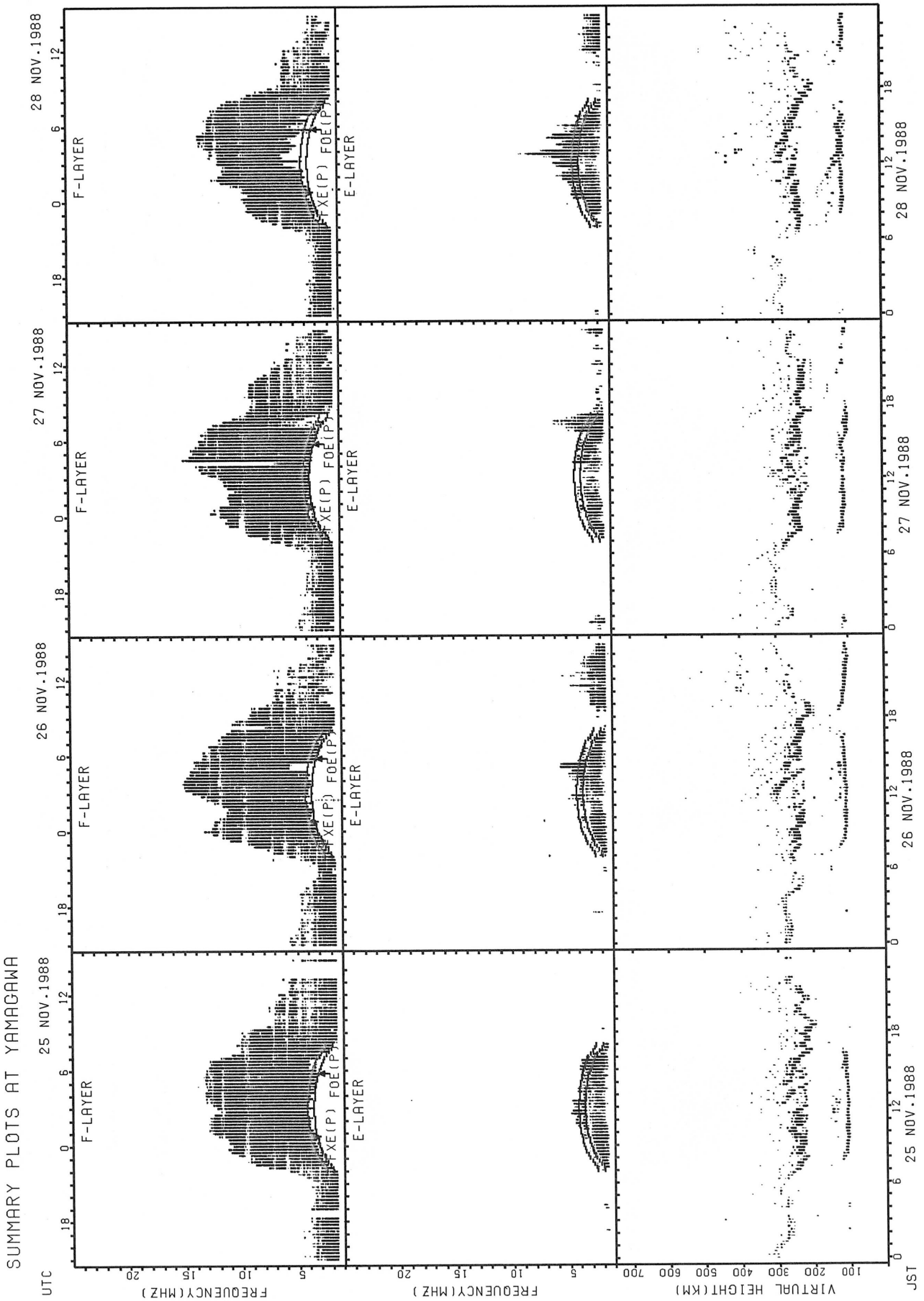
FXE(P): PREDICTED VALUE FOR FXE
FOE(P): PREDICTED VALUE FOR FOE

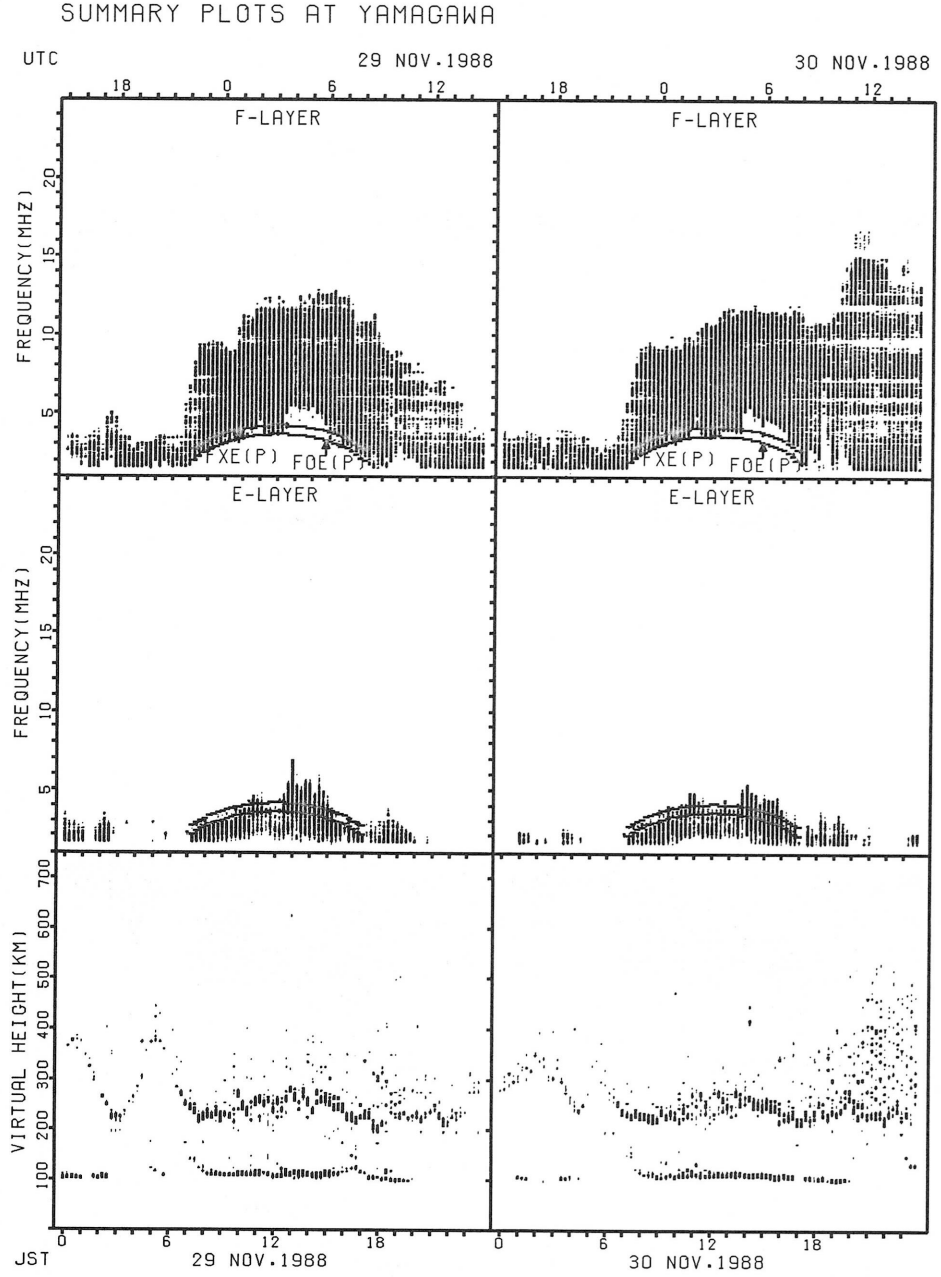

SUMMARY PLOTS AT YAMAGAWA
17 NOV.1988
18 NOV.1988
19 NOV.1988
20 NOV.1988
F-LAYER
E-LAYER
FXE(P) FOE(P)
FREQUENCY(MHZ)
VIRTUAL HEIGHT(KM)
UTC
JST
FXE(P): PREDICTED VALUE FOR FXE
FOE(P): PREDICTED VALUE FOR FOE

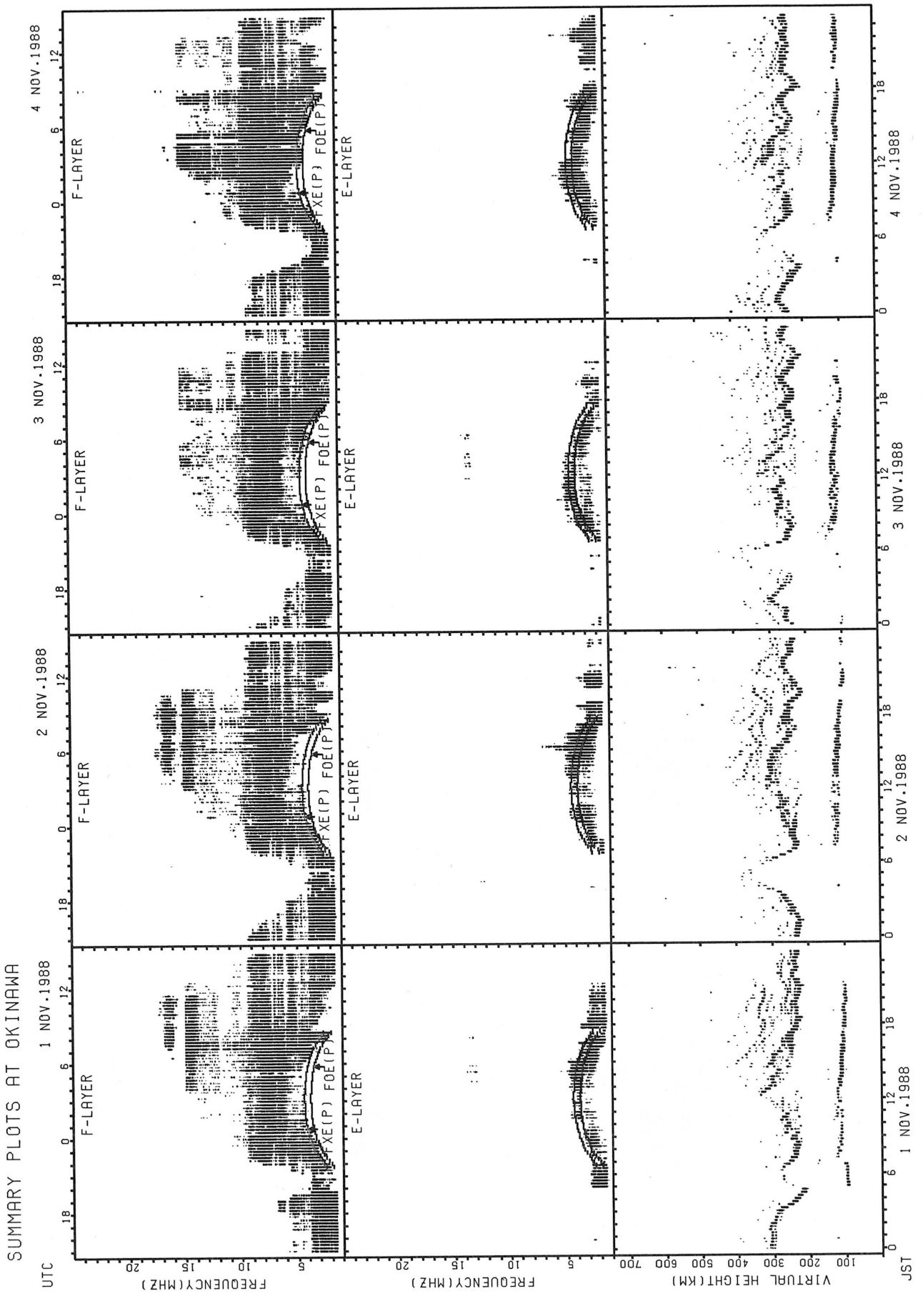
SUMMARY PLOTS AT YAMAGAWA



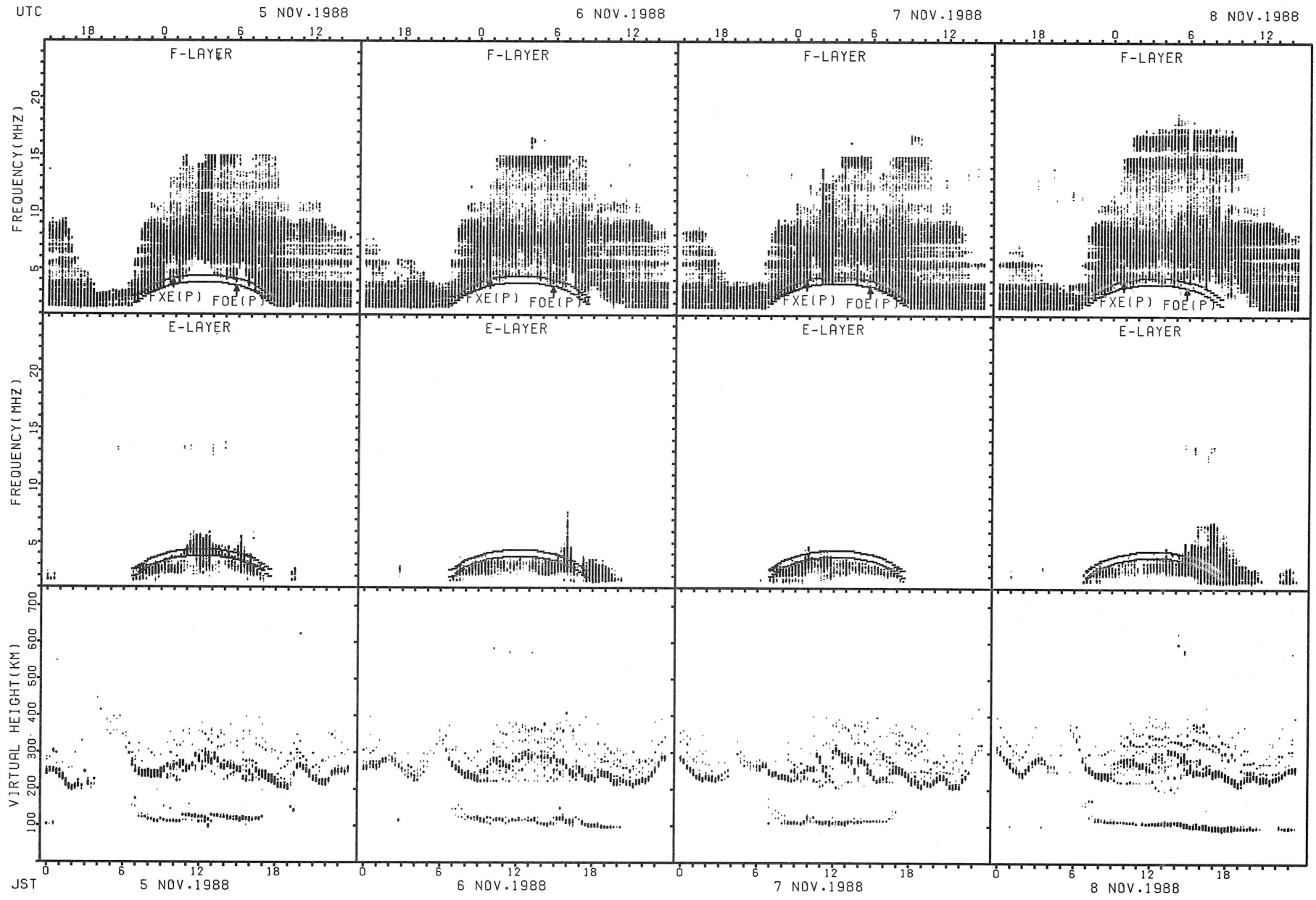
FXE(P); PREDICTED VALUE FOR FXE
FOE(P); PREDICTED VALUE FOR FOE


SUMMARY PLOTS AT YAMAGAWA
UTC
25 NOV.1988
26 NOV.1988
27 NOV.1988
28 NOV.1988
F-LAYER
E-LAYER
FXE(P) FOE(P)
FREQUENCY(MHZ)
VIRTUAL HEIGHT(KM)
JST
FXE(P); PREDICTED VALUE FOR FXE
FOE(P); PREDICTED VALUE FOR FOE


SUMMARY PLOTS AT YAMAGAWA
UTC
29 NOV.1988
30 NOV.1988
F-LAYER
F-LAYER
FXE(P)
FOE(P)
FXE(P)
FOE(P)
E-LAYER
E-LAYER
FREQUENCY(MHZ)
FREQUENCY(MHZ)
VIRTUAL HEIGHT(KM)
JST
29 NOV.1988
30 NOV.1988
FXE(P): PREDICTED VALUE FOR FXE
FOE(P): PREDICTED VALUE FOR FOE

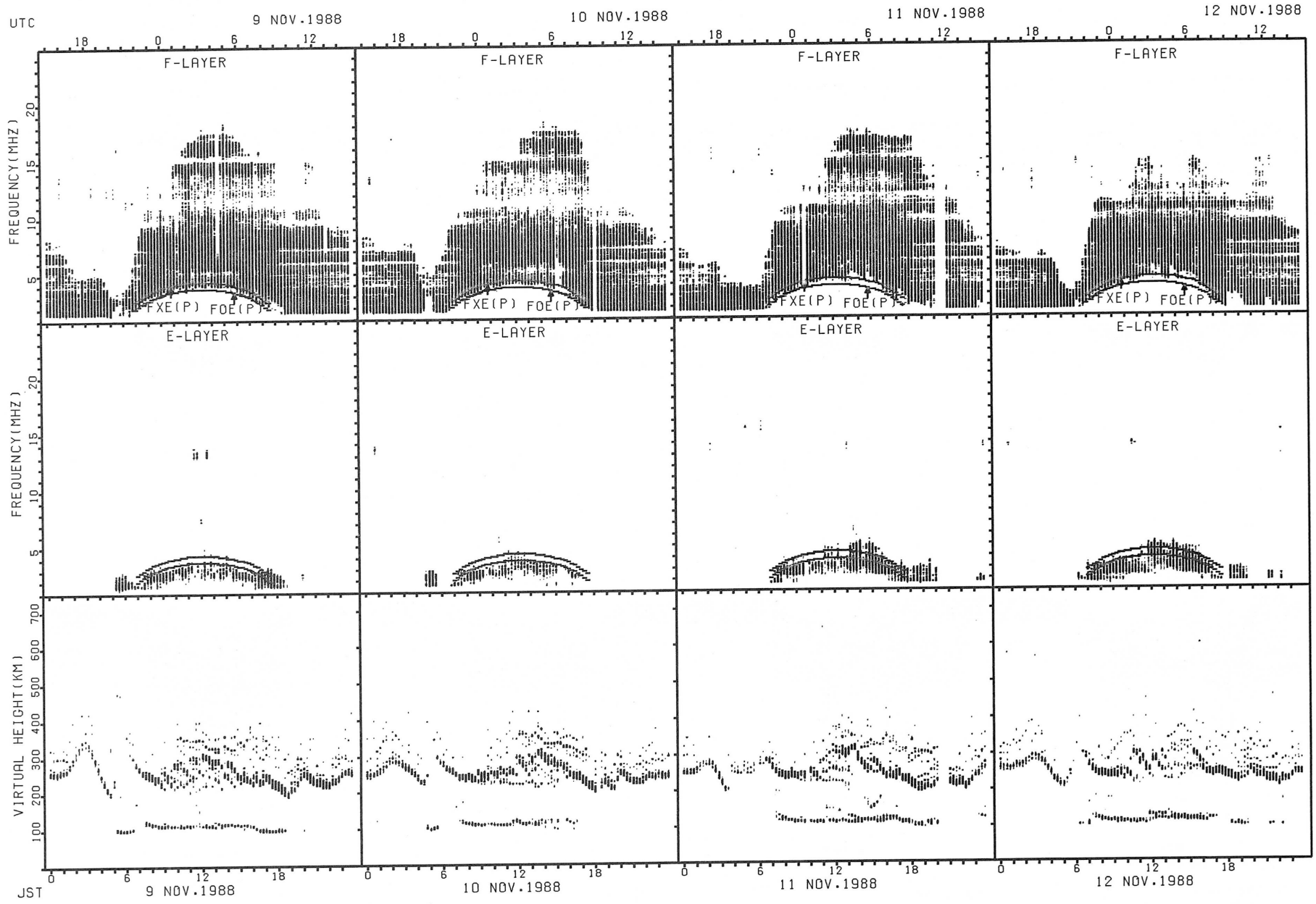

SUMMARY PLOTS AT OKINAWA
UTC
1 NOV.1988
2 NOV.1988
3 NOV.1988
4 NOV.1988
F-LAYER
E-LAYER
FXE(P) FOE(P)
FREQUENCY(MHZ)
VIRTUAL HEIGHT(KM)
JST
FXE(P): PREDICTED VALUE FOR FXE
FOE(P): PREDICTED VALUE FOR FOE

SUMMARY PLOTS AT OKINAWA



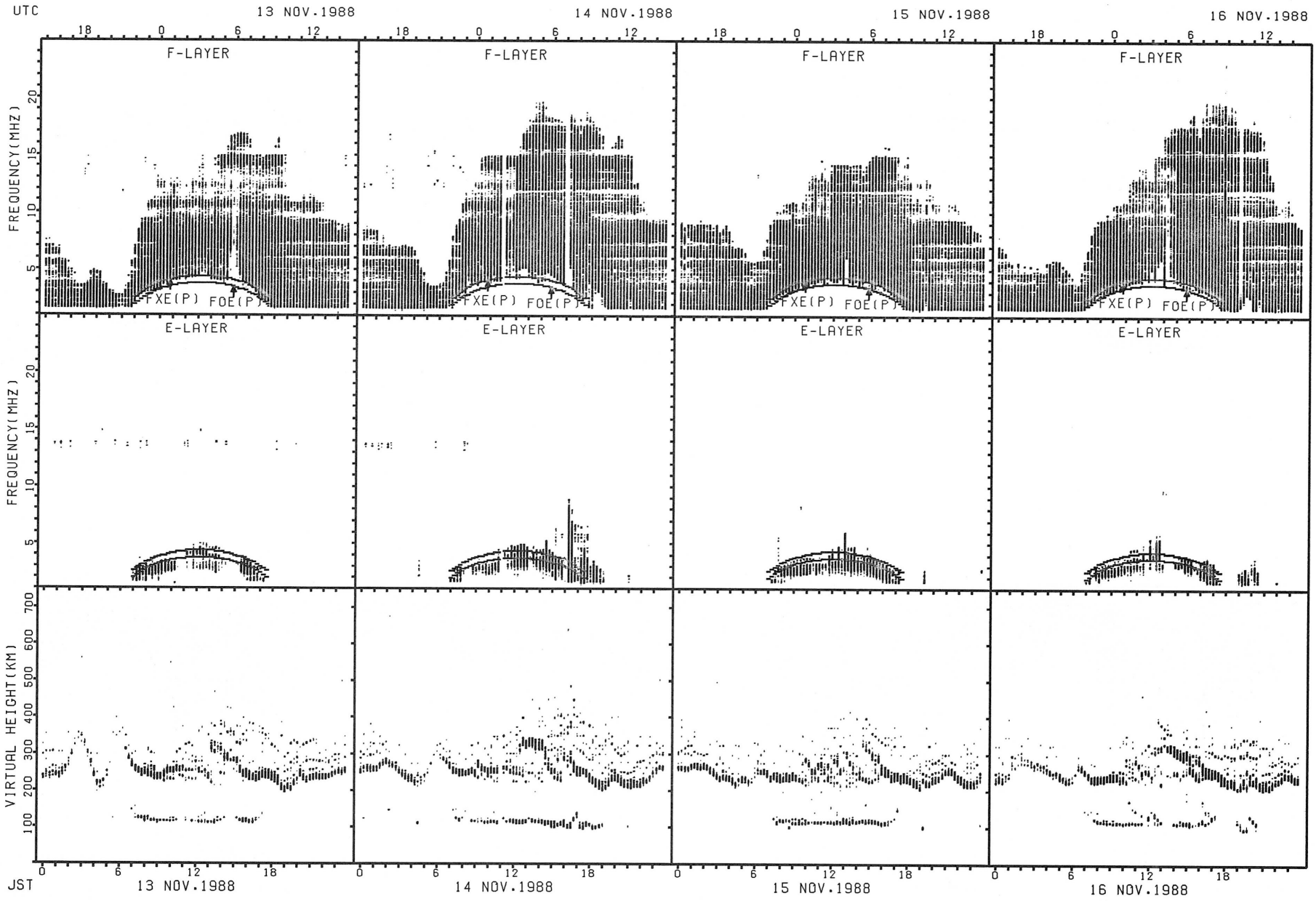
FXE(P); PREDICTED VALUE FOR FXE
FOE(P); PREDICTED VALUE FOR FOE

