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IONOSPHERIC DATA IN JAPAN

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CONTENTS

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INTRODUCTION

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

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

A. IONOSPHERE

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

A1. Automatic Scaling

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

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

a. Characteristics of Ionosphere

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

b. Descriptive Letters

The following descriptive letters are used in the tables.

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

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

C Impossible measurement because of any failure in observation.

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

N Impossible automatic scaling because of complex echoes.

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

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

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

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

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

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

d. Reliability of Automatic Scaling

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

e. Summary Plot

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

A2. Manual Scaling

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

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

a. Characteristics of Ionosphere

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

b. Symbols

(i) Descriptive Letters

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

A Measurement influenced by, or impossible because of, the presence of a lower thin layer,for example *Es*.

B Measurement influenced by, or impossible because of, absorption in the vicinity of *fmin*.

C Measurement influenced by, or impossible because of, any non-ionospheric reason.

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

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

F Measurement influenced by, or impossible because of, the presence of spread echoes.

G Measurement influenced or impossible because the ionization density of the layer is too small to enable it to be made accurately.

H Measurement influenced by, or impossible because of, the presence of a stratification.

K Presence of particle *E* layer.

L Measurement influenced or impossible because the trace has no sufficiently definite cusp between layers.

M Interpretation of measurement questionable because the ordinary and extraordinary components are not distinguishable.

N Conditions are such that the measurement cannot be interpreted.

O Measurement refers to the ordinary component.

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

Q Range spread present.

R Measurement influenced by, or impossible because of, attenuation in the vicinity of a critical frequency.

S Measurement influenced by, or impossible because of, interference or atmospherics.

T Value determined by a sequence of observations, the actual observation being inconsistent or doubtful.

V Forked trace which may influence the measurement.

W Measurement influenced or impossible because the echo lies outside the height range recorded.

X Measurement refers to the extraordinary component.

Y Lacuna phenomena, severe layer tilt.

Z Third magneto-electronic component present.

(ii) Qualifying Letters

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

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

D Greater than.

E Less than.

I Missing value has been replaced by an interpolated value.

J Ordinary component characteristic deduced from the extraordinary component.

M Mode interpretation uncertain.

O Extraordinary component characteristic deduced from the ordinary component. (Used for x-characteristics only.)

T Value determined by a sequence of observations, the actual observation being inconsistent or doubtful.

U Uncertain or doubtful numerical value.

Z Measurement deduced from the third magneto-electronic component.

(iii) Description of Types of *Es*

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

The types are:

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

B. SOLAR RADIO EMISSION

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

B1. Daily Data at Hiraiso

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

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

0 quiet or no burst,

1 a few bursts,

2 many bursts,

3 very many bursts.

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

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

* Measurement impossible because of interference.

B Measurement impossible because of bursts.

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

B2. Outstanding Occurrences at Hiraiso

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

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

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

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

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

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

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

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

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

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

C. RADIO PROPAGATION

C1. H.F. Field Strength at Hiraiso

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

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

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

C2. Radio Propagation Quality Figures at Hiraiso

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

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

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

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

C	artificial accident,
S	propagational accident,
U	inaccurate.

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

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

N normal,
U unstable,
W disturbed.

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

C3. Phase Variation in OMEGA Radio Waves at Inubo

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

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

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

C4. Sudden Ionospheric Disturbances

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

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

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

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

Types of fade-out are as follows:

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

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

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

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

b. Sudden Phase Anomaly (SPA) at Inubo

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

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

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

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

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

Transmitting Stations

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

HOURLY VALUES OF FOF2 AT WAKKANAI

JUL. 1993

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

DAY \ HOUR	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
1	63	62	62	62	62	84	84	87	87	74	70	A	75	59	A	A	A	84	A	77	78	80	66	49
2	66	65	72	60	50	54	A	64	A	A	A	A	A	A	71	67	89	A	A	78	82	73	80	80
3	73	65	66	55	61	60	55	A	A	A	A	A	61	71	74	A	A	78	A	87	73	82	66	67
4	70	64	60	63	62	67	76	A	A	A	61	79	A	A	A	62	72	58	66	66	74	73	72	64
5	64	52	51	54	56	60	65	70	72							54	A	64	78	67	74	72	74	72
6	66	63	60	62	62	66	61	72	77	A	A	63	58	68	63	79	A		A	74	54	50	74	78
7	72	60	58	55	55	53	A	A	A	A	A	A	A	A	A	A	60	A	A	88	73	A	67	64
8	63	53	50	48	50	61	71	86	84	A	A		66	64	62	68	64	67	65	73	71	72	65	72
9	66	54	63	60	50	48	A	A	A	A	A	A		A	A	A	A	A	56	55	A		A	63
10	51	52	52	A	53	52	A	59	A	A	A	A	A	A	55	A	60	A	A	52	58	62	64	A
11	51	A	48	43	48	51	A	54	A	A	A					57	A	57	59	55	66	60		49
12	52	47	35	34	32	A	A	A	A	A			A	A			A		A	54	66	62	61	49
13		59	52	48	48	A	A	A	A	A	A	A	A	A	A		58	A	A	A	64	66		60
14	54	51	50		37	A	A	A	A	A	A	A	A	61	A	A				54	64		54	52
15	50	48	48	45	44	51	60	51	A	66					A	A	A	57	63	65	75	64		A
16	52	52	54	48	43	50	62	A	A	A	A	A						55	54	66	64	62	60	54
17			51	50	31	50	A	62	A	A	A	A	A	A	59	A	62	57	55	58	62	64		62
18	52	50	50	47	47	54	49	61	68	67	68		59	A	57	A		A	62	66	A	75	66	66
19	66	50	54	52	A	55	58	A	A	67			64		51			61	A	51	63	77	57	64
20	62	51	54	54	53	60	82	88	81	67	67		61		A	59	A	63	A	A	88	84	78	53
21	71	58	62	52	52	A	A	A	A	61			A		A	A	A	A	A	72	78	74	A	A
22	62	66	53	A	52	A	A	55	A	A			A	A	A	67	64	68	A	66	65	A	66	66
23	65	58	53	52	55	58	A	67	64	66	A	A	A		63	80	67	67	67	67	72	66	72	58
24	58	60	62	62	60	53	A	A	69	74	80	A			A	A	63	A	59		87	74	66	61
25	51	53	52	52	32	51	54	58	A	66	A		65	67	66	71	70	67	66	67	70	73	66	66
26	66	66	66	61	60	53	82	54	74	A	66	70			59	63	58	64		66	64	67	62	62
27	61	58	54	54	55	62	69	66	67	A	65		49	60	70	70	A	A	70	86	A	77	77	66
28	67	66	58	55	54	63		72	84	A	A	A	A	56	61	78	64	70	67	72	76	53	66	66
29	61	55	54	52	55	53	72	71	66	62		55	A	A	71	68	A	65	A	73	64	78	80	66
30	71	66	57	55	A	A	64	73	78	59	76	57	67	A	69	78	A	65	A	78	64	69		63
31	58	54	51	55	60	72	67	76	84	82	66	59	A	A		67	56	66	A	74	79	77	72	63
	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
CNT	29	29	31	28	29	25	17	20	14	12			10		15	16	14	19	14	28	28	27	24	28
MED	63	58	54	54	53	54	65	66	76	66			62		63	68	64	65	64	67	70	72	66	64
U Q	66	63	60	57	58	61	74	72	84	70			66		70	74	67	67	67	74	75	77	73	66
L Q	53	52	51	49	47	51	59	58	68	64			59		59	62	60	58	