SUMMARY PLOTS AT OKINAWA

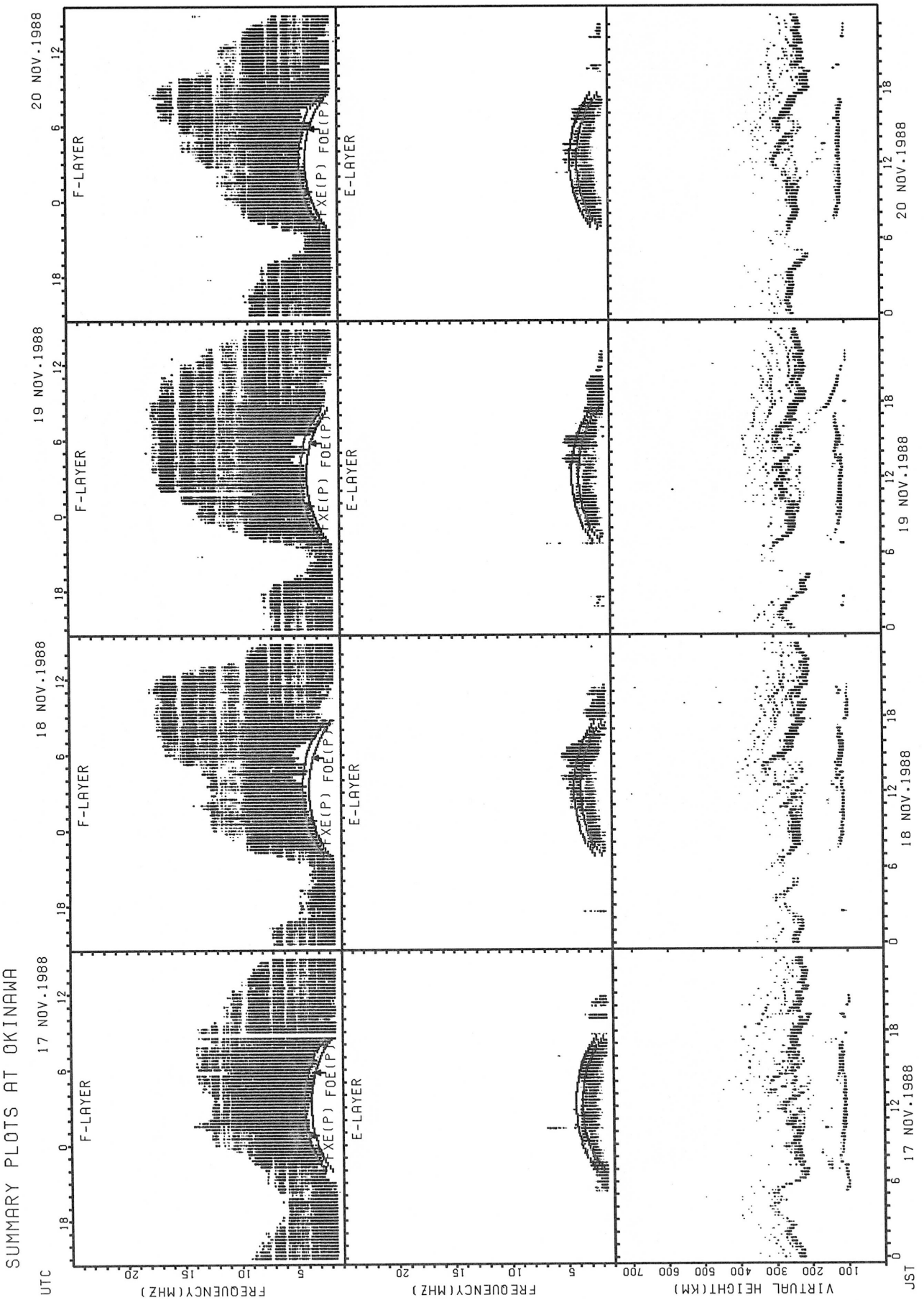


FXE(P): PREDICTED VALUE FOR FXE
FOE(P): PREDICTED VALUE FOR FOE

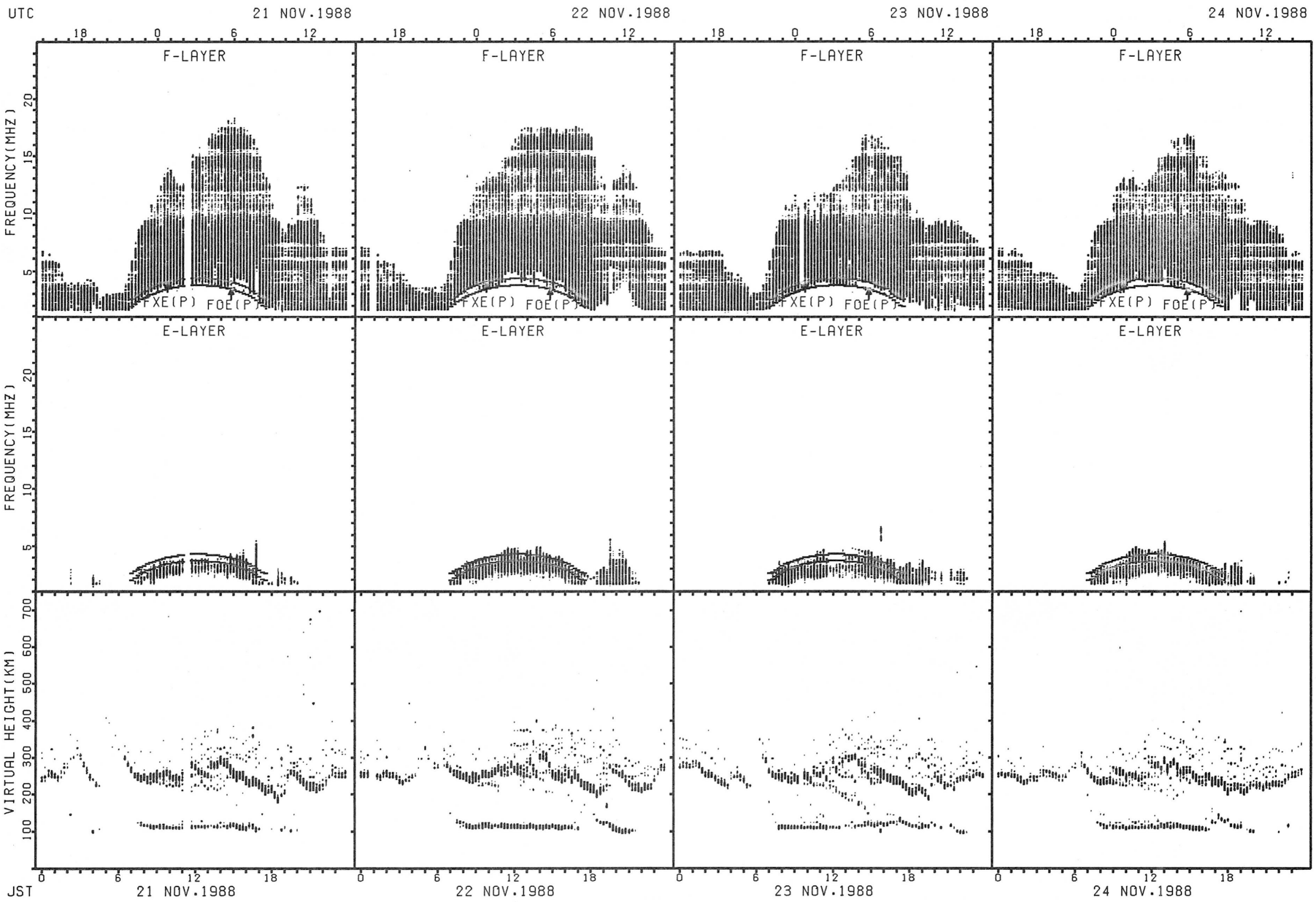
SUMMARY PLOTS AT OKINAWA



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

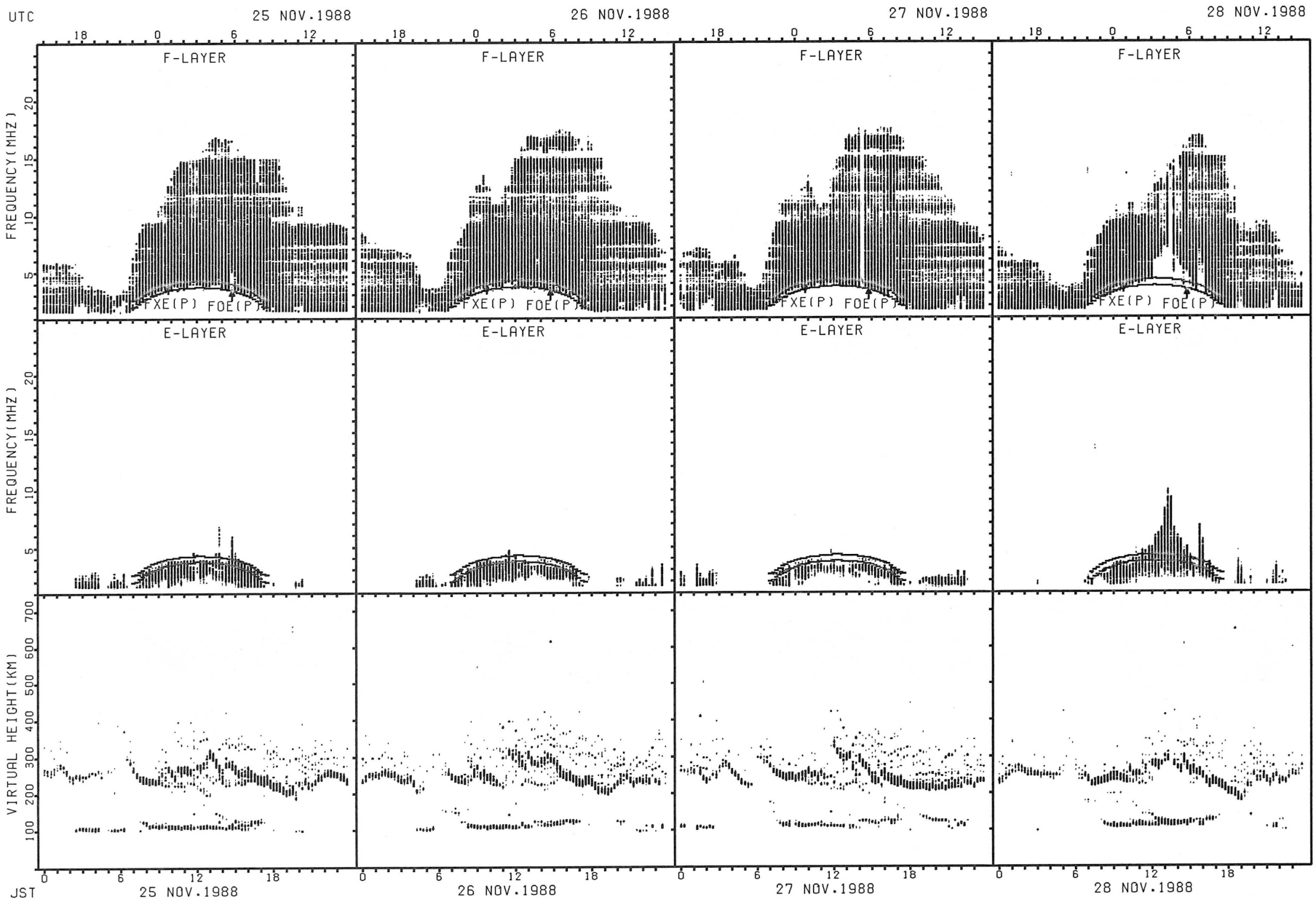

SUMMARY PLOTS AT OKINAWA
UTC
17 NOV.1988
18 NOV.1988
19 NOV.1988
20 NOV.1988
F-LAYER
E-LAYER
FXE(P)
FOE(P)
FREQUENCY(MHZ)
VIRTUAL HEIGHT(KM)
JST
FXE(P): PREDICTED VALUE FOR FXE
FOE(P): PREDICTED VALUE FOR FOE

SUMMARY PLOTS AT OKINAWA



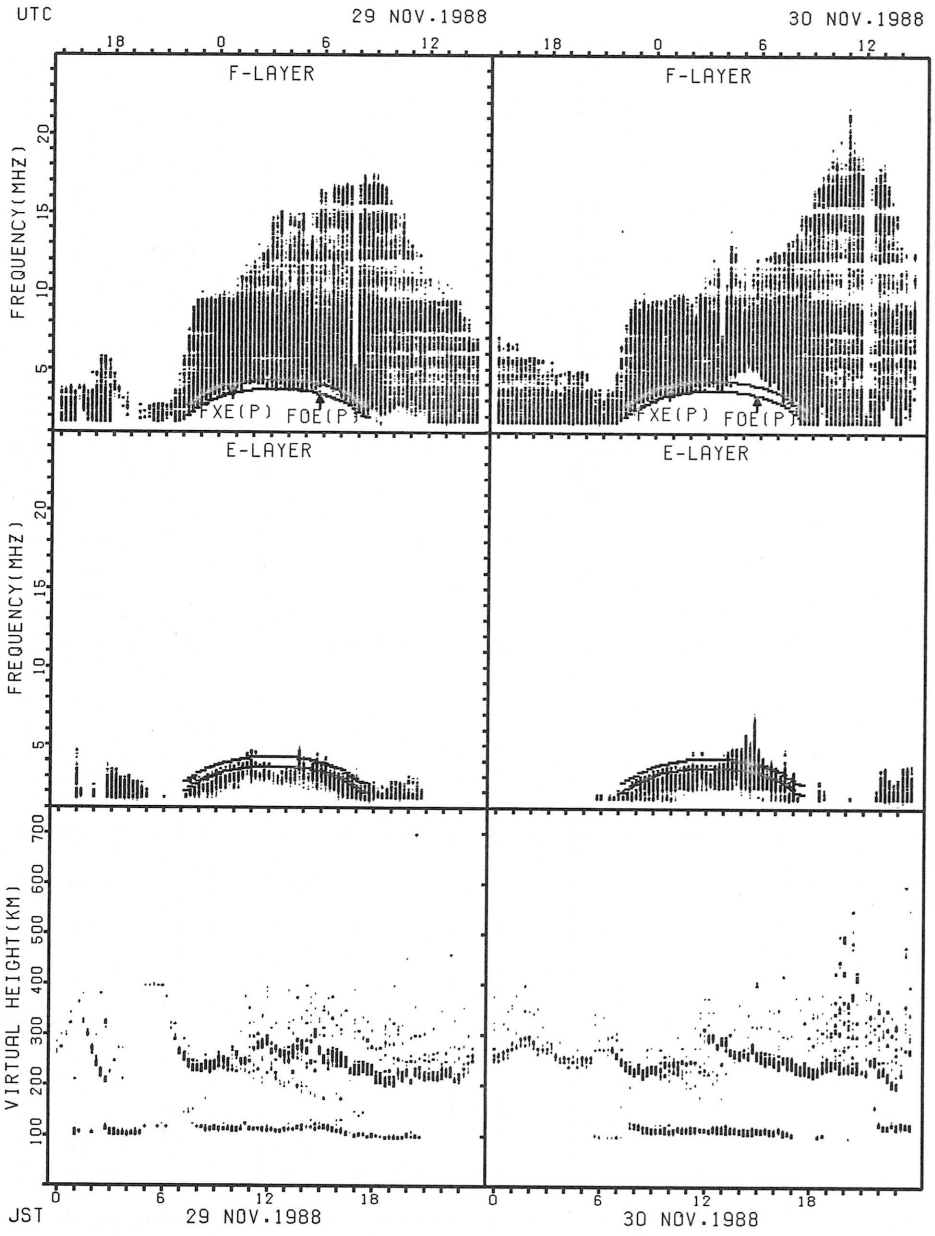
FXE(P): PREDICTED VALUE FOR FXE
FOE(P): PREDICTED VALUE FOR FOE

SUMMARY PLOTS AT OKINAWA



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

SUMMARY PLOTS AT OKINAWA



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

MONTHLY MEDIANS OF H'F AND H'ES
NOV.1988 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								28	29	31	31	30	31	31	30	31	29	18						
MED								249	230	232	238	237	236	246	242	240	240	273						
U Q								258	236	238	246	246	240	250	250	244	251	292						
L Q								245	228	224	234	232	230	236	236	232	233	260						

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								15	25	26	27	21	26	23	20	13		12	10	11	13	10		
MED								157	125	125	123	125	125	123	125	145		115	116	113	113	112		
U Q								171	136	131	131	130	129	127	127	163		122	119	149	118	115		
L Q								117	118	121	121	113	119	119	123	120		107	111	109	109	109		

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								29	31	31	31	31	31	31	30	30	31	13						
MED								250	230	240	240	244	250	252	253	245	252	272						
U Q								260	242	252	250	252	260	260	260	252	262	299						
L Q								242	224	228	232	238	238	246	244	236	242	257						

H'ES

	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
CNT	13	11						23	30	31	31	30	31	31	31	29	20	14	12	15	15	14	14	16
MED	103	101						157	119	115	113	113	113	113	113	119	112	106	107	109	107	108	105	106
U Q	109	107						175	131	119	125	121	117	117	119	126	153	107	127	119	111	117	109	110
L Q	101	101						141	115	113	111	109	109	107	111	105	101	99	103	105	101	103	99	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								30	30	30	30	28	30	31	29	31	29	20	12					
MED								244	230	237	242	246	248	250	250	246	238	269	308					
U Q								252	236	240	248	256	262	262	266	250	253	295	333					
L Q								236	226	230	238	239	242	236	241	240	231	250	299					

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	10						29	30	30	29	30	30	31	28	31	29	25	17	17	16	15	14	
MED	108	109						131	119	116	119	115	117	117	113	115	113	115	111	109	108	111	108	
U Q	125	137						158	131	125	125	119	131	119	122	131	143	144	115	124	115	123	113	
L Q	105	103						121	113	113	113	109	113	113	107	111	107	102	104	105	103	107	103	

MONTHLY MEDIANS OF H'F AND H'ES

NOV.1988 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								21	31	31	31	30	21	29	31	31	31	31	28	19	21	13		
MED								282	234	240	244	250	248	260	264	252	240	242	251	262	278	282		
U Q								289	242	248	252	256	271	278	274	266	246	252	261	288	312	308		
L Q								258	228	230	238	242	244	248	252	244	234	230	241	252	267	268		

H'ES

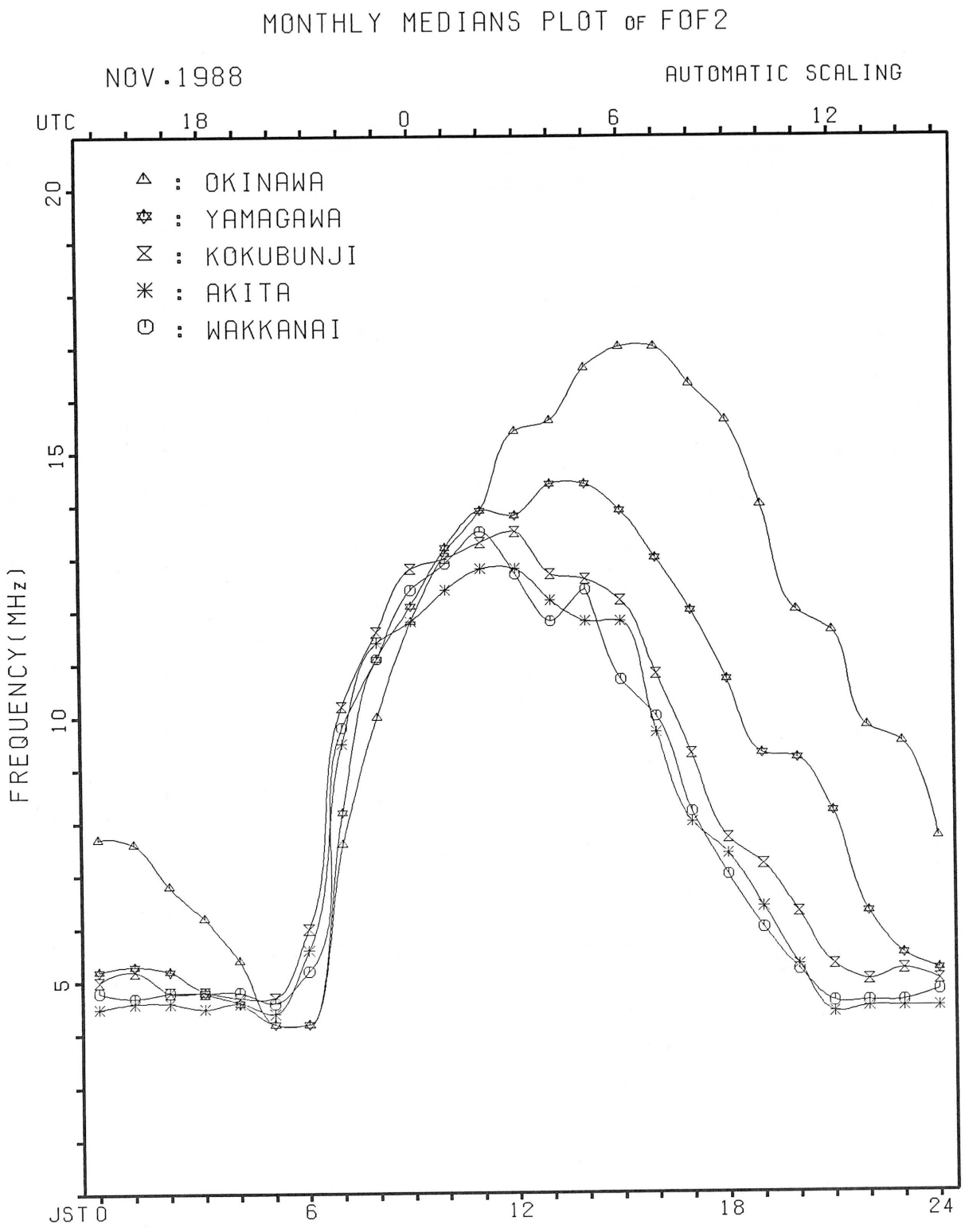
	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
CNT								18	31	31	31	30	31	31	30	30	31	17	17	15				
MED								161	119	113	119	119	117	115	115	113	113	109	107	115				
U Q								179	131	125	125	127	121	119	121	115	119	124	115	141				
L Q								137	115	111	111	113	113	113	111	111	109	105	99	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	14							13	31	31	31	27	14	20	31	31	30	31	31	29	31	30	27	20
MED	296							288	242	246	252	258	279	290	286	262	258	242	234	248	264	255	270	283
U Q	324							307	250	256	258	270	310	306	304	280	268	254	242	259	278	266	280	301
L Q	280							259	240	240	246	250	270	278	266	254	248	234	226	228	250	240	246	267

H'ES

	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
CNT								11	30	31	31	29	31	30	31	30	30	26	14	16	17			
MED								141	121	115	115	115	119	117	115	119	115	126	104	114	107			
U Q								161	137	125	121	120	125	121	119	121	119	151	119	125	125			
L Q								109	121	113	113	113	113	113	115	115	111	111	101	103	104			


MONTHLY MEDIANS PLOT OF FOF2
NOV.1988
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

NOV. 1988 | 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 51	X 51	X 50	X 53	X 50	X 51	X 66												X 86	X 74	X 59	X 57	X 59	X 55
2	X 52	X 50	X 49	X 46	X 47	X 46												X 98	X 91	X 78	X 67	X 70	X 51	X 58
3	X 58	X 55	X 56	X 51	X 49	X 53												X 91	X 86	X 84	X 66	X 56	X 55	X 55
4	X 54	X 51	X 57	X 60	X 46	X 48												X 94	X 74	X 71	X 66	X 62	X 56	X 55
5	X 54	X 55	X 60	X 52	X 42	X 39												X 81	X 68	X 67	X 59	X 62	X 50	X 55
6	X 52	X 48	X 48	X 50	X 48	X 44												X 92	X 78	X 72	X 49	X 47	X 46	X 45
7	X 47	X 49	X 47	X 42	X 43	X 44												X 92	X 76	X 63	X 62	C	X 52	X 50
8	X 53	X 54	X 49	X 49	C	X 46												X 82	X 81	X 76	X 59	X 51	X 51	X 51
9	X 54	X 47	X 46	X 44	X 44	X 44	X 55											X 94	X 76	X 73	X 57	X 48	X 45	X 45
10	X 47	O X 46	X 47	X 44	X 46	X 49	X 63											X 80	X 71	X 76	X 64	X 47	X 47	X 47
11	X 48	S	X 50	X 42	X 42	X 44	X 58											X 75	X 66	X 64	X 56	X 43	X 40	X 41
12	X 42	X 42	X 41	X 44	X 44	X 45	X 58											X 102	X 81	X 73	X 68	X 55	X 52	X 51
13	X 51	X 48	X 44	X 47	X 45	X 43	X 50											X 90	X 67	X 67	X 61	X 52	X 48	X 45
14	X 45	X 43	X 45	X 44	X 42	X 41	X 54											X 91	X 81	S	X 64	X 52	X 51	X 51
15	X 50	X 49	X 49	X 47	X 45	X 46	X 53											X 96	X 83	X 76	X 66	X 67	X 57	X 50
16	X 45	X 45	X 45	X 46	X 47	O X 45	X 56											X 103	X 85	X 93	X 67	X 57	X 53	X 49
17	O X 47	X 43	X 42	X 41	S	X 47	X 59											X 91	X 91	X 89	X 66	X 61	X 54	X 50
18	X 47	X 48	X 46	X 45	X 42	X 42	X 52											X 86	X 77	X 68	X 61	X 52	X 46	X 45
19	X 44	X 45	X 46	X 43	X 38	X 41	X 51											X 79	X 71	X 63	X 56	X 49	X 45	X 45
20	X 45	X 44	X 42	X 43	X 41	X 38	X 46											X 73	X 64	X 54	X 54	X 45	X 37	X 38
21	X 39	X 38	X 38	X 42	X 42	X 40	X 47											X 70	X 64	X 59	X 43	X 40	X 40	X 42
22	O X 42	X 42	X 43	X 44	X 41	X 40	X 49											X 79	X 57	O X 65	X 60	X 47	X 38	X 38
23	X 40	X 39	X 40	X 42	X 39	X 43	X 50											X 69	X 66	X 68	X 42	X 38	X 39	X 39
24	X 42	X 41	X 41	X 45	X 42	X 42	X 49											C	C	C	C	C	C	C
25	C	C	C	C	C	C	C											X 74	X 58	X 62	X 62	X 45	X 42	X 46
26	X 45	X 43	X 44	X 45	X 44	X 38	X 40											X 85	X 78	X 58	X 39	X 47	X 44	O X 44
27	X 47	X 44	X 44	X 43	X 42	X 40	X 48											X 66	X 66	X 64	X 52	X 39	X 44	X 38
28	X 37	X 39	X 39	X 39	X 39	X 41	O X 47											X 71	X 58	X 48	X 46	X 44	X 40	X 43
29	X 41	X 43	X 45	X 46	X 43	X 40	X 45											X 79	X 62	X 57	X 49	X 48	S	X 43
30	X 42	X 42	X 42	X 42	X 41	X 39	X 45											X 70	X 70	X 75	X 84	X 63	X 60	O X 64
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	29	28	29	29	27	29	22											28	29	28	29	28	28	29
MED	X 47	X 45	X 45	X 44	X 43	X 43	X 50											X 84	X 74	X 68	X 60	X 50	X 48	X 46
UQ	X 51	X 49	X 49	X 47	X 46	X 46	X 56											X 92	X 81	X 76	X 66	X 57	X 54	X 51
LQ	X 42	X 42	X 42	X 43	X 42	X 40	X 47											X 74	X 66	X 63	X 54	X 46	X 43	X 43

NOV. 1988 | FXI (0.1 MHZ)

IONOSPHERIC DATA

NOV. 1988 | 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

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	45	45	44	47	44	45	60	95	109	108	120	126	131	129	123	124	114	97	80	68	53	51	53	49
2	46	44	43	40	41	40	62	105	116	123	127	124	127	127	129	120	97	92	85	72	61	64	55	52
3	52	49	50	45	H 43	47	S 64	104	125	131	139	145	136	S 136	141	137	117	85	80	78	60	50	49	49
4	48	45	51	54	40	42	57	105	124	126	133	130	126	125	118	120	108	88	68	65	60	56	50	49
5	48	49	54	46	H 36	33	51	90	104	119	124	127	126	117	110	116	94	75	62	61	53	56	54	49
6	46	42	42	44	42	S 38	53	98	127	127	124	129	128	116	106	113	99	86	72	66	43	41	40	39
7	41	43	41	36	37	38	54	97	120	125	128	131	125	126	135	112	104	86	70	57	56	I C 55	46	44
8	47	48	43	43	I C 44	40	59	92	117	119	136	I C 138	139	134	122	109	95	76	75	70	53	45	45	45
9	48	41	40	38	38	38	49	92	125	139	138	139	142	146	132	123	103	88	70	67	51	42	39	39
10	41	S 40	41	38	40	43	57	94	116	133	139	128	134	132	128	121	104	74	65	70	58	41	41	41
11	42	I S 42	44	36	36	38	52	101	120	116	119	117	125	124	111	116	99	69	60	58	50	37	34	35
12	36	36	35	38	38	39	52	102	109	109	111	129	133	128	120	115	111	96	75	67	62	49	46	45
13	45	42	38	41	39	37	44	92	108	116	118	126	120	114	112	106	102	84	61	61	55	46	42	39
14	39	37	39	38	36	35	48	93	111	121	138	138	139	119	121	123	101	85	75	I S 70	53	46	45	45
15	44	43	S 43	41	39	40	47	90	109	120	131	130	129	124	123	119	105	90	77	70	60	61	51	44
16	39	39	39	40	41	S 39	50	95	107	111	119	126	121	129	127	126	113	97	79	87	61	51	47	43
17	U S 41	37	36	35	I S 36	41	53	93	102	100	112	130	117	114	117	123	104	85	85	83	60	55	48	44
18	41	42	S 40	39	36	36	46	103	110	118	116	118	124	122	114	112	92	80	71	62	55	46	40	39
19	38	39	40	37	32	35	45	92	R 114	108	122	117	129	128	106	113	85	73	65	57	50	S 43	39	39
20	39	38	36	37	35	32	40	72	91	96	97	112	109	108	111	107	102	67	58	48	48	39	31	32
21	33	32	32	36	36	34	41	88	H 102	120	115	131	109	111	113	91	76	64	58	53	42	34	34	36
22	S 36	36	37	38	35	34	43	85	105	118	120	108	103	104	101	105	91	73	51	S 59	54	V 41	32	32
23	34	33	34	36	33	37	44	91	106	111	106	106	108	110	109	93	82	63	60	62	36	32	33	33
24	36	35	35	39	36	36	43	83	98	107	108	101	103	98	96	86	85	C	C	C	C	C	C	C
25	C	C	C	C	C	C	C	C	C	C	110	119	117	108	108	103	90	68	52	56	56	39	36	40
26	39	37	38	39	38	32	34	72	102	117	113	115	136	136	114	101	90	79	72	52	33	41	38	U S 38
27	41	38	38	37	36	34	42	88	104	112	120	106	110	125	116	111	88	60	60	58	S 46	33	38	32
28	31	33	33	33	33	35	S 41	75	89	97	105	116	115	117	98	108	94	65	52	42	40	38	34	37
29	35	37	39	40	37	34	39	90	81	90	106	99	103	105	104	101	86	73	56	51	43	42	I S 38	37
30	36	36	36	36	35	33	39	78	93	87	95	96	100	112	106	94	92	64	64	69	78	57	S 54	U S 58
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	29	29	29	29	29	29	29	29	29	29	30	30	30	30	30	30	30	29	29	29	29	29	29	29
MED	41	39	39	38	37	37	48	92	109	117	120	126	125	123	114	112	98	79	68	62	54	45	41	40
UQ	45	43	43	41	40	40	53	97	116	121	128	130	131	128	123	120	104	86	75	70	60	51	48	45
LQ	36	37	36	37	36	34	43	88	102	108	111	115	110	112	108	105	90	69	60	57	48	41	38	37

NOV. 1988 | FOF2 (0.1 MHZ)

IONOSPHERIC DATA

NOV. 1988 | 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	L	L	L	L	L	L								
2									L	L	L	L	L	L	L		A							
3											L	L	L	L	L									
4										L	L	L	L	L										
5										L	L	L	L	L	L	L								
6										L	L	L	L	L										
7										L	L	L	L	L	L									
8										L	L	C	L											
9									L	L	L	L	L	L	L									
10											L	L	L		L									
11									L	L	L	L	L											
12										L	L	L	A	L										
13											L	L												
14											L	L	L	L	L									
15											L	L	L	L										
16									L			L	L	L		L								
17												L	L											
18											L	L	L	L										
19											L	A	L	L										
20											L		L	L	L									
21											L	L	L											
22										L			L	L	L	L								
23										L	L	L	L											
24										L			L	L	L									
25								C	C	C			L	U L 530	L									
26										L	L		L	L	L									
27									L	L	L	L	L	L										
28										L	L	L	L	L										
29										L	L			L										
30										L	L		U L 530			L								
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													1	1										
MED													U L 580	U L 530										
UQ																								
LQ																								

NOV. 1988 | FOF1 (0.01 MHZ)

IONOSPHERIC DATA

NOV. 1988 | 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								245	A	350	355	A	A	A	A	A	A	3						
2							B	260	305	A	A	A	360	355	A	A	A							
3							B	235	300	320	U A 335	A	A	A	A	A	A							
4							S	A 290		A	340	350	345	335	320	280	225							
5							B	240	290	325	340	350	350	335	325	275	195							
6							S	235	290	325	345	350	355	340	315	270	215							
7							B	225	295	325	340	355	355	350	A	280	A							
8							B	220	295	320	A	C	355	A	R 325	A	210							
9								215	285	A	340	A	350	340	320	270	220							
10								A	A	A	A	A	355	355	330	A	A							
11								220	295	A 325	A	A	A	A	A	A	230							
12								225	300	335	355	360	A	A	305	A	205							
13								230	295	330	345	365	365	350	330	295	220							
14								245	A	A	A	A	A	A	A	A	A							
15								225	285	330	350	360	A	345	U A 315	285	A							
16								220	295	A	345	A	A	350	335	285	A							
17								220	285	300	350	360	A	345	320	A	A							
18								225	A	330	340	355	360	A	A	280	A							
19								230	275	A	A	A	R 355	A	320	A	210							
20								215	295	325	340	A	A	340	325	A	A							
21								190	290	A	345	360	360	345	325	280	215							
22								205	295	320	350	360	360	340	325	280	A							
23								215	280	315	340	350	355	335	310	280	205							
24								H 195	260	310	345	350	350	345	325	285	205							
25								C	C	C	335	345	345	340	320	280	180							
26								175	260	305	335	345	350	335	310	280	200							
27								A	280	A	A	340	A	330	295	240	175							
28								205	A	310	345	345	345	335	310	A	U A 195							
29								195	270	330	355	A	A	A	A	260	205							
30								185	260	A	330	350	345	330	305	250	A							
31																								
	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
CNT								26	24	19	23	18	19	21	22	18	17							
MED								220	290	325	345	350	355	340	320	280	205							
UQ								230	295	330	348	360	358	345	325	280	215							
LQ								205	280	318	340	350	350	335	310	270	200							

NOV. 1988 | FOE (0.01 MHZ)

IONOSPHERIC DATA

NOV. 1988 | 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	JA 22	EB 16	JA 24	JA 26	JA 27	JA 20	EB 18	G	JA 32	G	JA 40	JA 42	JA 45	JA 42	JA 45	34	JA 29	JA 21	JA 17	JA 19	JA 23	JA 35	JA 27	JA 22
2	ES 18	EB 15	EB 15	EB 14	EB 15	EB 15	20	G	JA 37	41	39	JA 50	G 29	G	JA 43	JA 43	60	JA 52	JA 52	JA 37	JA 19	EB 15	FB 15	EB 14
3	JA 55	JA 32	JA 24	JA 30	JA 25	EB 15	20	28	35	JA 50	43	JA 53	JA 52	JA 43	JA 44	JA 54	JA 74	JA 46	JA 53	JA 53	JA 41	JA 28	JA 22	JA 22
4	JA 18	JA 21	JA 17	JA 21	EB 14	EB 15	JA 25	JA 46	JA 32	JA 44	G 30	G 33	G 30	G 28	35	31	26	JA 21	EB 15	EB 15	20	JA 26	EB 16	21
5	JA 29	23	EB 13	EB 14	EB 13	EB 13	18	G	33	36	36	37	36	G	G	31	26	JA 24	EB 15	EB 14	ES 17	EB 15	EB 15	EB 15
6	EB 15	JA 20	JA 15	EB 14	EB 14	ES 15	17	G 23	30	34	G	G 28	G 21	G 23	G	G	24	JA 28	JA 23	EB 15	EB 15	EB 15	EB 15	FS 19
7	EB 16	EB 15	FB 13	EB 15	EB 14	EB 15	EB 15	25	G	33	39	37	G	G	JA 38	G 20	JA 30	23	20	JA 20	23	FB 16	20	JA 18
8	JA 23	24	15	EB 16	C	EB 16	EB 16	G	34	33	37	C	37	38	G	30	G 19	JA 26	JA 21	19	EB 15	EB 13	EB 13	EB 14
9	EB 13	EB 14	JA 21	19	20	JA 18	EB 15	G	G	JA 43	G	JA 41	G	G	G 20	G	G	JA 24	JA 43	JA 39	JA 43	JA 51	JA 24	JA 23
10	EB 13	EB 16	EB 15	EB 15	JA 19	JA 19	JA 26	JA 36	JA 53	47	JA 95	JA 53	JA 43	39	JA 33	JA 51	JA 43	JA 34	EB 15	JA 29	EB 15	JA 25	JA 25	JA 23
11	JA 22	32	JA 20	EB 15	EB 13	EB 16	20	G	33	JA 39	38	JA 41	JA 47	JA 43	JA 53	JA 45	26	JA 37	JA 36	JA 21	JA 22	JA 24	JA 33	JA 21
12	EB 15	EB 14	ES 18	EB 15	JA 20	JA 24	EB 15	G 21	G 28	G 22	G 25	JA 40	JA 53	JA 54	36	29	JA 41	JA 21	JA 20	22	EB 15	EB 14	JA 26	JA 23
13	JA 18	EB 16	EB 14	EB 15	EB 13	JA 27	EB 16	G	G	36	38	38	40	40	G	32	JA 28	JA 21	JA 24	29	JA 18	JA 26	EB 15	EB 16
14	EB 15	EB 15	EB 14	EB 13	EB 15	EB 14	EB 15	JA 26	JA 32	JA 43	JA 43	JA 51	JA 43	JA 46	34	45	JA 31	JA 25	27	ES 18	EB 15	EB 14	EB 15	EB 15
15	EB 15	EB 13	EB 16	18	JA 19	JA 20	ES 16	G	G	36	G 33	36	40	G 33	36	30	28	JA 23	JA 26	JA 26	JA 23	JA 25	JA 16	25
16	EB 14	EB 15	EB 16	EB 14	EB 14	EB 16	EB 14	G	G	37	G	JA 48	JA 38	G 25	JA 36	G	JA 32	JA 30	JA 28	JA 20	EB 17	EB 15	EB 16	EB 16
17	ES 19	EB 14	EB 15	EB 16	ES 18	EB 14	EB 16	G	G	34	38	39	40	42	36	JA 36	JA 26	JA 27	EB 15	26	JA 24	EB 15	JA 22	FB 13
18	JA 30	JA 20	ES 19	JA 22	EB 15	19	EB 15	G	JA 30	G 27	38	41	38	JA 44	JA 38	29	24	20	22	19	20	JA 18	EB 15	20
19	23	JA 45	JA 24	JA 22	EB 15	EB 15	EB 15	G	36	JA 48	JA 50	JA 54	G	37	G	JA 26	JA 23	JA 34	JA 23	JA 16	EB 14	ES 17	EB 14	EB 15
20	EB 15	EB 17	EB 15	EB 15	EB 13	EB 13	EB 15	G	31	35	38	40	JA 39	G	38	JA 30	JA 28	21	EB 14	EB 14	EB 14	EB 15	EB 15	EB 15
21	EB 15	EB 14	JA 21	EB 15	EB 14	EB 15	EB 15	26	G	JA 33	G	G	G	G	G	G 24	G 20	EB 15	JA 35	JA 22	21	19	21	18
22	EB 15	19	JA 20	EB 13	EB 15	EB 15	EB 15	G 18	G	G 25	G	JA 41	G	37	G 30	30	24	JA 24	18	ES 19	JA 18	EB 15	EB 14	EB 15
23	EB 16	EB 17	EB 13	EB 14	EB 14	EB 13	EB 15	JA 37	G	34	37	G	G	38	34	30	25	JA 18	JA 28	JA 25	EB 14	JA 17	JA 16	EB 16
24	EB 14	EB 14	EB 13	EB 14	EB 14	EB 13	EB 15	G	G	G	36	JA 42	38	G	G	G	G	C	C	C	C	C	C	C
25	C	C	C	C	C	C	C	C	C	C	38	39	40	38	35	G 25	G	EB 15	EB 14	JA 27	JA 40	JA 22	JA 19	EB 14
26	JA 18	EB 15	EB 15	EB 14	EB 15	EB 15	EB 15	G	28	G	38	38	41	36	34	33	JA 29	JA 22	JA 21	22	JA 32	JA 40	EB 15	ES 17
27	EB 16	EB 15	EB 15	EB 14	EB 14	EB 15	EB 15	23	G	33	37	G 30	JA 42	G	37	JA 42	G	EB 14	EB 15	16	JA 26	JA 22	JA 24	JA 21
28	JA 21	EB 13	EB 13	EB 15	EB 14	EB 15	EB 14	JA 25	31	33	38	41	40	41	JA 51	28	G 19	21	JA 22	JA 22	22	EB 15	JA 22	JA 26
29	21	23	19	EB 13	EB 15	JA 21	EB 14	G	G	G	36	JA 39	JA 45	JA 39	JA 37	26	G	21	EB 16	20	EB 15	EB 13	27	EB 16
30	JA 21	ES 15	EB 14	EB 15	EB 15	EB 13	EB 14	G	G	32	36	39	43	43	35	JA 30	25	JA 21	JA 32	JA 26	JA 29	19	JA 24	JA 19
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	29	29	29	29	28	29	29	29	29	29	30	29	30	30	30	30	30	29	29	29	29	29	29	29
MED	EE 18	EB 16	EB 15	EB 15	EB 15	EB 15	EB 15	G	28	34	38	40	40	38	36	30	26	JA 23	JA 22	JA 21	20	17	16	EE 18
UQ	JA 21	20	JA 19	EB 16	EE 16	18	EE 17	25	32	39	38	JA 42	JA 43	42	JA 33	34	JA 29	JA 27	JA 28	JA 26	JA 23	JA 25	JA 24	JA 21
LQ	EB 15	EB 15	EB 14	EB 14	EB 14	EB 15	EB 15	G	G	32	G 33	37	G 29	G	G 20	26	G 20	JA 21	EB 16	19	EB 15	EB 15	EB 15	EB 15

NOV. 1988 | FOES (0.1 MHZ)

IONOSPHERIC DATA

NOV. 1988 | 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 15	E B 16	E B 15	19	23	18	E B 18	G	31	G	G	39	39	39	38	32	25	17	E B 15	E B 15	18	19	16	17
2	E S 18	E B 15	E B 15	E B 14	E B 15	E B 15	18	G	G 21	36	38	37	G 26	G	34	31	50	21	18	20	E B 14	E B 15	E B 15	E B 14
3	22	19	19	20	19	E B 15	19	27	33	39	38	47	39	38	30	31	35	24	21	20	33	E B 14	E B 13	E B 13
4	E B 15	E B 15	E B 14	E B 13	E B 14	E B 15	22	25	G 24	33	G 29	G 30	G 29	G 26	34	31	26	17	E B 15	E B 15	E B 14	20	E B 16	E B 15
5	E B 15	17	E B 13	E B 14	E B 13	E B 13	17	G	32	36	36	37	36	G	G	30	25	16	E B 15	E B 14	E S 17	E B 15	E B 15	E B 15
6	E B 15	E B 15	E B 14	E B 14	E B 14	E S 15	17	G 17	30	33	G	G 27	G 21	G 22	G	G	23	16	E B 14	E B 15	E B 15	E B 15	E B 15	E S 19
7	E B 16	E B 15	E B 13	E B 15	E B 14	E B 15	E B 15	25	G	G	39	G	G	G	34	G 19	24	18	19	17	E B 15	E B 16	E B 16	E B 16
8	E B 15	E B 15	15	E B 16	C	E B 16	E B 16	G	33	33	36	C	37	38	G	30	G 18	22	19	E B 13	E B 15	E B 13	E B 13	E B 14
9	E B 13	E B 14	E B 14	E B 13	17	16	E B 15	G	G	34	G	37	G	G	G 19	G	G	21	29	21	19	31	19	18
10	E B 13	E B 16	E B 15	E B 15	E B 15	E B 13	17	27	30	36	39	42	G 24	38	G 25	35	24	21	E B 15	E B 14	E B 15	20	19	17
11	E B 14	30	E B 14	E B 15	E B 13	E B 16	E B 15	G	31	34	36	37	39	37	39	33	25	23	28	19	17	16	17	E B 15
12	E B 15	E B 14	E S 18	E B 15	E B 14	E B 15	E B 15	G 18	G 21	G 24	G 29	50	38	33	28	G 17	E B 14	18	E B 15	E B 15	E B 14	17	16
13	E B 15	E B 16	E B 14	E B 15	E B 13	E B 14	E B 16	G	G	35	36	38	38	37	G	32	G 15	E B 14	19	18	E B 15	19	E B 15	E B 16
14	E B 15	E B 15	E B 14	E B 13	E B 15	E B 14	E B 15	G 22	30	33	40	46	42	35	34	36	25	19	17	E S 18	E B 15	E B 14	E B 15	E B 15
15	E B 15	E B 13	E B 16	E B 13	E B 15	E B 15	E S 16	G	G	34	G 31	G 26	37	G 32	35	G 26	23	21	22	18	19	E B 15	E B 16	E B 14
16	E B 14	E B 15	E B 16	E B 14	E B 14	E B 16	E B 14	G	G	34	G	40	38	G 25	G 28	G	26	21	17	E B 14	E S 17	E B 15	E B 16	E B 16
17	E S 19	E B 14	E B 15	E B 16	E S 18	E B 14	E B 16	G	G	33	38	38	39	39	35	33	23	E B 15	E B 15	16	20	E B 15	E B 15	E B 13
18	E B 15	E B 14	E S 19	E B 14	E B 15	E B 13	E B 15	G	29	G 27	37	38	38	39	33	G	21	E B 15	E B 15	E B 14	E B 15	E B 15	E B 15	E B 16
19	E B 15	21	15	16	E B 15	E B 15	E B 15	G	35	38	38	52	G	37	G	26	G 18	20	E B 15	16	E B 14	E S 17	E B 14	E B 15
20	E B 15	E B 17	E B 15	E B 15	E B 13	E B 13	E B 15	G	G	34	36	38	38	G	37	29	22	E B 15	E B 14	E B 14	E B 14	E B 15	E B 15	E B 15
21	E B 15	E B 14	E B 13	E B 15	E B 14	E B 15	E B 15	24	G	33	G	G	G	G	G	G 23	G 17	E B 15	22	21	E B 15	E B 15	E B 16	E B 14
22	E B 15	E B 14	E B 14	E B 13	E B 15	E B 15	E B 15	G 17	G	G 23	G	G 32	G	37	G 22	30	24	17	E B 14	E S 19	E B 15	E B 15	E B 14	E B 15
23	E B 16	E B 17	E B 13	E B 14	E B 14	E B 13	E B 15	G 18	G	33	G	G	G	37	33	29	23	18	18	19	E B 14	E B 15	E B 15	E B 16
24	E B 14	E B 14	E B 13	E B 14	E B 14	E B 13	E B 15	G	G	G	36	40	37	G	G	G	G	C	C	C	C	C	C	C
25	C	C	C	C	C	C	C	C	C	C	36	37	38	36	34	G 23	G	E B 15	E B 14	25	20	E B 14	E B 15	E B 14
26	E B 15	E B 15	E B 15	E B 14	E B 15	E B 15	E B 15	G	28	G	36	37	38	G	33	G	17	E B 14	E B 14	E B 14	23	36	E B 15	E S 17
27	E B 16	E B 15	E B 15	E B 14	E B 14	E B 15	E B 15	21	G	32	35	G 29	37	G	G	G 21	G	E B 14	E B 15	16	21	E B 15	17	E S 17
28	E B 15	E B 13	E B 13	E B 15	E B 14	E B 15	E B 14	G 16	30	33	38	37	39	37	39	27	G 19	13	E B 14	19	E B 14	E B 15	E B 15	E B 14
29	E B 15	E B 14	E B 14	E B 13	E B 15	E B 14	E B 14	G	G	G	G	38	37	37	33	22	G	E B 14	E B 16	E B 15	E B 15	E B 13	E S 19	E B 16
30	E B 14	E S 15	E B 14	E B 15	E B 15	E B 13	E B 14	G	G	31	36	37	39	35	32	G 19	23	21	22	19	26	16	E B 14	E B 15
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	29	29	29	29	28	29	29	29	29	29	30	29	30	30	30	30	30	29	29	29	29	29	29	29
MED	E B 15	E B 15	E B 14	E B 14	E B 14	E B 15	E B 15	G	G 18	33	36	37	37	36	33	28	23	17	E B 16	16	E B 15	E B 15	E B 15	E B 15
UQ	E B 15	E B 16	E B 15	E B 15	E B 15	E B 15	E B 16	G 18	30	34	38	38	39	37	34	31	25	21	19	19	19	16	E B 16	E B 16
LQ	E B 15	E B 14	E B 14	E B 14	E B 14	E B 14	E B 15	G	G	G 27	G	G 30	G 24	G	G	G 19	G 17	E B 15	E B 15	E B 15	E B 15	E B 15	E B 15	E B 14

NOV. 1988 | FBES (0.1 MHZ)

IONOSPHERIC DATA

NOV. 1988 | 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	15	16	15	14	13	14	18	15	15	16	18	20	21	20	18	21	15	13	15	15	13	14	14	14
2	E S 18	15	15	14	15	15	15	14	15	18	19	17	20	18	17	16	14	13	14	14	14	15	15	14
3	14	14	13	14	13	15	16	15	15	17	17	17	20	22	17	15	14	15	13	15	14	14	13	13
4	15	15	14	13	14	15	E S 16	15	16	18	17	19	18	17	17	14	14	13	15	15	14	14	16	15
5	15	13	13	14	13	13	14	15	14	18	17	18	19	19	16	16	14	13	15	14	E S 17	15	15	15
6	15	15	14	14	14	E S 15	E S 15	14	15	16	16	17	17	17	17	13	13	13	14	15	15	15	15	E S 19
7	16	15	13	15	14	15	15	14	15	16	18	19	18	19	17	16	16	15	15	13	15	16	16	16
8	15	15	E C 15	16	C	16	16	15	E C 18	17	18	C	20	19	18	16	15	15	13	13	15	13	13	14
9	13	14	14	13	15	14	15	13	16	17	18	18	17	19	16	16	17	14	15	15	15	16	13	14
10	13	16	15	15	15	13	14	15	13	15	16	15	15	17	14	14	15	E S 17	15	14	15	12	13	14
11	14	14	14	15	13	16	15	14	15	17	17	18	18	18	18	17	16	13	14	15	12	14	15	15
12	15	14	E S 18	15	14	15	15	14	14	15	16	17	14	15	16	17	15	14	14	15	15	14	14	14
13	15	16	14	15	13	14	16	14	16	17	16	23	20	19	16	20	14	14	16	16	15	13	15	16
14	15	15	14	13	15	14	15	15	18	19	19	31	17	17	15	14	14	14	15	E S 18	15	14	15	15
15	15	13	16	13	15	15	E S 16	15	16	17	17	19	20	19	17	16	16	14	14	15	14	15	15	14
16	14	15	16	14	14	16	14	15	17	18	18	20	20	20	21	16	14	14	13	14	E S 17	15	16	16
17	E S 19	14	15	16	E S 18	14	16	14	14	16	18	18	19	20	16	17	13	15	15	12	13	15	15	13
18	15	14	E S 19	14	15	13	15	14	15	16	18	17	18	18	16	14	15	15	15	14	15	15	15	16
19	15	13	13	14	15	15	15	15	16	15	17	16	16	17	24	15	16	14	15	14	14	E S 17	14	15
20	15	17	15	15	13	13	15	14	16	15	23	18	17	18	16	15	14	15	14	14	14	15	15	15
21	15	14	13	15	14	15	15	14	16	17	19	18	18	17	19	16	15	15	14	14	15	15	16	14
22	15	14	14	13	15	E S 15	15	15	18	16	18	18	18	16	15	15	14	14	14	E S 19	15	15	14	15
23	16	17	13	14	14	13	15	13	14	15	16	17	18	16	17	15	13	14	14	13	14	15	15	16
24	14	14	13	14	14	13	15	14	14	15	14	E S 20	17	17	17	15	14	C	C	C	C	C	C	C
25	C	C	C	C	C	C	C	C	C	C	15	18	17	15	17	15	14	15	14	14	13	14	15	14
26	15	15	15	14	15	15	15	14	14	15	16	17	17	16	18	18	15	14	14	14	14	14	15	E S 17
27	16	15	15	14	14	15	15	13	15	18	17	17	19	17	15	14	14	14	15	13	15	15	13	E S 17
28	14	13	13	15	14	15	14	13	17	15	16	16	16	16	17	15	15	15	14	13	14	15	16	13
29	15	14	14	13	15	14	14	14	17	17	18	E C 18	19	17	16	15	16	14	16	15	15	13	E S 19	16
30	14	E S 15	14	15	15	13	14	15	16	16	16	17	17	17	15	14	15	14	17	15	14	14	14	15
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	29	29	29	29	28	29	29	29	29	29	30	29	30	30	30	30	30	29	29	29	29	29	29	29
MED	15	15	14	14	14	15	15	14	15	16	17	18	18	17	17	15	14	14	14	14	14	15	15	14
UQ	15	15	15	15	15	15	15	15	16	17	18	18	19	19	17	16	15	15	15	15	15	15	15	16
LQ	14	14	13	14	14	14	15	14	15	15	16	17	17	17	16	15	14	14	14	14	14	14	14	14

NOV. 1988 | FMIN (0.1 MHZ)

IONOSPHERIC DATA

NOV. 1988 | 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	270	270	275	300	285	310	310	325	325	310	300	290	270	290	285	295	305	305	315	325	300	285	290	305
2	320	300	285	285	260	280	315	335	315	310	305	290	285	285	300	305	320	305	315	320	290	300	305	295
3	285	270	265	300	H 250	265	S 320	320	315	305	290	295	280	S 290	285	305	315	305	295	320	305	305	280	275
4	270	280	290	325	335	290	320	320	325	315	300	315	285	295	305	305	315	320	305	315	315	305	295	285
5	285	300	320	345	H 280	280	310	325	320	310	310	290	295	305	305	320	325	325	305	310	305	300	310	305
6	305	280	270	665	310	S 295	295	315	320	305	300	295	295	300	295	300	320	315	310	335	315	290	295	280
7	275	300	320	280	280	285	310	320	315	310	305	305	300	295	305	310	310	315	320	325	305	I C 310	315	275
8	275	290	300	280	I C 275	270	315	330	325	295	300	I C 295	285	290	305	310	320	320	305	325	320	295	285	300
9	310	300	265	265	280	280	325	305	315	305	305	295	285	295	305	310	320	315	315	340	325	310	290	290
10	280	S 285	285	285	290	285	320	335	325	305	315	315	295	290	295	305	325	320	310	330	330	320	290	290
11	295	I S 300	305	330	305	300	315	335	330	325	300	300	295	305	300	315	325	325	325	325	330	320	295	285
12	290	285	265	275	295	300	310	315	325	320	295	300	300	295	315	300	305	325	320	310	320	320	295	295
13	290	320	255	290	325	330	305	325	320	330	320	305	305	295	300	305	315	320	325	315	325	315	300	290
14	285	285	290	315	320	285	320	325	330	310	305	310	300	310	290	295	315	310	305	I S 320	335	305	295	290
15	290	300	S 295	320	290	295	335	325	335	305	305	305	295	295	300	300	310	315	310	315	315	305	320	305
16	295	285	280	290	315	S 315	315	345	335	315	315	300	300	295	300	305	305	315	305	320	345	305	315	300
17	U S 310	305	280	270	S	290	325	335	335	320	305	300	305	295	300	315	320	310	300	320	335	325	320	305
18	290	310	S 300	315	325	290	305	325	325	315	320	305	300	300	295	315	315	325	305	315	320	325	300	295
19	290	280	305	335	320	295	305	325	R 325	325	315	305	295	315	325	320	330	320	315	325	320	S 335	305	290
20	300	300	300	310	330	335	315	340	335	325	335	305	325	305	310	320	325	350	325	335	335	335	320	290
21	305	305	280	305	325	300	315	335	H 335	325	310	320	310	305	315	335	335	335	320	325	335	320	295	300
22	S 300	300	300	315	310	290	305	325	325	315	325	325	320	305	305	315	330	335	295	S 325	325	V 330	300	275
23	285	290	295	295	305	295	305	325	335	300	320	325	305	295	320	315	320	325	315	335	355	335	295	305
24	300	295	300	305	315	310	320	325	335	315	315	325	320	310	315	320	325	C	C	C	C	C	C	C
25	C	C	C	C	C	C	C	C	C	C	300	310	310	300	300	305	305	325	325	320	325	340	295	295
26	305	295	290	290	340	350	300	325	315	310	300	285	290	295	300	310	320	305	320	350	A	A	290	U S 285
27	295	315	305	310	300	295	315	340	335	315	325	335	300	300	315	315	340	335	315	330	S 335	325	300	320
28	305	290	300	295	305	305	S 335	345	340	320	320	305	315	320	320	315	330	330	340	320	315	320	295	285
29	290	275	305	325	325	300	300	345	350	320	315	305	305	295	300	320	320	330	315	330	315	325	I S 310	290
30	290	290	290	320	320	310	320	335	350	335	320	305	295	305	315	315	335	335	305	325	300	280	S 285	U S 275
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	29	29	29	29	28	29	29	29	29	29	30	30	30	30	30	30	30	29	29	29	28	28	29	29
MED	290	295	290	305	308	295	315	325	325	315	308	305	300	295	302	310	320	320	315	325	320	318	295	290
UQ	300	300	300	320	322	305	320	335	335	320	320	310	305	305	315	315	325	325	320	330	332	325	305	300
LQ	285	285	280	290	288	285	305	325	320	310	300	295	295	295	300	305	315	315	305	320	315	305	295	285

NOV. 1988 | M(3000)F2 (0.01)

IONOSPHERIC DATA

NOV. 1988 | 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 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	L	L	L	L	L	L								
2									L	L	L	L	L	L	L		A							
3											L	L	L	L	L									
4										L	L	L	L	L										
5										L	L	L	L	L	L	L								
6										L	L	L	L	L										
7										L	L	L	L	L	L									
8										L	L	C	L											
9									L	L	L	L	L	L	L									
10											L	L	L		L									
11									L	L	L	L	L											
12										L	L	L	A	L										
13											L	L												
14											L	L	L	L	L									
15											L	L	L	L										
16									L			L	L	L		L								
17												L	L											
18											L	L	L	L										
19											L	A	L	L										
20											L		L	L	L									
21										L	L	L	L											
22										L			L	L	L	L								
23										L	L	L	L											
24										L			L	L	L									
25								C	C	C			L	U L 385	L									
26										L	L		L	L	L									
27									L	L	L	L	L	L										
28										L	L	L	L	L										
29										L	L			L										
30										L	L		U L 380			L								
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													1	1										
MED													U L 380	U L 385										
UQ																								
LQ																								

NOV. 1988 | M(3000)F1 (0.01)

IONOSPHERIC DATA

NOV. 1988 | H'F2 (KM) | 135° E Mean Time (G.M.T. + ? 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									235	235	255	280	300L	275L	265	270								
2									250	250	250	270	265	280	260		245A							
3											265	265	250H	275	280									
4										240	255	255	245	260										
5										250	255	270	285L	250	250	255								
6										240	250	255	265	250										
7										250	260	255	265L	265	265									
8										250L	250	250IC	275											
9									240	245	240	250	295L	265	245									
10											250	240	275		255									
11									235	235	270L	250	285											
12										225	260	255	260	270										
13											255	260												
14											275	260	265	235	235									
15											250	245	260	240										
16									220			265	245	260		260								
17												260	235											
18											245	240	275	265										
19											245	240	285	260										
20											230		235	250	255									
21										255	250	240	235H											
22										245			260	290L	265L	265								
23										245	245	240	270											
24										255			255	245	260L									
25								C	C	C			270	280	275									
26										255	230		275	260	240									
27									235	240	230	225	240	250										
28										245	255	250	235	235										
29										235	260			265										
30										230	245		300			245								
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									6	19	25	23	28	22	13	5	1							
MED									235	245	250	255	265	260	260	260	245A							
UQ									240	250	255	260	275	270	265	265								
LQ									235	238	245	242	248	250	250	255								

NOV. 1988 | H'F2 (KM)

IONOSPHERIC DATA

NOV. 1988 | 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 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	330	330	335	285	E A 315	275	250	235	230	230	240	230	235	240	245	235	235	220	225	220	260	305	290	265
2	260	265	300	325	375	335	265	230	230	A 245	H 240	235	235	230	245	245	A	240	235	240	280	265	260	275
3	A 325	330	355	290	H 315	355	260	240	230	235	225	A	235	230	H 235	240	A 230	225	280	240	E A 280	260	310	320
4	320	340	280	245	235	295	255	245	230	225	H 210	H 210	220	220	235	240	230	215	240	240	255	270	275	295
5	310	285	240	220	H 280	325	260	235	225	230	240	225	H 220	235	225	225	220	215	240	250	260	265	260	265
6	270	330	345	300	260	305	290	250	240	225	230	225	225	235	235	245	235	230	240	215	230	295	295	350
7	340	285	260	315	325	310	275	245	245	230	235	230	H 205	225	230	230	235	220	230	235	265	255	260	325
8	330	295	E C 285	345	I C 340	355	260	235	245	235	235	I C 225	210	H 235	240	230	220	215	245	220	230	280	305	285
9	260	285	360	360	315	310	245	230	235	220	230	H 215	H 225	225	235	225	220	225	A 255	225	230	A	A 315	315
10	320	330	315	310	320	310	255	A 240	240	235	235	E A 245	215	250	240	235	215	215	235	235	220	E A 275	A 310	305
11	290	A	280	240	270	290	275	235	235	230	H 215	215	230	255	240	250	225	220	A 245	225	230	260	305	320
12	320	325	E S 400	340	295	285	265	255	215	220	H 220	240	A	240	245	230	235	210	230	245	240	235	290	285
13	290	255	370	320	245	245	275	250	240	235	235	230	240	225	235	225	225	215	230	250	240	260	285	310
14	320	330	305	270	260	315	265	240	230	240	235	A	A 255	230	230	A 260	225	225	250	240	225	260	280	290
15	305	290	285	260	300	295	220	235	230	230	235	230	230	230	240	H 240	225	230	250	240	240	275	240	265
16	265	315	330	310	265	275	260	225	225	215	235	230	225	225	240	255	230	230	240	240	220	260	255	280
17	295	285	335	370	285	305	235	230	230	235	225	250	245	235	250	245	220	235	250	240	230	245	245	285
18	300	270	310	270	245	295	275	240	230	230	230	225	H 215	235	230	230	220	215	H 240	230	250	250	280	305
19	310	A 360	285	250	260	310	275	245	235	220	230	A	235	235	225	245	210	225	245	225	235	245	270	310
20	300	295	290	275	255	250	260	220	225	225	225	235	230	235	240	235	230	205	235	220	225	235	280	325
21	305	305	355	300	255	290	265	245	225	225	H 210	230	225	230	240	225	210	215	A 260	235	235	260	315	300
22	305	305	305	265	275	310	275	245	240	225	235	230	H 215	235	235	240	230	215	265	260	240	240	300	350
23	335	330	305	310	305	310	290	250	225	225	H 220	215	225	240	245	230	225	215	255	235	215	245	305	305
24	290	295	305	285	275	280	260	230	225	H 210	235	240	225	225	H 210	235	230	C	C	C	C	C	C	C
25	C	C	C	C	C	C	C	C	C	C	230	225	240	225	240	230	220	215	225	A 260	245	225	290	300
26	275	290	305	305	240	230	285	250	240	H 225	235	240	250	245	225	H 230	225	235	225	215	A	A	310	345
27	305	265	290	280	295	310	280	235	230	245	235	225	225	210	H 225	H 215	215	210	250	220	245	265	290	275
28	280	310	300	310	290	295	230	220	220	230	H 215	220	230	240	235	240	220	210	215	255	255	260	305	320
29	325	350	280	250	260	305	285	230	215	230	240	255	230	240	225	235	220	205	240	235	250	240	I S 280	310
30	305	320	305	260	260	280	260	230	230	220	235	235	225	250	245	225	225	A 230	A 265	235	A 265	310	310	310
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	29	28	29	29	29	29	29	29	29	29	30	27	29	30	30	30	29	29	29	29	28	27	29	29
MED	305	305	305	290	275	305	265	235	230	230	235	230	225	235	235	235	225	215	240	235	240	260	290	305
UQ	320	330	332	310	302	310	275	245	235	235	235	235	235	240	240	240	230	225	250	240	254	266	305	320
LQ	290	285	285	265	260	285	260	230	225	225	225	225	225	225	230	230	220	215	235	225	230	245	275	285

NOV. 1988 | H'F (KM)

IONOSPHERIC DATA

NOV. 1988 | 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

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								130	A	120	120	A	A	A	A	A	A	B						
2							B	125	E A 130	A	A	A	E A 130	120	A	A	A							
3							B	125	115	115	120	115	A	A	A	A	A							
4							S	A	E A 150	A	E A 125	E A 135	E A 125	E A 130	125	E A 125	E A 135							
5							B	130	120	115	115	120	120	120	120	120	130							
6							S	E A 140	125	120	120	E A 125	120	E A 120	120	120	E A 150							
7							B	E A 140	120	115	120	110	115	120	A	E A 125	A							
8							B	130	130	125	A	C	E A 150	120	120	A	E A 145							
9								120	120	A	125	A	115	120	120	120	140							
10								A	A	A	A	A	E A 125	E A 130	E A 125	A	A							
11								130	120	115	110	A	A	A	A	A	125							
12								E A 145	A 130	E A 120	E A 125	E A 130	A	A	E A 125	A	E A 125							
13								130	120	E A 130	120	125	120	120	120	125	130							
14								E A 160	A	A	A	A	A	A	A	A	A							
15								130	120	E A 130	E A 140	E A 135	A	E A 135	A	A	A							
16								125	120	115	120	A	A	E A 120	E A 130	120	A							
17								130	120	120	120	120	120	115	E A 135	A	A							
18								130	A	E A 140	115	115	115	120	A	E A 135	A							
19								130	120	115	115	115	115	120	125	A	E A 140							
20								130	115	120	120	115	115	125	120	120	A							
21								125	120	A	115	120	115	120	120	E A 130	E A 145							
22								A 135	120	E A 130	120	E A 140	115	E A 125	E A 125	E A 130	A							
23								E A 155	120	120	115	120	115	120	120	120	130							
24								H 125	120	115	115	120	115	115	125	120	130							
25								C	C	C	120	A	120	120	120	E A 135	130							
26								130	120	120	110	115	120	120	120	125	E A 135							
27								A	115	A	A	E A 130	A	115	A 115	E A 135	135							
28								E A 150	A	E A 135	E A 135	115	115	115	120	120	A							
29								140	130	120	120	A	115	115	A	E A 145	E B 145							
30								140	125	A	120	120	120	120	E A 125	E A 125	A							
31																								
	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
CNT								26	24	21	25	20	22	25	21	19	16							
MED								130	120	118	120	118	116	120	120	122	130							
UQ								A 135	122	122	120	E A 128	120	120	E A 125	E A 130	E A 142							
LQ								130	120	115	115	115	115	120	120	120	130							

NOV. 1988 | H'E (KM)

IONOSPHERIC DATA

NOV. 1988 | 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	105	B	110	105	105	110	B	G	120	G	135	120	120	120	115	115	110	115	115	115	105	110	110	110
2	S	B	B	B	B	B	185	G	125	115	115	110	110	G	120	125	110	125	115	105	110	B	B	B
3	110	110	110	105	105	B	155	145	135	120	120	115	110	115	115	110	105	110	115	110	110	110	115	110
4	115	110	110	115	B	B	115	115	110	115	110	115	110	110	E G 170	E G 205	150	105	B	B	100	110	B	110
5	115	105	B	B	B	B	155	G	E G 180	170	E G 195	E G 160	E G 175	G	G	140	115	120	B	B	S	B	B	B
6	B	105	110	B	B	S	155	120	E G 180	E G 180	G	110	110	105	G	G	145	105	105	B	B	B	B	S
7	B	B	B	B	B	B	B	E G 165	G	E G 180	130	125	G	G	110	110	115	110	110	110	110	B	110	110
8	110	110	C	B	C	B	B	G	E G 165	E G 185	115	C	145	125	G	110	115	110	105	105	B	B	B	B
9	B	B	110	110	105	110	B	G	G	115	G	115	G	G	105	G	G	120	115	110	110	105	100	105
10	B	B	B	B	120	125	115	105	110	105	100	100	105	E G 185	105	100	105	105	B	110	B	105	105	105
11	110	100	115	B	B	B	100	G	145	125	115	120	120	120	115	120	135	115	110	110	105	110	110	110
12	B	B	S	B	105	135	B	125	110	105	105	105	100	100	120	120	115	100	115	115	B	B	105	105
13	120	B	B	B	B	130	B	G	G	E G 150	140	155	135	130	G	E G 180	115	110	110	150	105	130	B	B
14	B	B	B	B	B	B	B	125	120	120	110	115	110	115	125	125	100	105	100	S	B	B	B	B
15	B	B	B	110	115	110	S	G	G	135	115	115	115	115	E G 175	110	120	110	110	110	105	130	105	105
16	B	B	B	B	B	B	B	G	G	115	G	110	110	105	110	G	115	110	110	100	S	B	B	B
17	S	B	B	B	S	B	B	G	G	125	125	125	120	150	150	105	110	115	B	105	115	B	115	B
18	110	110	S	140	B	115	B	G	125	110	145	125	145	125	115	E G 175	115	130	115	110	105	110	B	120
19	115	110	115	115	B	B	B	G	125	120	135	115	G	120	G	105	110	100	105	105	B	S	B	B
20	B	B	B	B	B	B	B	G	E G 175	150	125	130	125	G	120	120	120	100	B	B	B	B	B	B
21	B	B	115	B	B	B	B	135	G	115	G	G	G	G	G	115	125	B	110	110	110	110	110	105
22	B	100	105	B	B	S	B	115	G	115	G	105	G	E G 200	110	E G 200	105	105	110	S	110	B	B	B
23	B	B	B	B	B	B	B	120	G	135	135	G	G	160	E G 185	E G 175	155	105	125	110	B	105	110	B
24	B	B	B	B	B	B	B	G	G	G	E G 170	135	130	G	G	G	G	C	C	C	C	C	C	C
25	C	C	C	C	C	C	C	C	C	C	150	150	130	145	150	110	G	B	B	120	120	125	120	B
26	115	B	B	B	B	B	B	G	E G 180	G	150	145	150	E G 190	E G 155	155	105	105	115	130	125	115	B	S
27	B	B	B	B	B	B	B	115	G	125	115	110	110	G	130	105	G	B	B	145	115	115	110	110
28	120	B	B	B	B	B	B	115	115	E G 185	E G 160	155	150	135	120	115	130	105	120	120	115	B	115	110
29	115	115	105	B	B	115	B	G	G	G	E G 175	120	120	115	105	120	G	110	B	125	B	B	115	B
30	105	S	B	B	B	B	B	G	G	120	E G 170	E G 165	125	120	120	105	120	105	110	110	105	110	105	155
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	13	10	10	7	6	8	7	12	16	25	25	27	24	22	23	26	25	26	21	23	18	15	16	14
MED	115	110	110	110	105	115	155	119	U 118	113	U 122	118	120	119	118	114	115	110	110	110	110	110	110	110
UQ	115	110	115	115	115	128	155	128	E G 170	U 138	U 142	128	131	U 135	U 130	U 130	120	115	115	118	115	115	115	110
LQ	110	105	110	108	105	110	115	115	118	115	115	112	110	115	112	110	110	105	110	110	105	110	105	105

NOV. 1988 | H'ES (KM)

IONOSPHERIC DATA

NOV. 1988 | TYPES OF ES | 135° E Mean Time (G.M.T. + 9 h)

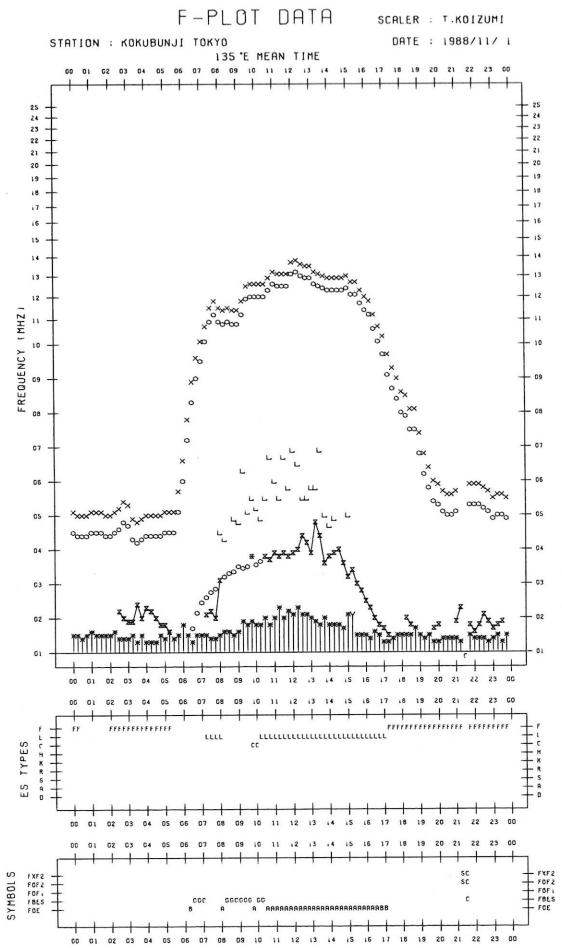
Station KOKUBUNJI TOKYO Lat. 35° 42.4' N, Long. 139° 29.3' E Sweep 1 MHz to 25 MHz in 24 sec in automatic operation

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

NOV. 1988 | 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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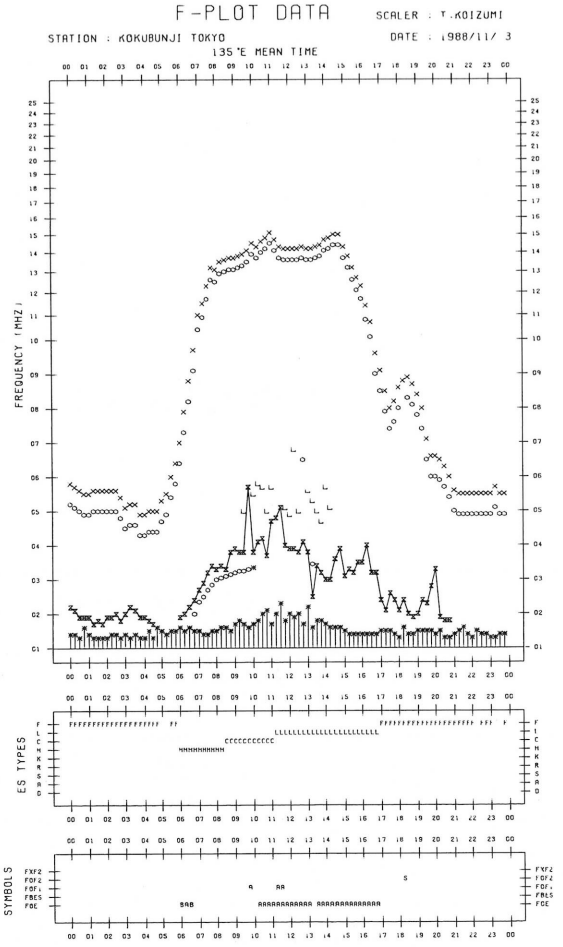
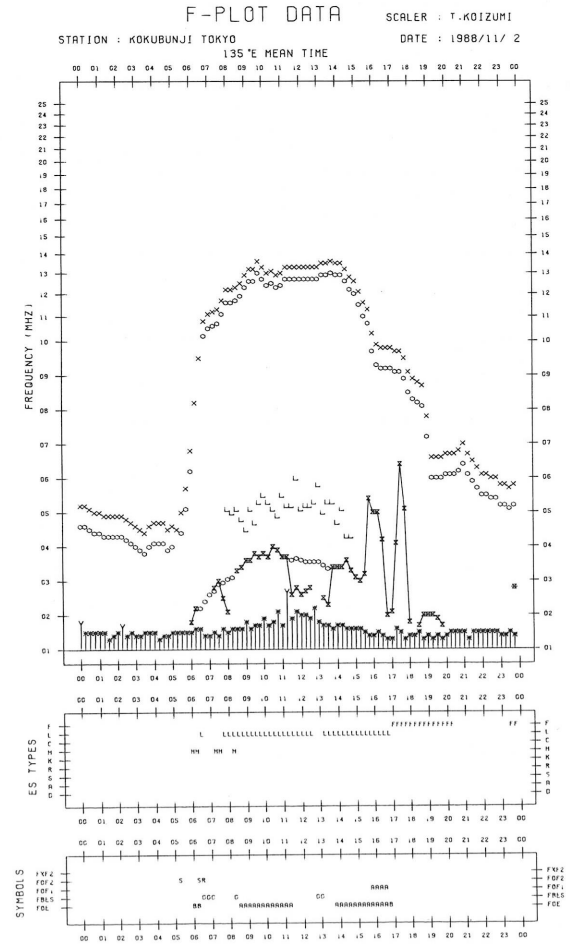
SCALER : T.KOIZUMI
STATION : KOKUBUNJI TOKYO
DATE : 1988/11/ 1
135 °E MEAN TIME
FREQUENCY (MHZ)
ES TYPES
SYMBOLS


F-PLOT DATA
SCALER : T.KOIZUMI
STATION : KOKUBUNJI TOKYO
DATE : 1988/11/ 3
135 °E MEAN TIME
FREQUENCY (MHZ)
ES TYPES
SYMBOLS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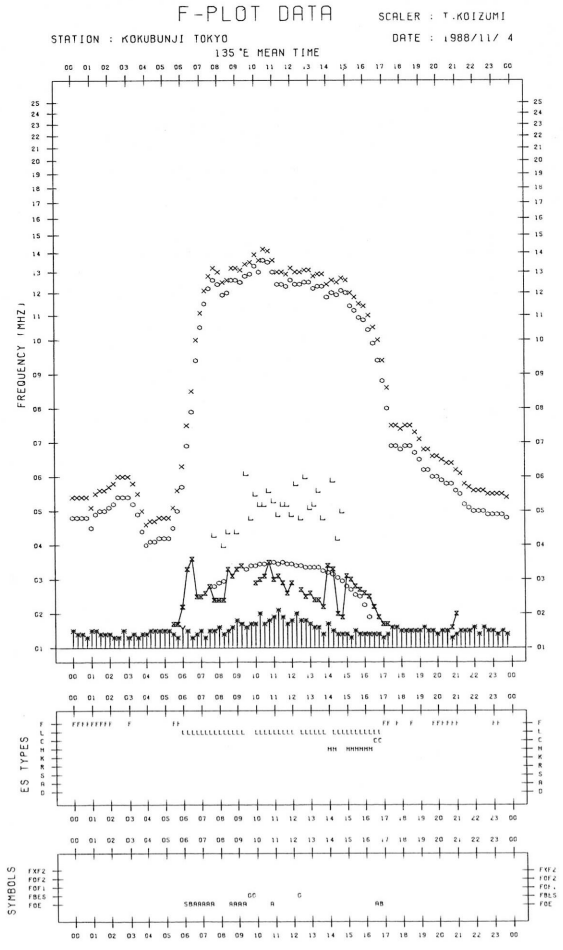
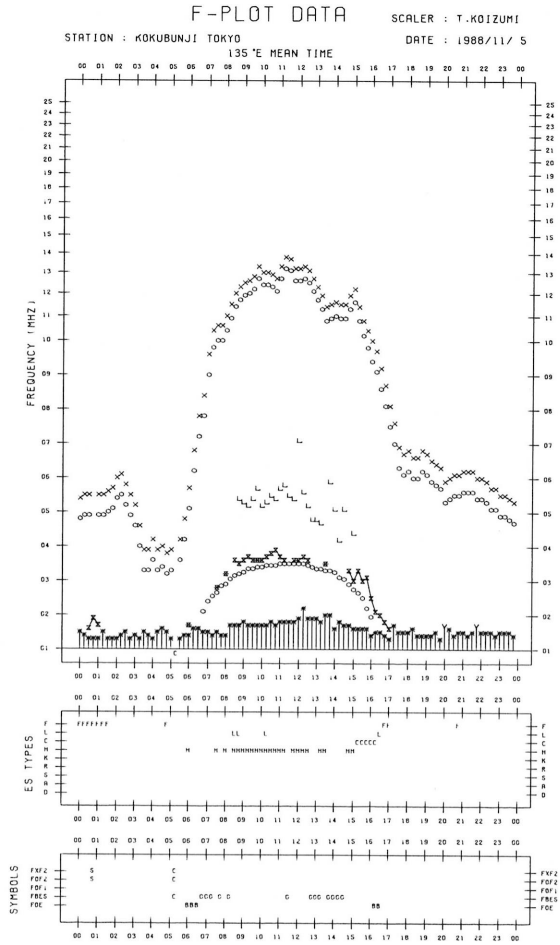
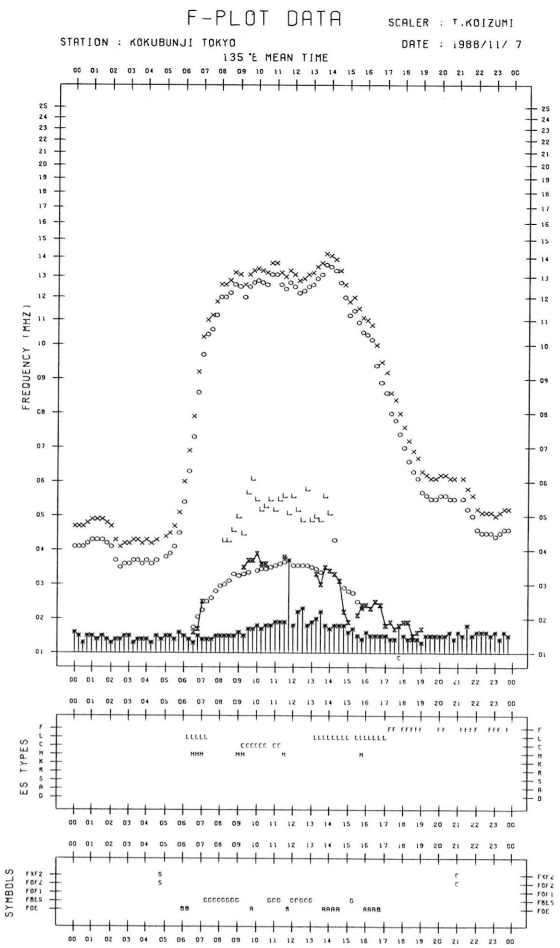
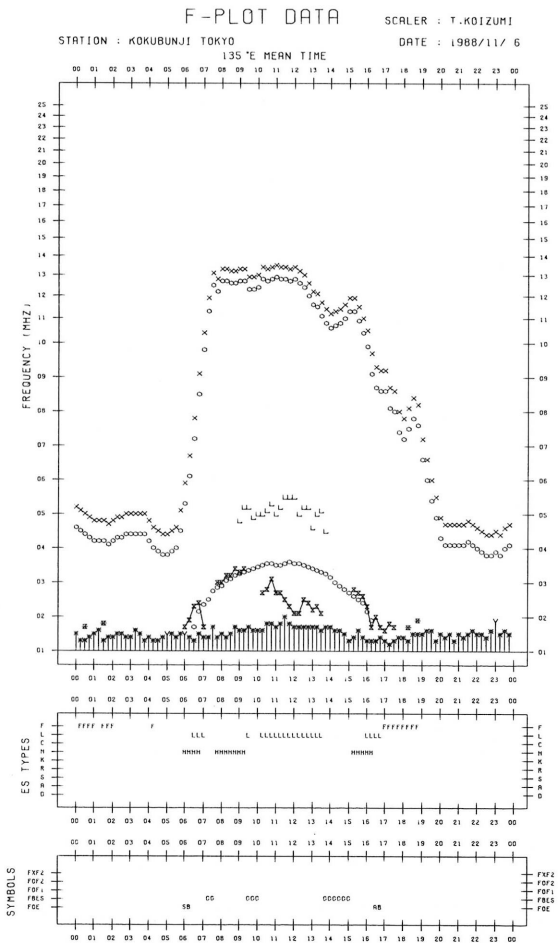
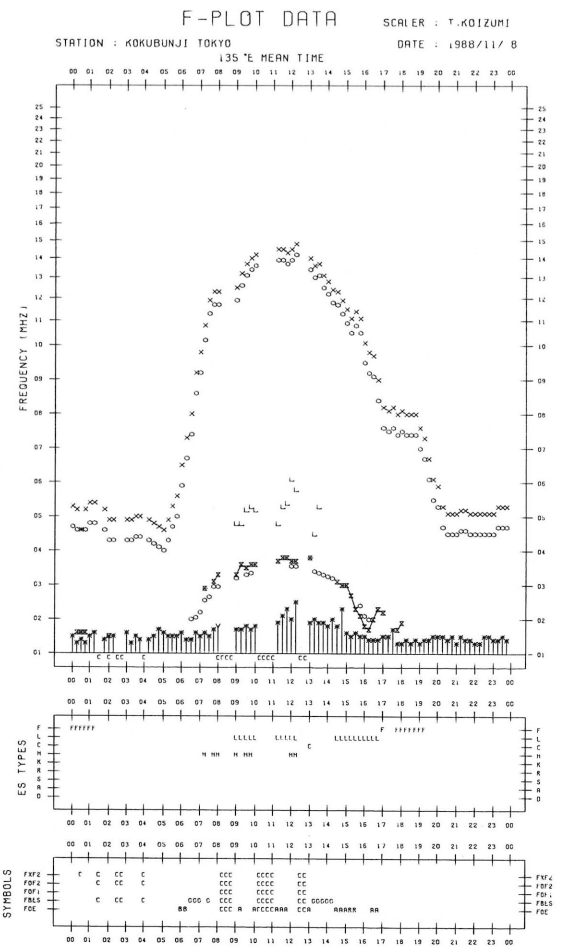
SCALER : T.KOIZUMI
STATION : KOKUBUNJI TOKYO
DATE : 1988/11/ 2
135 °E MEAN TIME
FREQUENCY (MHZ)
ES TYPES
SYMBOLS

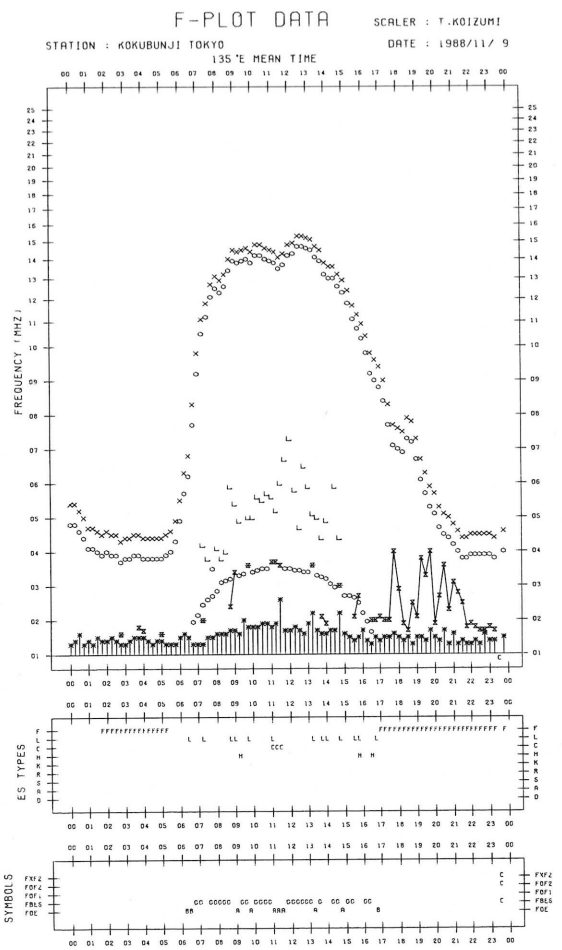

F-PLOT DATA
SCALER : T.KOIZUMI
STATION : KOKUBUNJI TOKYO
DATE : 1988/11/ 4
135 °E MEAN TIME
FREQUENCY (MHZ)
ES TYPES
SYMBOLS

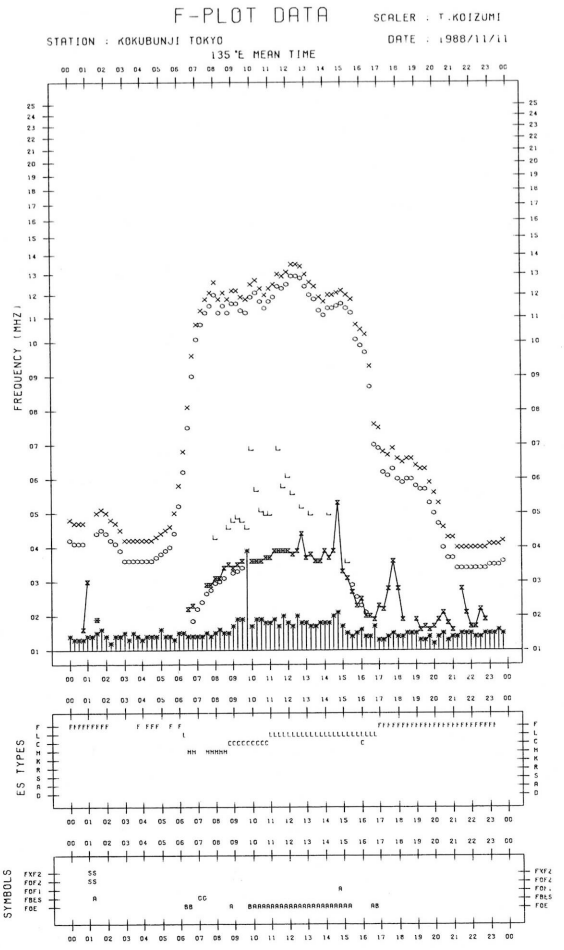

F-PLOT DATA
SCALER : T.KOIZUMI
STATION : KOKUBUNJI TOKYO
DATE : 1988/11/ 5
135 °E MEAN TIME
FREQUENCY (MHZ)
ES TYPES
SYMBOLS

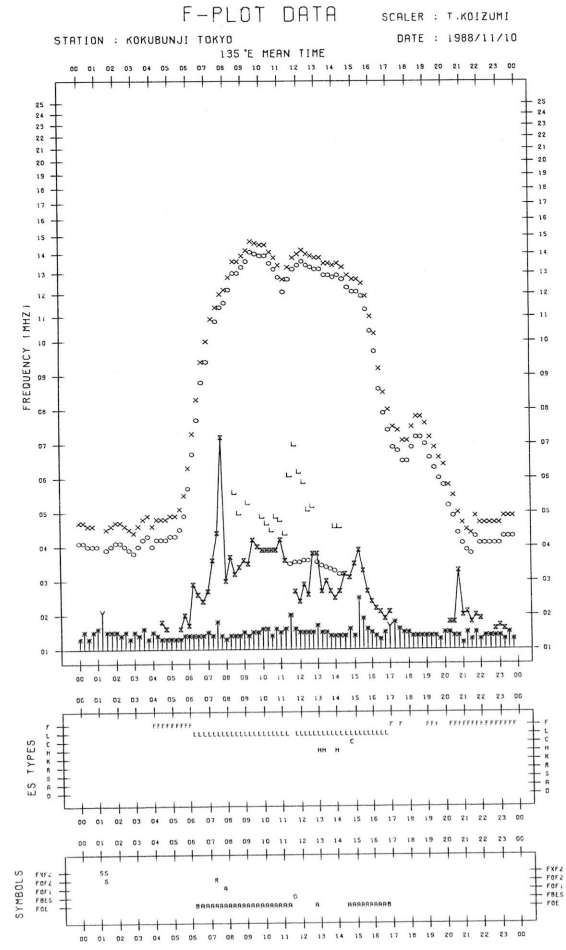

F-PLOT DATA
SCALER : T.KOIZUMI
STATION : KOKUBUNJI TOKYO
DATE : 1988/11/ 7
135 °E MEAN TIME
FREQUENCY (MHZ)
ES TYPES
SYMBOLS

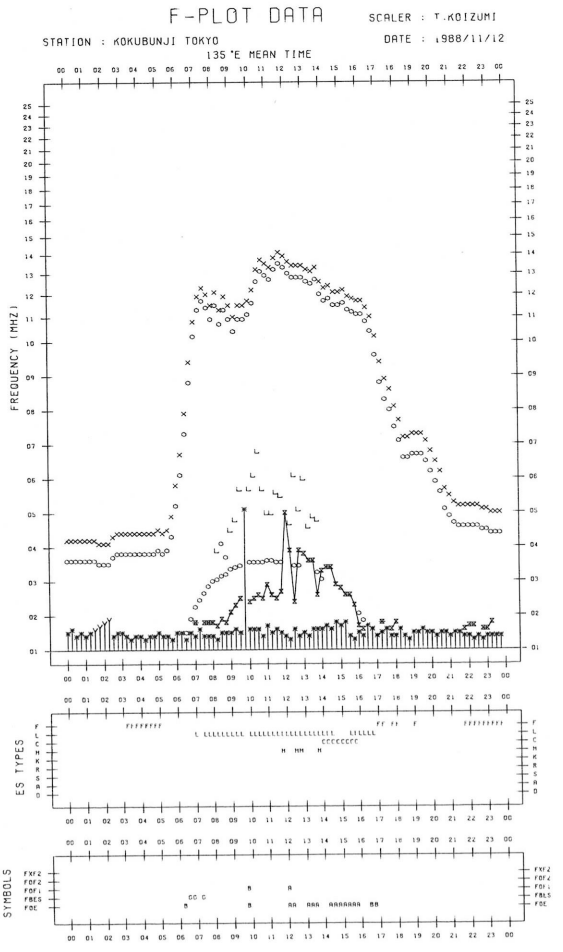

F-PLOT DATA
SCALER : T.KOIZUMI
STATION : KOKUBUNJI TOKYO
DATE : 1988/11/ 6
135 °E MEAN TIME
FREQUENCY (MHZ)
ES TYPES
SYMBOLS

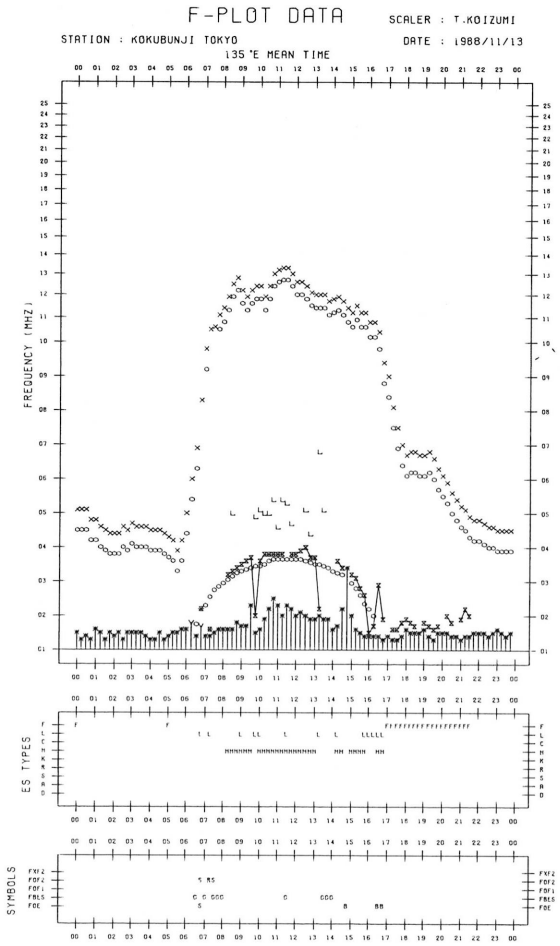

F-PLOT DATA
SCALER : T.KOIZUMI
STATION : KOKUBUNJI TOKYO
DATE : 1988/11/ 8
135 °E MEAN TIME
FREQUENCY (MHZ)
ES TYPES
SYMBOLS

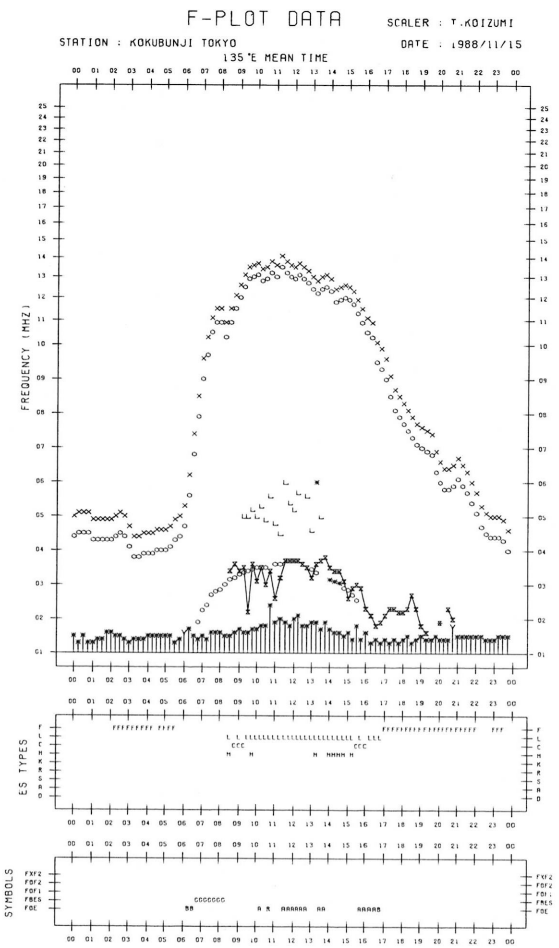

F-PLOT DATA
SCALER : T.KOIZUMI
STATION : KOKUBUNJI TOKYO
DATE : 1988/11/ 9
135°E MEAN TIME
FREQUENCY (MHZ)
ES TYPES
SYMBOLS

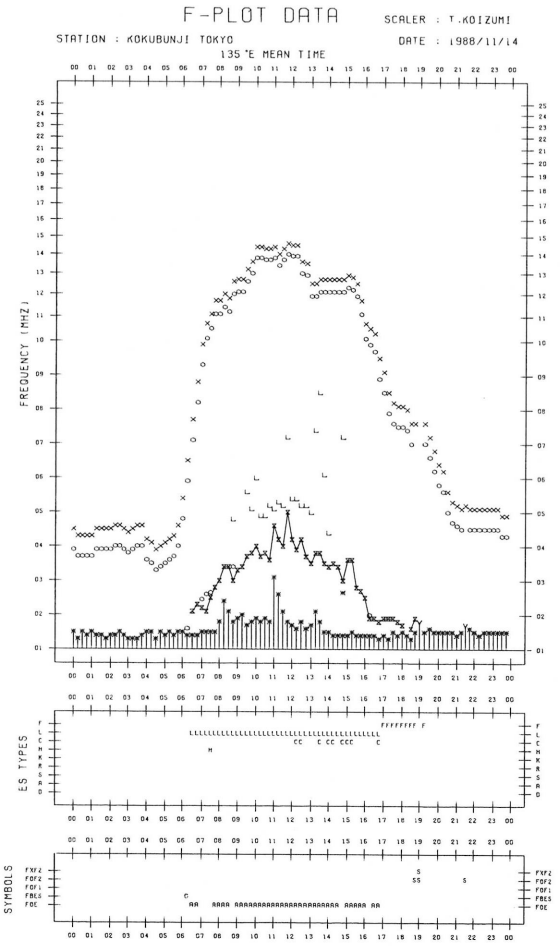

F-PLOT DATA
SCALER : T.KOIZUMI
STATION : KOKUBUNJI TOKYO
DATE : 1988/11/11
135°E MEAN TIME
FREQUENCY (MHZ)
ES TYPES
SYMBOLS

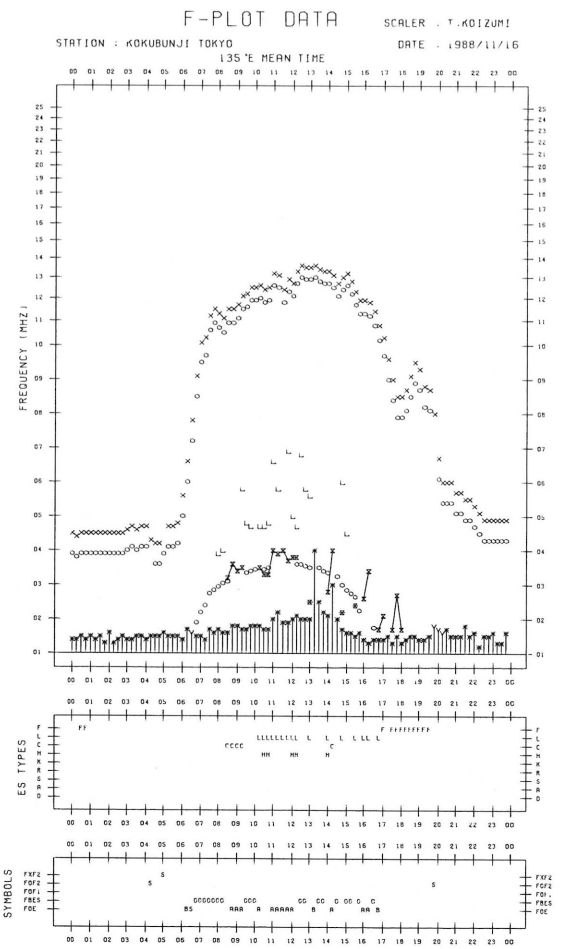

F-PLOT DATA
SCALER : T.KOIZUMI
STATION : KOKUBUNJI TOKYO
DATE : 1988/11/10
135°E MEAN TIME
FREQUENCY (MHZ)
ES TYPES
SYMBOLS

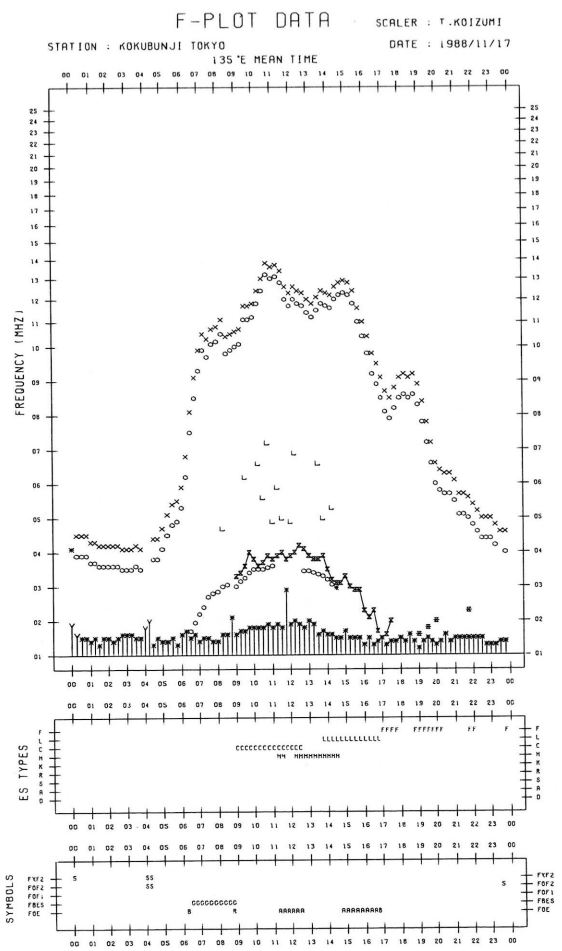

F-PLOT DATA
SCALER : T.KOIZUMI
STATION : KOKUBUNJI TOKYO
DATE : 1988/11/12
135°E MEAN TIME
FREQUENCY (MHZ)
ES TYPES
SYMBOLS

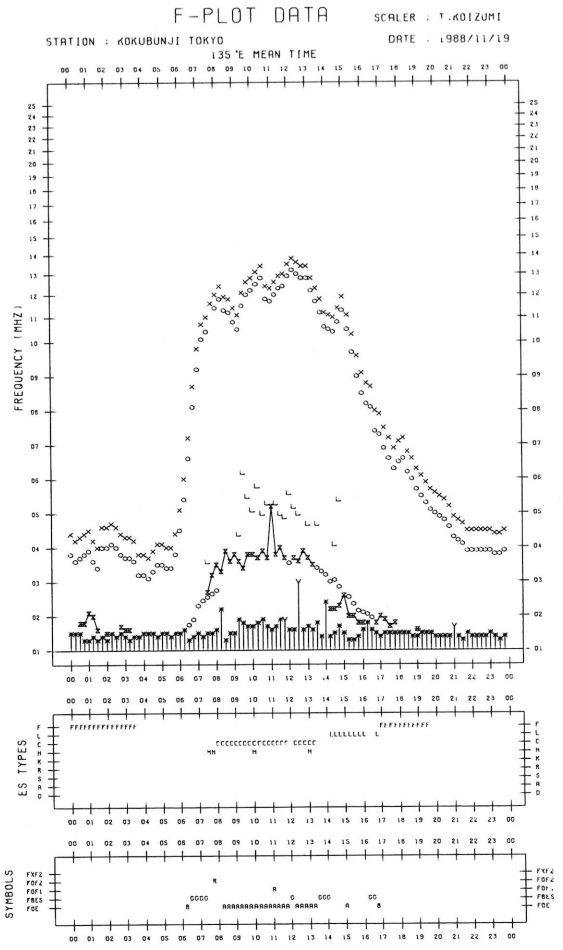

F-PLOT DATA
SCALER : T.KOIZUMI
STATION : KOKUBUNJI TOKYO
DATE : 1988/11/13
135°E MEAN TIME
FREQUENCY (MHZ)
ES TYPES
SYMBOLS

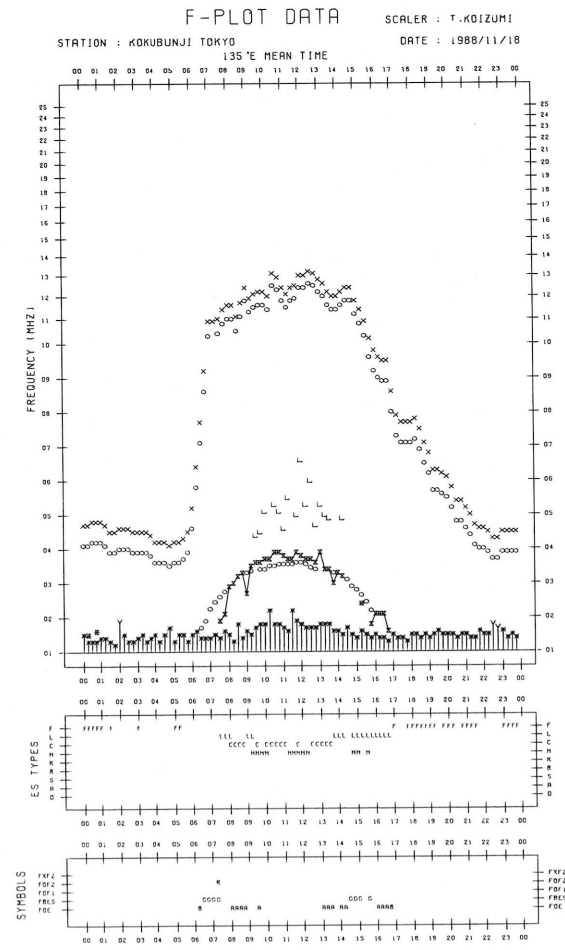

F-PLOT DATA
SCALER : T.KOIZUMI
STATION : KOKUBUNJI TOKYO
DATE : 1988/11/15
135°E MEAN TIME
FREQUENCY (MHZ)
ES TYPES
SYMBOLS

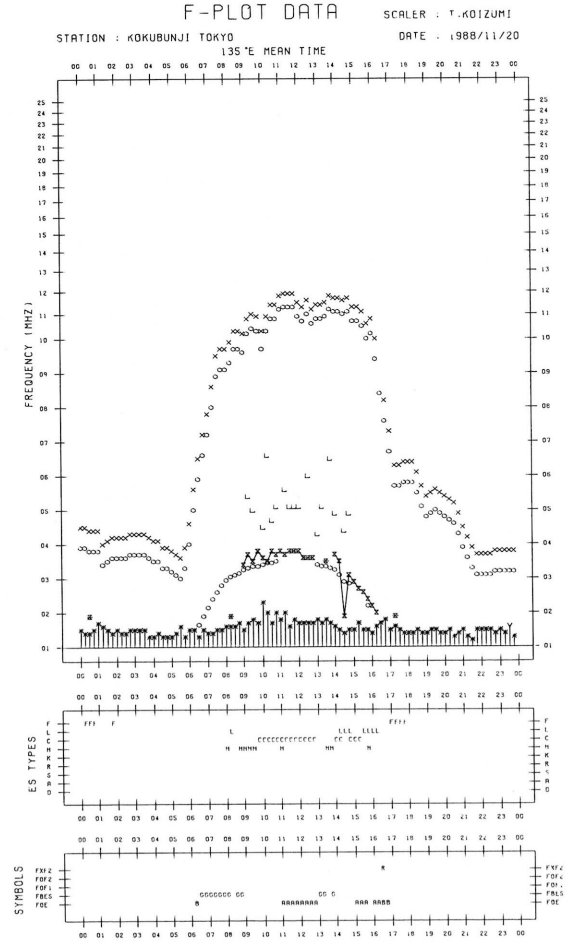

F-PLOT DATA
SCALER : T.KOIZUMI
STATION : KOKUBUNJI TOKYO
DATE : 1988/11/14
135°E MEAN TIME
FREQUENCY (MHZ)
ES TYPES
SYMBOLS

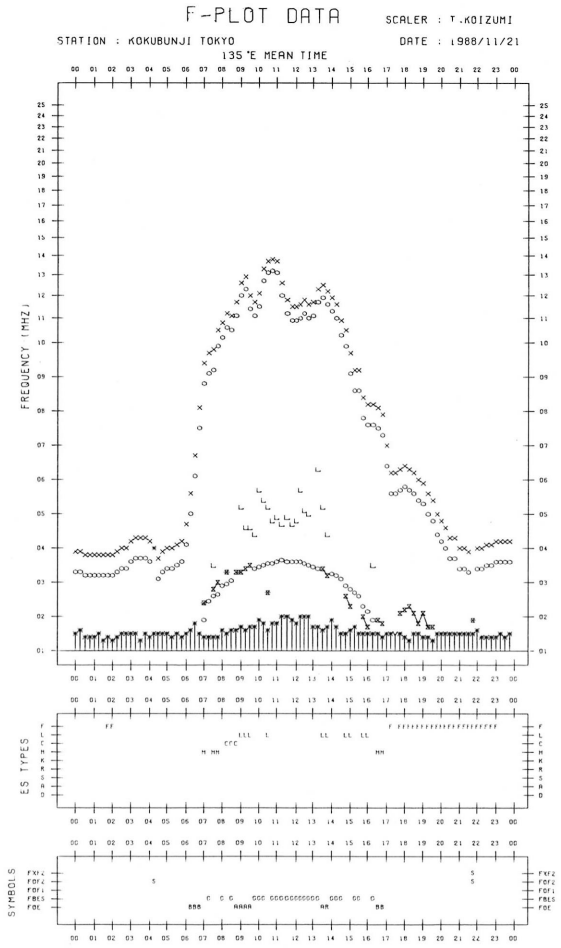

F-PLOT DATA
SCALER : T.KOIZUMI
STATION : KOKUBUNJI TOKYO
DATE : 1988/11/16
135°E MEAN TIME
FREQUENCY (MHZ)
ES TYPES
SYMBOLS

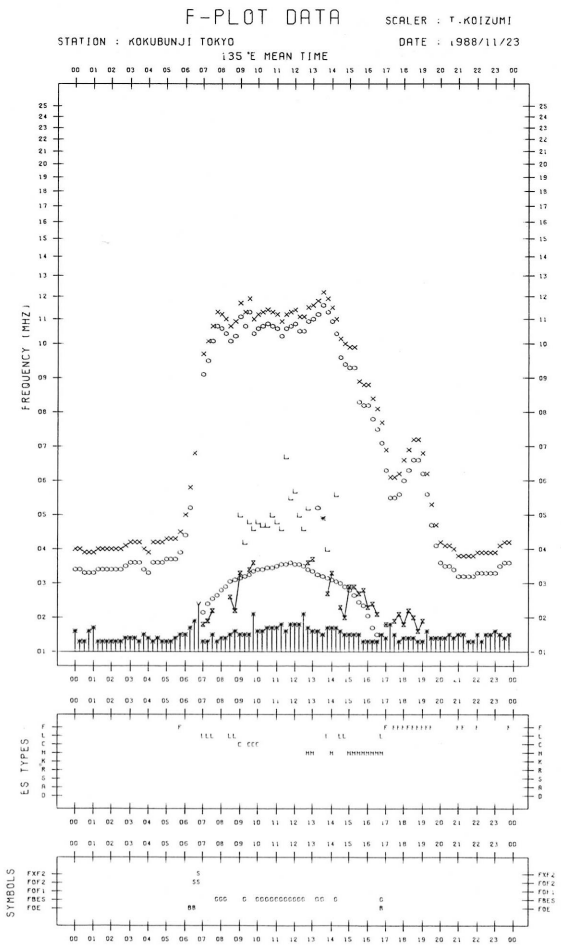

F-PLOT DATA
SCALER : T.KOIZUMI
STATION : KOKUBUNJI TOKYO
DATE : 1988/11/17
135°E MEAN TIME
FREQUENCY (MHZ)
ES TYPES
SYMBOLS

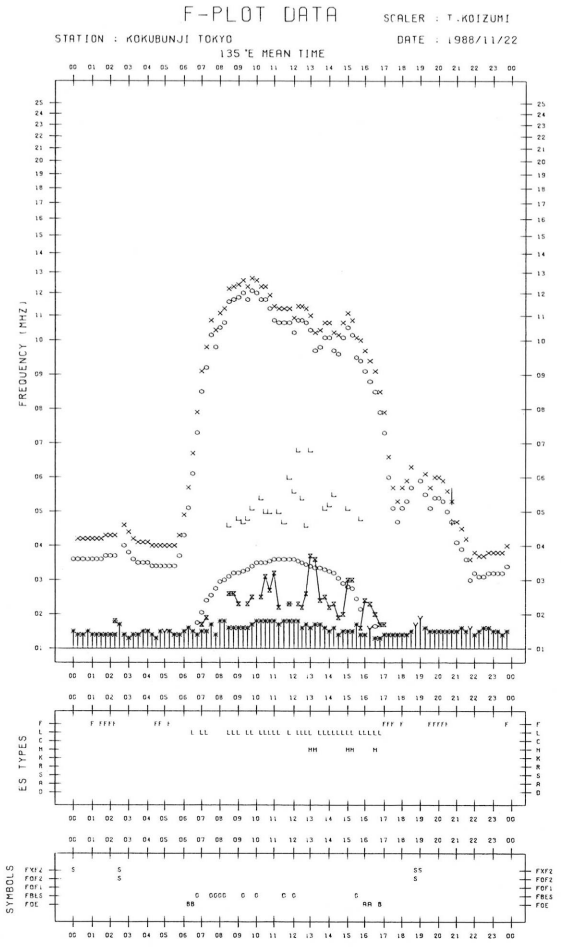

F-PLOT DATA
SCALER : T.KOIZUMI
STATION : KOKUBUNJI TOKYO
DATE : 1988/11/19
135°E MEAN TIME
FREQUENCY (MHZ)
ES TYPES
SYMBOLS

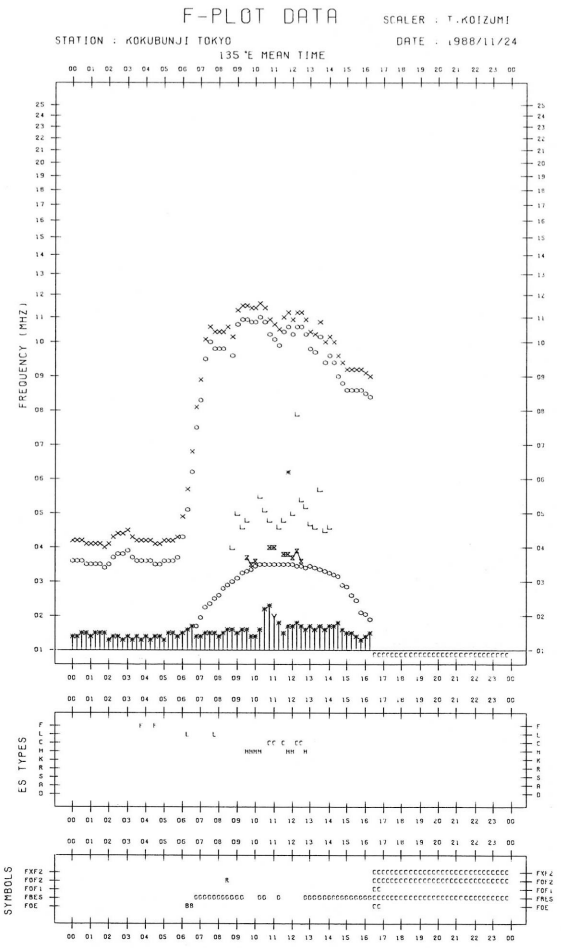

F-PLOT DATA
SCALER : T.KOIZUMI
STATION : KOKUBUNJI TOKYO
DATE : 1988/11/18
135°E MEAN TIME
FREQUENCY (MHZ)
ES TYPES
SYMBOLS

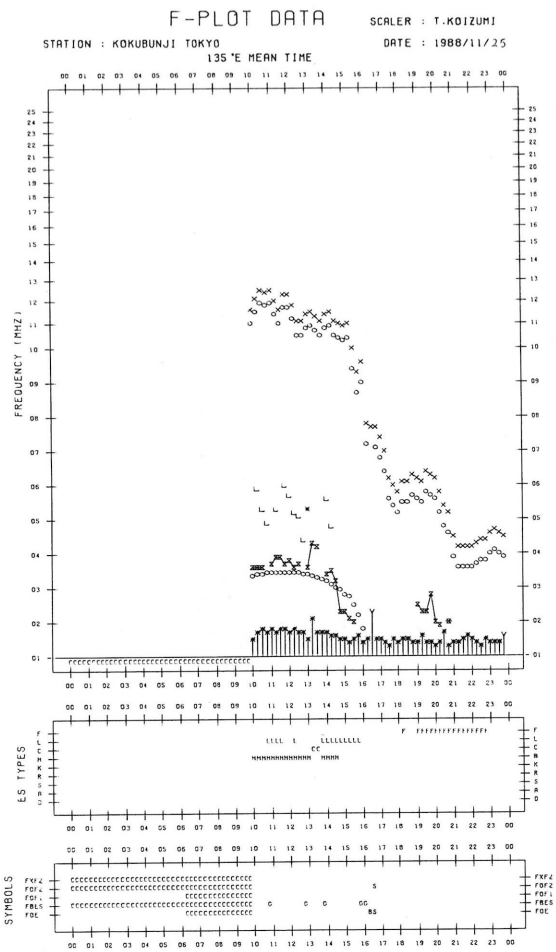

F-PLOT DATA
SCALER : T.KOIZUMI
STATION : KOKUBUNJI TOKYO
DATE : 1988/11/20
135°E MEAN TIME
FREQUENCY (MHZ)
ES TYPES
SYMBOLS

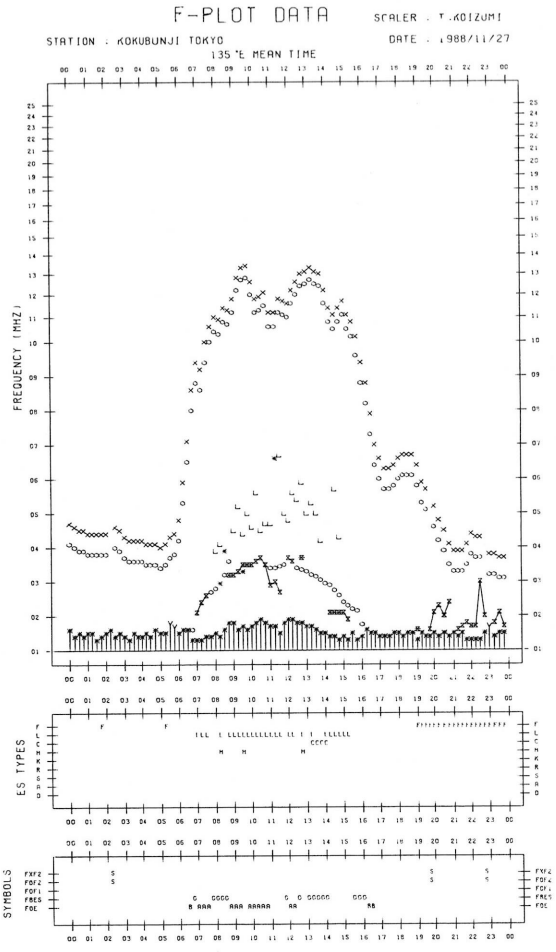

F-PLOT DATA
SCALER : T.KOIZUMI
STATION : KOKUBUNJI TOKYO
DATE : 1988/11/21
135 'E MEAN TIME
FREQUENCY (MHZ)
ES TYPES
SYMBOLS

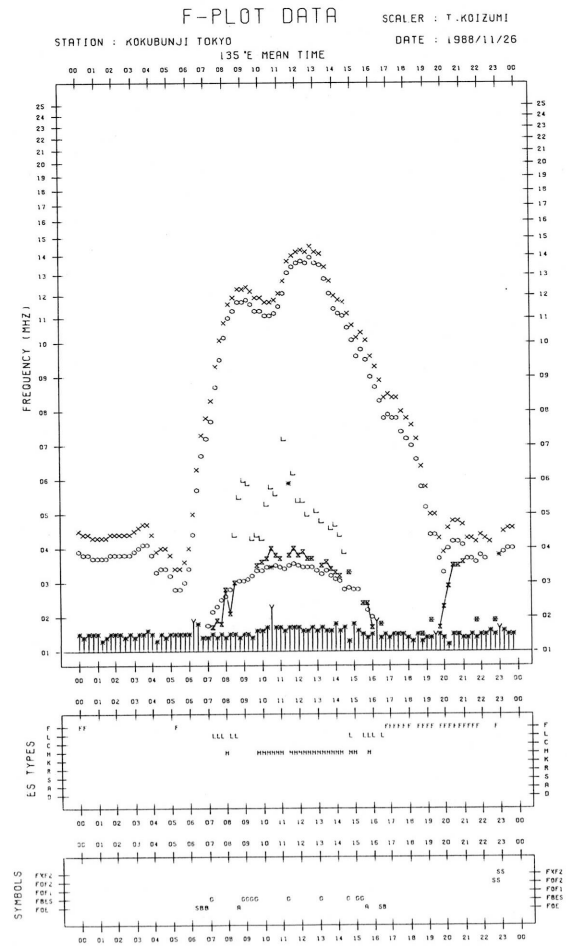

F-PLOT DATA
SCALER : T.KOIZUMI
STATION : KOKUBUNJI TOKYO
DATE : 1988/11/23
135 'E MEAN TIME
FREQUENCY (MHZ)
ES TYPES
SYMBOLS

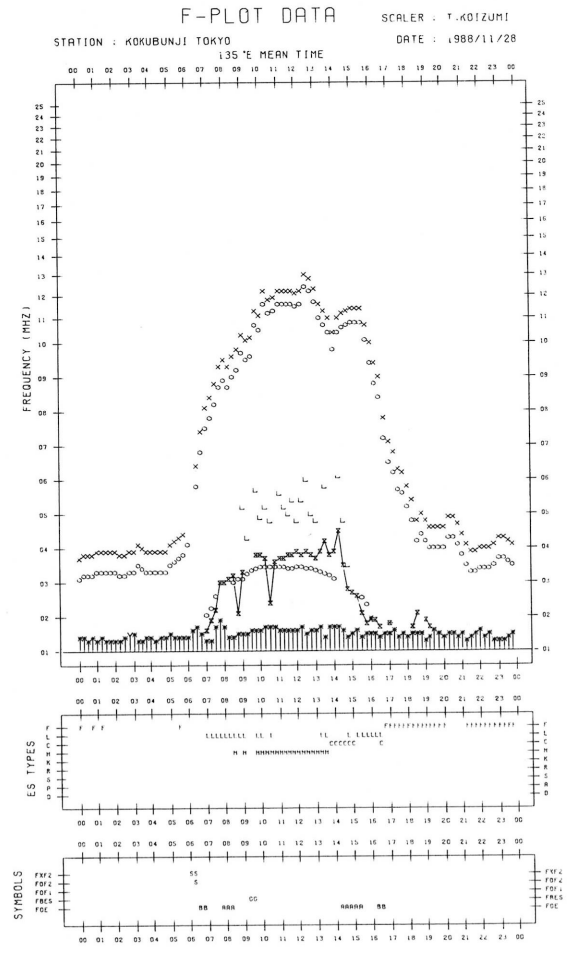

F-PLOT DATA
SCALER : T.KOIZUMI
STATION : KOKUBUNJI TOKYO
DATE : 1988/11/22
135 'E MEAN TIME
FREQUENCY (MHZ)
ES TYPES
SYMBOLS

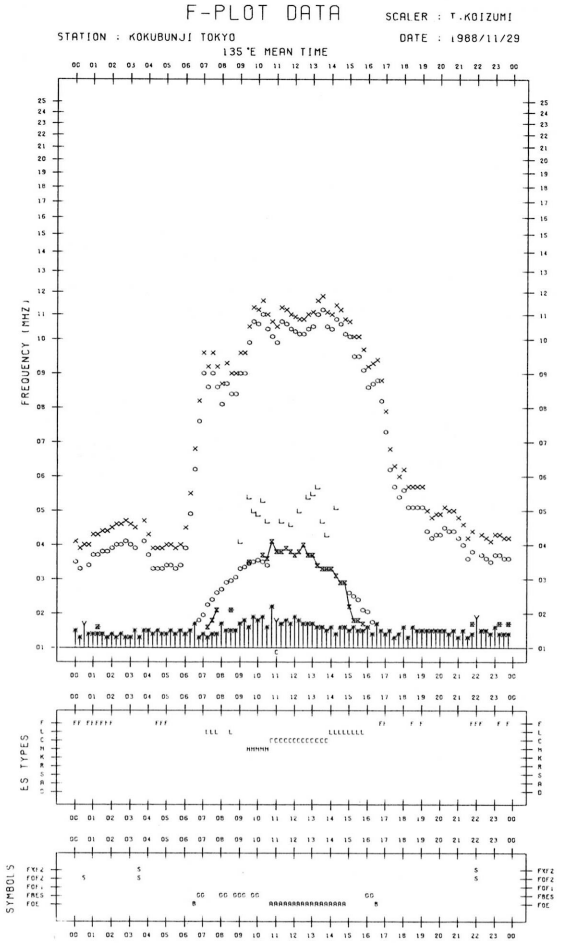

F-PLOT DATA
SCALER : T.KOIZUMI
STATION : KOKUBUNJI TOKYO
DATE : 1988/11/24
135 'E MEAN TIME
FREQUENCY (MHZ)
ES TYPES
SYMBOLS

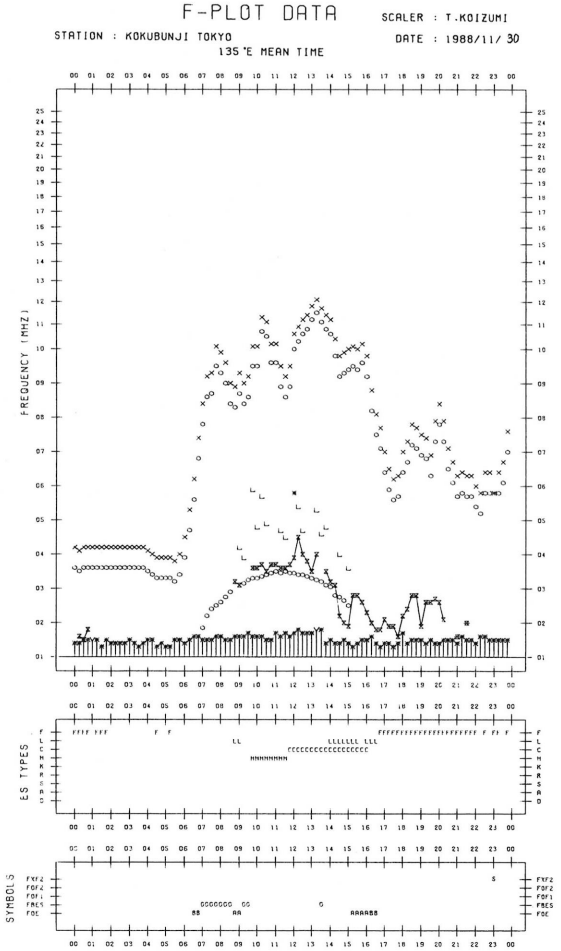

F-PLOT DATA
SCALER : T.KOIZUMI
STATION : KOKUBUNJI TOKYO
DATE : 1988/11/25
135 °E MEAN TIME
FREQUENCY (MHZ)
ES TYPES
SYMBOLS


F-PLOT DATA
SCALER : T.KOIZUMI
STATION : KOKUBUNJI TOKYO
DATE : 1988/11/27
135 °E MEAN TIME
FREQUENCY (MHZ)
ES TYPES
SYMBOLS


F-PLOT DATA
SCALER : T.KOIZUMI
STATION : KOKUBUNJI TOKYO
DATE : 1988/11/26
135 °E MEAN TIME
FREQUENCY (MHZ)
ES TYPES
SYMBOLS


F-PLOT DATA
SCALER : T.KOIZUMI
STATION : KOKUBUNJI TOKYO
DATE : 1988/11/28
135 °E MEAN TIME
FREQUENCY (MHZ)
ES TYPES
SYMBOLS


F-PLOT DATA
SCALER : T.KOIZUMI
STATION : KOKUBUNJI TOKYO
DATE : 1988/11/29
135 °E MEAN TIME
FREQUENCY (MHZ)
ES TYPES
SYMBOLS


F-PLOT DATA
SCALER : T.KOIZUMI
STATION : KOKUBUNJI TOKYO
DATE : 1988/11/ 30
135 °E MEAN TIME
FREQUENCY (MHZ)
ES TYPES
SYMBOLS

B.Solar Radio Emission

B1.Daily Data at Hiraiso

200 MHz

Hiraiso November 1988

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	10	10	(11)	B	10	*	*	(*)	2	*
2	B	B	(B)	B	B	2	2	(3)	3	2
3	B	B	(B)	B	B	3	3	(3)	3	3
4	B	B	(B)	B	B	3	3	(3)	3	3
5	B	B	(B)	B	B	3	3	(3)	3	2
6	B	B	(B)	B	B	3	3	(3)	3	3
7	B	B	(B)	B	B	3	3	(3)	2	3
8	B	B	(B)	B	B	2	2	(3)	3	2
9	(B)	B	(B)	B	B	(3)	2	(3)	2	3
10	B	B	(B)	B	B	1	1	(2)	2	2
11	B	11	(*)	B	B	1	1	(*)	2	1
12	B	11	(*)	11	B	2	*	(*)	1	2
13	10	10	(11)	B	11	1	1	(2)	1	1
14	B	10	(10)	B	B	1	*	(*)	1	*
15	B	11	(11)	B	B	0	0	(1)	3	1
16	B	B	(*)	B	B	2	1	(*)	2	2
17	B	B	(11)	B	B	2	1	(*)	3	2
18	B	B	(B)	B	B	3	3	(3)	3	3
19	B	B	(B)	B	B	3	3	(3)	2	3
20	B	B	(B)	B	B	2	1	(2)	1	2
21	B	B	(B)	B	B	1	2	(1)	3	1
22	B	B	(B)	10	B	2	2	(2)	1	2
23	9	9	(9)	9	9	1	0	(0)	*	0
24	9	9	(9)	10	9	0	0	(0)	1	0
25	11	10	(10)	10	10	1	1	(0)	0	1
26	10	10	(11)	10	10	0	0	(0)	0	0
27	10	10	(10)	10	10	0	0	(0)	0	0
28	10	10	(9)	9	10	0	0	(0)	0	0
29	10	10	(10)	10	10	0	0	(0)	0	0
30	10	10	(10)	B	10	0	0	(0)	2	0

B. Solar Radio Emission

B1. Daily Data at Hiraiso

500 MHz

Hiraiso November 1988

Single-frequency total flux observations at 500 MHz

FLUX DENSITY: 10^{-22} Wm^{-2}Hz^{-1}

UT DATE	00-03	03-06	06-09	21-24	DAY
1	47	47	(46)	49	47
2	50	48	(46)	49	48
3	49	49	(49)	51	49
4	50	49	(49)	50	50
5	50	50	(50)	50	50
6	50	(51)	-	-	50
7	52	51	(51)	47	51
8	48	49	(48)	-	48
9	-	50	(50)	47	(50)
10	46	46	(45)	46	46
11	48	48	(47)	45	47
12	46	47	(46)	-	46
13	-	44	(45)	48	(45)
14	46	47	(47)	47	47
15	47	47	(46)	48	47
16	50	48	(48)	53	49
17	52	50	(48)	45	51
18	46	47	(46)	44	46
19	46	46	(46)	44	46
20	45	44	(44)	43	44
21	44	45	(44)	44	44
22	45	46	(45)	43	45
23	44	44	(43)	45	43
24	45	44	(*)	43	45
25	44	45	(45)	43	44
26	44	44	(44)	*	44
27	45	44	(44)	45	44
28	47	47	(46)	44	46
29	45	46	(45)	45	45
30	45	46	(45)	-	45

Note: No observations during the following periods:

6th 0300 - 0735, 2100 - 2340
8th 2108 - 9th 0405
12th 2105 - 13th 0350
30th 2128 - 2335

B. Solar Radio Emission

B2. Outstanding Occurrences at Hiraiso

Hiraiso — November 1988

Single-frequency observations

Normal observing period: 2120 - 0735 U.T. (sunrise to sunset)

NOV 1988	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	500	46 C	0250.2	0254.0	25	14	2	0
	200	44 NS	2100E	0211	640D	13	7	0
	200	42 SER	2222.4	2232.3	17.2	21	-	0
	500	4 S/F	2235.2	2236.1	4.5	5	-	0
2	200	44 NS	2100E	0034	640D	27	15	0
	500	23 GRF	2220	2308	360	5	3	0
3	200	46 C	0457.8	0458.2	2.6	1400	-	0
	200	44 NS	2103E	0248	630D	22	13	0
	200	48 C	2121.8	2122.8	5.3	14000U	1100U	0 SUNRISE
	500	46 C	2122.0U	2122.8	7.5	750	54	SR SUNRISE
	100	46 C	2122.2	-	8.6	1000D	270D	-
4	500	46 C	0526.3	0528.5	7.3	42	18	MR
	200	44 NS	2103E	0430	630D	37	14	WL
5	500	27 RF	0001.5	0018	48	8	3	WR
	200	46 C	0029.0	0029.7	1.5	205	-	SL
	500	22 GRF	0126.5	0142	75	11	4	0
	500	23 GRF	0340	0417	145	14	7	WL
	100	43 NS	0400	0455	210D	140	40	-
	200	46 C	0542.6	0543.6	3.4	540	-	SL
	500	24 R	0627	-	60D	-	7U	WR SUNSET
	200	44 NS	2105E	2238	630D	35	19	MR
	500	22 GRF	2130	2246	193	15	8	0
6	200	8 S	0136.2	0136.3	0.5	10000	-	0
	200	44 NS	2105E	0010	630D	57	35	MR
	100	44 NS	2105E	0542	630D	50	17	-
7	200	41 F	0121.8	0150.2	37.0	510	-	0
	500	22 GRF	0440	0510	115	72	8	WR
	200	44 NS	2105E	0351	630D	28	13	MR
8	200	44 NS	2105E	-	630D	-	77	-
	100	44 NS	2105E	-	240D	-	180	-
9	200	44 NS	2105E	2238	630D	21	8	0
10	200	46 C	0033.0	0033.7	2.1	8600	-	0
	100	46 C	0033.2	-	1.5	1000D	-	-
	100	41 F	0333.8	0335.6	2.6	390	-	-
	200	41 F	0335.1	0336.3	1.3	1500	-	0
10	500	48 C	0610.0	0707.7	80D	1000D	210U	ML SUNSET
				0612.6		165		0
	200	49 GB	0610.2	0613.0	79D	53000	675U	0 SUNSET
				0718.5		2600U		WL
	100	48 C	0612.0	-	73D	1000D	360D	- SUNSET
	200	43 NS	2241	0217	300D	9	2	WR
11	500	47 RF	0013	0030	44	9	4	WR
	200	44 NS	2105E	2308	330D	7	3	0
12	500	42 SER	0345.5	0351.5	53	14	-	0
13	200	8 S	0517.8	0518.1	0.9	60	-	0
	500	46 C	0528.1	0536.1	25.5	96	19	0
				0532.8		91		0
	200	46 C	0531.0	0534.3	88	30	8	0
				0611.9		25		WL
	100	41 F	0531.4	0533.9	4.8	240	-	-
	200	24 R	2113E	2213	260D	10	6	0
	500	48 C	2258.0	2307.5	81	710	62	SR
				0001.0		54		WL
	200	48 C	2304.0	2305.3	47.5	705	80	WR
	100	48 C	2305.0	-	67	890	170	-
14	100	41 F	0046.2	0046.3	2.2	150	-	-
	200	41 F	0046.2	0048.1	2.1	240	-	0
	100	46 C	0149.5	0150.6	6.7	880	165	-
	200	46 C	0214.9	0215.5	1.5	90	-	0
	200	42 SER	0236.7	0241.8	10.2	1300	-	0
	200	44 NS	2113E	2343	350D	6	3	0
	500	4 S/F	2318.3	2319.0	1.1	53	-	WL
	500	46 C	2333.7	2337.5	4.1	25	-	WL

NOV 1988	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	500	46 C	0251.8	0254.1	17.0	14	3	0
	200	42 SER	0438.3	0447.2	22.4	84	-	ML
	500	41 F	0608.8	0609.5	1.1	264	-	WL
	200	8 S	2158.2	2158.6	0.5	1050	-	0
	200	41 F	2223.9	2225.8	2.6	340	-	0
	200	43 NS	2228	2312	510D	53	25	WL
	100	43 NS	2235	0010	320D	240	105	-
	200	41 F	2347.5	2351.7	5.1	1100	-	0
16	200	42 SER	0112.8	0114.9	5.0	2400	-	0
	200	8 S	0457.6	0457.7	0.8	120	-	WL
	500	46 C	0620.5	0628.1	51D	302	38U	MR SUNSET
				0633.1		212		MR
	200	46 C	0625.3	0626.4	55D	320	30U	0 SUNSET
				0643.6U		40		0
	100	42 SER	0625.3	0631.2	26	430	-	-
	200	44 NS	2117E	2248	610D	16	6	WR
	100	42 SER	2145.3	2146.3	10	970	-	-
	500	42 SER	2146.0	2146.4	13.5	890	-	0
	200	42 SER	2146.7	2146.9	2.1	820	-	0
17	100	45 C	0002.4	-	1.3	1000D	-	-
	200	8 S	0002.6	0002.8	0.9	570	-	0
	500	42 SER	0002.7	0002.9	28.5	1300	-	0
17	200	46 C	0010.0	0012.3	6.3	28	6	WR
	200	8 S	0029.7	0029.7	0.9	5500	-	0
	200	8 S	0106.4	0107.3	1.0	490	-	0
	100	46 C	0106.8	0107.3	2.2	630	-	-
	200	45 C	0448.2	0448.8	1.1	1200	-	0
	100	46 C	0448.3	0449.4	1.3	475	-	-
	500	41 F	0448.9	0449.0	0.8	580	-	WL
	500	42 SER	0632.0	0639.2	9.3	260	-	0
	200	46 C	0637.6	0638.9	2.1	1030	-	0
	100	46 C	0638.2	-	2.1	1000D	-	-
	200	44 NS	2117E	0030	600D	72	34	MR
18	200	44 NS	2120E	0025	600D	25	10	MR
19	200	44 NS	2121E	0122	600D	7	4	WR
20	200	46 C	0434.3	0434.7	1.8	57	-	WR
	200	44 NS	2122E	0543	600D	8	3	WR
	500	42 SER	2148.0	2148.3	4.2	25	-	MR
	200	42 SER	2315.5	2322.8	11.9	160	-	0
	100	41 F	2322.3	-	5.3	1000D	-	-
	500	41 F	2322.7	2326.7	5.3	62	-	MR
21	200	42 SER	0106.7	0114.9	18.5	350	-	MR
	100	42 SER	0107.4	0115.5	10.1	730	-	-
	500	4 S/F	0114.8	0115.7	2.8	36	-	WR
	500	41 F	0159.1	0159.5	2.2	35	-	MR
	100	42 SER	0204.6	-	57	1000D	-	-
	200	42 SER	0237.6	0244.2	23.2	170	-	WR
	200	44 NS	2122E	2243	600D	9	4	MR
	100	41 F	2249.2	2252.1	6.7	960	-	-
	500	46 C	2249.7	2254.0	15.0	196	30	MR
	200	46 C	2249.8	2252.1	14.5	90	21	0
22	200	46 C	0505.5	0506.1	1.2	450	-	0
	500	41 F	0505.5	0507.2	3.0	57	-	MR
	100	46 C	0505.6	0507.6	2.8	1000D	-	-
23	200	8 S	0320.9	0321.3	0.7	107	-	MR
24	200	8 S	0120.5	0120.6	0.2	330	-	0
	200	42 SER	0444.6	0508.7	97	650	-	0
	500	8 S	0457.4	0457.5	0.8	405	-	0
	100	8 S	0508.2	0508.6	0.8	1000D	-	-
	200	43 NS	2343	0049	198	6	2	WL
26	200	42 SER	2212.9	2213.2	22.4	53	-	0
	200	42 SER	2257.6	2257.8	4.9	820	-	0
27	500	46 C	0212.7	0214.2	4.2	32	12	WR
	200	46 C	0212.8	0213.1	7.3	460	140	0
	100	42 SER	0212.9	0213.7	9.2	970	-	-
	500	46 C	2222.5	2223.2	6.0	75	8	WL

C. RADIO PROPAGATION

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

NOV 1988 FREQUENCY 15 MHZ BANDWIDTH 80 HZ RECEIVING ANTENNA ROD 4.5 M

MEASURED AT HIRAISO

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

C. RADIO PROPAGATION

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

NOV 1988 FREQUENCY 15 MHZ BANDWIDTH 80 HZ RECEIVING ANTENNA ROD 4.5 M

MEASURED AT HIRAISO

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

C. Radio Propagation

c2. Radio Propagation Quality Figures at Hiraiso

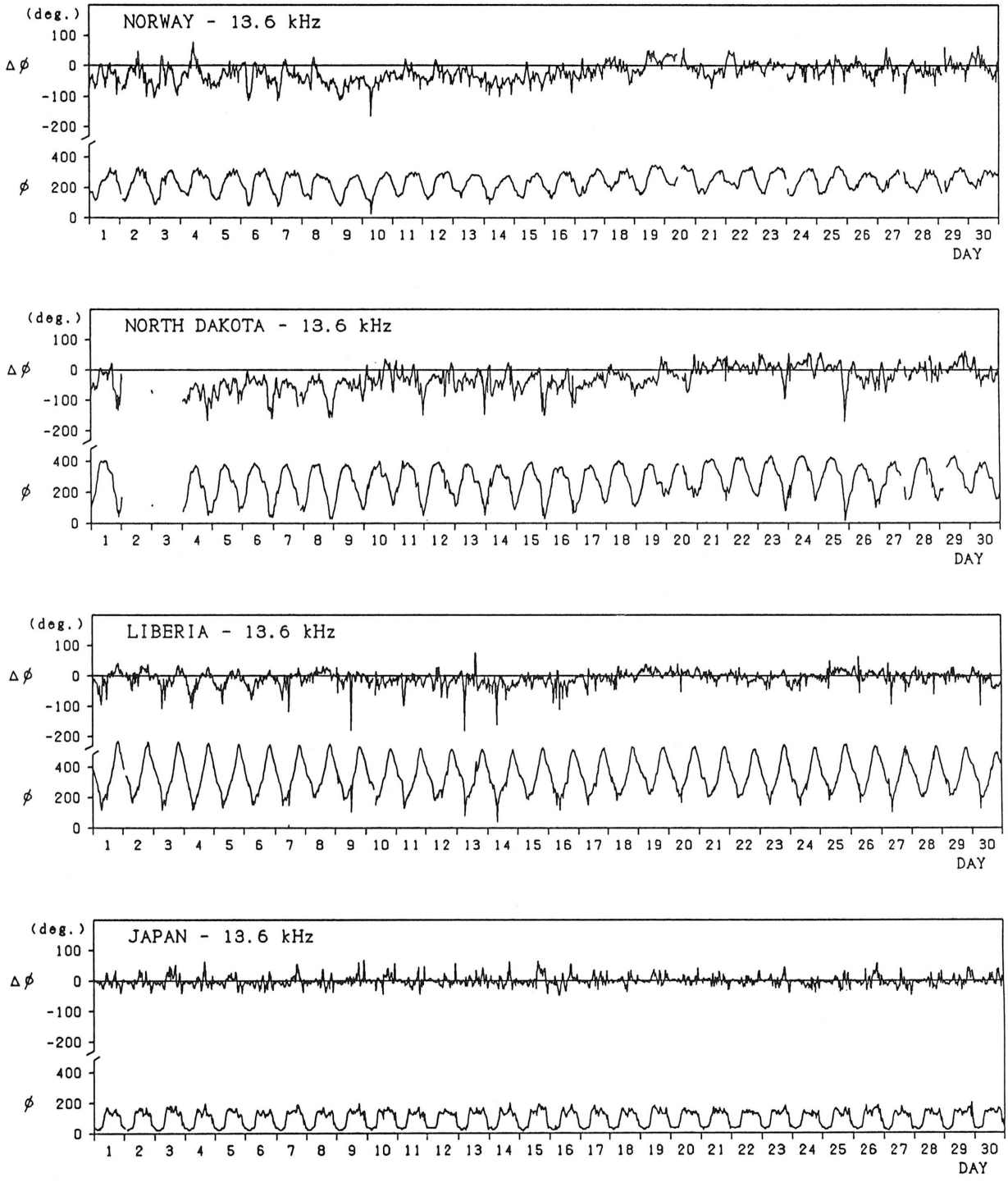
Hiraiso — Time in U.T

Nov. 1988	Whole Day Figure	W W V 00|06 06|12 12|18 18|24	W W V H 00|06 06|12 12|18 18|24	Conditions 00|06 06|12 12|18 18|24	Principal Geomagnetic Storms Start	Ene	Range
1	4o	4 S S 4	4 4 4U 4	N N N N			
2	4+	4 4U 5U 4	4 5 5U 4	N N N N			
3	4+	4 5U S 4	4 4 5U 4	N N N N			
4	4-	3 S S 4	4 4 S 4	N N N N			
5	4-	4 S S C	4 3U C C	N N N N			
6	4-	4 S S 3	4 4 4U 4	N N N N			
7	4o	4 4U S 4	3 4 4U 4	N N N N			
8	4o	4 4U S 5	4 4 4U 4	N N N N			
9	4+	4 4U S 5	4 4 5U 4	N N N N			
10	4o	4 S S 4	4 4 5U 4	N N N N			
11	4-	3 3U S 4	4 4 S 4	N N N N			
12	4o	4 4U S 4U	4 4 4U 4	N N N N			
13	3+	3 S S 4	3 4 S 3	N N N N			
14	4o	4 S S 4	4 4 4U 4	N N N N			
15	4o	4 4U S 4	4 5 4U 4	N N N N			
16	4o	5 4U S 4	4 4 S 4	N N N N			
17	4o	4 5U S 3	4 5 4U 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	4o	4 S S 4	4 4 S 4	N N N N			
21	4o	4 4U S 4	4 4 S 4	N N N N			
22	4o	4 4U S 4	4 4 S 4	N N N N			
23	4o	4 S S 4	4 4 S 4	N N N N			
24	4o	4 4U S 4U	4 4 S 4	N N N N			
25	4o	4 S S 4	4 4 S 4	N N N N			
26	4o	4 4U S 4	4 4 S 4	N N N N			
27	4o	4 4U S 4	4 3 4U 4	N N N N			
28	4-	4 S S 4	4 3 S 4	N N N N			
29	4o	4 4U S 5	4 3 S 5	N N N N			
30	4+	4 4U S 5U	4 4 5U 4	N N N N	0800	24.0	170

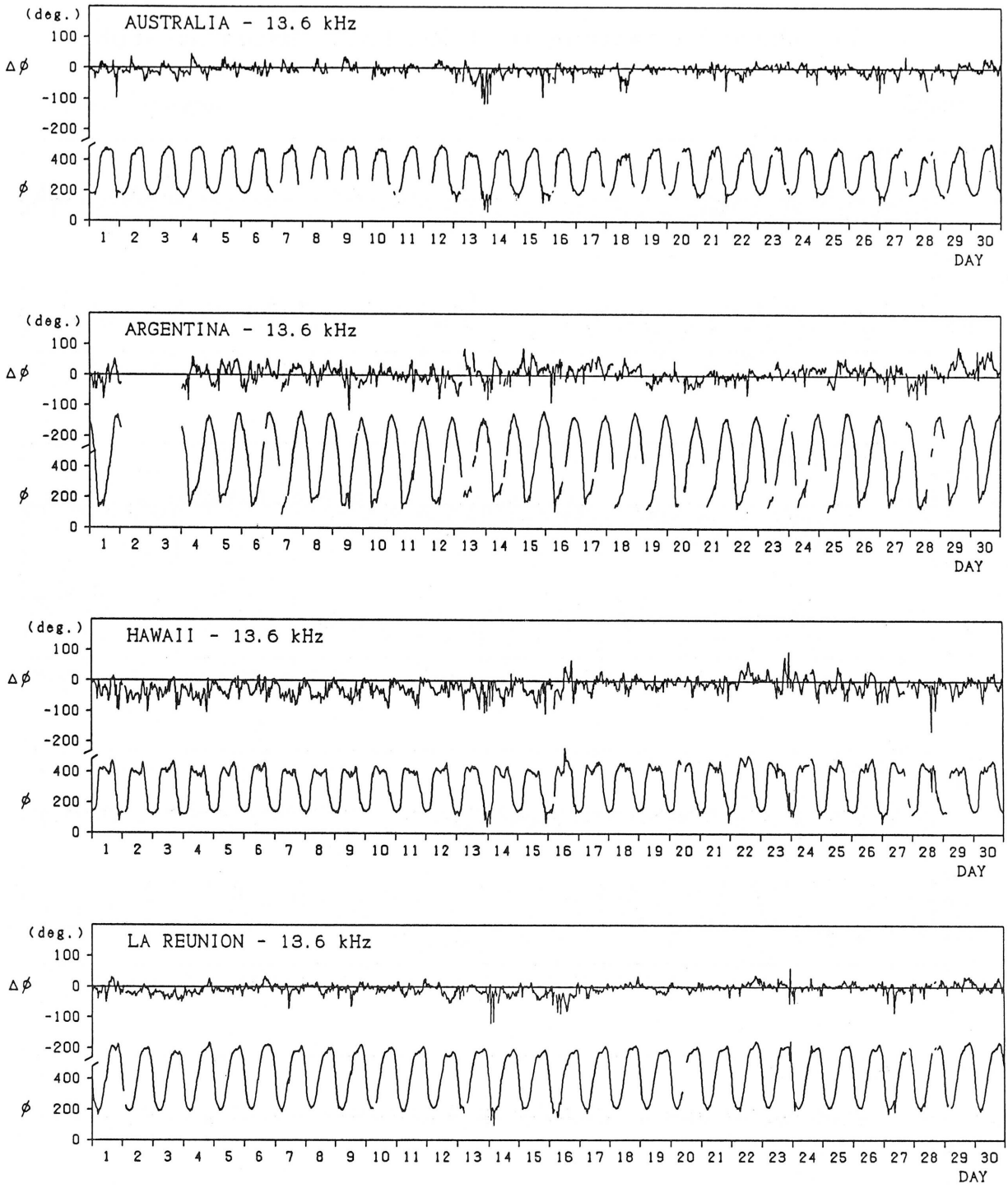
C. Radio Propagation

C3. Phase Variations in OMEGA Radio Waves at Inubo

Inubo November 1988



Inubo November 1988



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

Start (U.t.)	End (U.T.)	Max. (U.T.)	Max. Phase Deviation (negative value, deg.)
Nov.08/1021	Nov.10/1330	Nov.09/0516	147.6
Nov.14/0135	Nov.15/1904D	Nov.14/1255	117.0

C4. Sudden Ionospheric Disturbance

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

Hiraiso Time in U.T.

Nov. 1988	S W F									Corresepondence		
	Drop-out Intensities(dB)					Start	Duration	Type	Imp.	Solar Flare	Solar Noise	Geomag. Crochet
	CO	HA	1)	2)	3)							
9				13	X	1225	16	SL	1	X		
10		X	13	X	X	0611	35	SL	1	X	X	
13	X	X	30D	X	X	0528	49	G	2+	X	X	
14	X	X	27D		X	0151	35	SL	2+	X	X	
14			20			0415	12	S	2-		X	
14			13			0748	29	SL	1			
16	X	48E	X	X	X	0406	26	SL	3+	X	X	
16			15			0626	32	SL	1	X	X	
21		16				2252	32	SL	2	X	X	
27		20	15			2215	37	SL	2+		X	

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

(b) Sudden Phase Anomaly (SPA) at Inubo

Inubo

Nov. 1988	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		24	41	35			0435	0603	0454
1		124	67				1058	1216	1110
1	10				76	57	2143	2327	2151
2		—		10		—	0256	0314	0314
2		—	19			—	0957	1021	1001
3	6	—		16	13	—	0012	0105	0019
3		—	19			—	0839	0919	0852
3		—			22	—	2124	2220	2128
4			6	8	4	7	0157	0216	0203
4	8		15	18	6	13	0218	0311	0228
4			14	10	6		0527	0604	0532
4			16	6			0637	0712	0643
4			5				0830	0856	0834
4					6		2228	2252	2236
5			13	10			0417	0457	0421
5			11	8			0527	0609	0530
5					6		2123	2217	2125
6			8	9			0304	0347	0316
6			8	6			0507	0535	0510
7		—	13	—			0309	0340	0315
7		—	9	—			0404	0435	0414
7			21	—			0509	0550	0520
7			18				0800	0835	0811
7		158	76				1103	1251	1116
8			23	—	22		0053	0205	0105
9				6	4		0051	0116	0101
9	16	20	45	51	23	20	0209	0301	0218
9	10		14	14		6	0404	0426	0410
9			5	5			0434	0448	0439
9			8	4			0459	0548	0514
9			8				0754	0816	0804
9			18				0817	0901	0823
9		168	47				1223	1400	1235
9					74	22	1932	2021	1941
10				19	8*		0055	0144	0108
10			15	10			0534	0605D	0542
10	91	—	286	167	39	32	0605E	0859	0620
10		21	6				1032	1119	1037
11				8	6		0020	0032	0022
11			17	11	8		0109	0137	0114
11			13	10			0320	0348	0330
11			8	17	16		0358	0424	0405
11			13	15			0426	0451	0430
11			19	14			0503	0537D	0513
11			22	11			0537E	0617	0547
11	23		59	30			0625	0721	0635
11			22	32			0727	0823	0738
11			12				0827	0851	0831
11		23					1515	1624	1522
12			9				0722	0754	0729
12		61	14				1147	1246	1159
12		49					1609	1739	1627
12					24		1943	2006	1949
12					14		2025	2038	2027
12					34		2115	2216	2121
12				18	34		2222	2342	2247
13	16		41	72	37	34	0125	0249D	0151
13			8	28			0249E	0321	0254
13	77	202	281	170	65	52	0449	0712D	0537
13			43	43			0712E	0805	0719

Inubo

Nov.	S				P		A		
1988	Phase Advance (degrees)						Time (U.T.)		
Date	Ω/N	Ω/L	Ω/LR	NWC	Ω/H	Ω/ND	Start	End	Maximum
13		44					1311	1352	1320
13		26					1354	1439	1404
13		28					1632	1754	1645
13					45		2020	2051	2023
13					133	76	2057	2242	2113
13	35	28	35	12	119	90	2248	0111	2313
14	39	47	118	—	90	63	0149	0325	0203
14	46	59	142	—	61	54	0343	0546	0416
14		24	31	—			0632	0720	0650
14		122	114	86			0747	0907	0802
14		67	14				1204	1300	1212
14		49					1437	1546	1452
14		23					1645	1728	1655
14					81	42	1947	2024	1954
15			13		7		0121	0156	0140
15			38	43	20		0245	0354	0254
15			11				0909	0922	0913
15		55	23				1057	1154	1106
15					61	76	2037	2142	2052
15			11	35	90	73	2216	2337	2232
16	7	—	22	18	12		0110	0202	0119
16	11	—	59	47	31	22	0228	0400D	0248
16	62	—	219	116	102	60	0400E	0500D	0414
16		—	111	68			0500E	0625D	0506
16	26	—	165	78			0625E	0756	0636
16		—	26				0804	0835	0812
16		—	23				0845	0914	0852
16		—	57				0921	1006	0929
16		—	13				1148	1234	1200
16		—			52		2138	2227	2148
17			26	13*	10		0106	0156	0110
17			41	20*			0542	0635D	0602
17		29	47	18			0635E	0717	0641
17		49	55	18			0724	0808	0733
17				8	7		2304	2334	2309
18				12	10		0053	0131	0105
18				8			0305	0335	0312
18			8	6			0455	0524	0500
19				5	8		2215	2246	2218
20				8			0240	0314	0300
20			9	8			0457	0536	0505
20				10	24		2209	2311	2216
20				6	5		2324	2337	2327
20		14	19	—	31	23	2347	0051	2355
21		25	31	—	26		0150	0234	0207
21			6	—			0309	0327	0313
21			11	—		27	0334	0400	0341
21			6	—			0402	0424	0411
21			18*	—			0431	0526	0440
21			15	—			0649	0740	0701
21		25*					1338	1504	1348
21	28	19	25	71	95	91	2251	0058	2306
22			25	—	14		0041	0145	0106
22			9	8			0413	0448	0419
22			34	12			0620	0703D	0627
22			24	4			0703E	0751	0710
22		29					1459	1604	1513
24			21				0801	0914	0814
24		47					1245	1418	1256
24					57	34	2204	2321	2213
26					25		2129	2246	2143
26	9						2313	2325	2317
26	43	39	56	104	91	74	2330	0052	2341
27			16	10	6		0103	0157	0118
27			13	11	7		0215	0234	0221
27	24	27	68	65	45	22	0249	0419	0317
27		83	98	49			0809	1007	0827
27	28	32	43*	135	165*	163	2211	0037	2336
28			14	—			0509	0552	0524
28			30	—			0740	0847	0751
28		23	9				1137	1222	1144
29	11		22	27	13		0223	0320	0227
29			10				0633	0723	0638
30			15	9			0113	0143	0118
30			7	6			0336	0416	0341
30	19	8	23	22			0434	0545	0440
30			21	7			0608	0700	0620

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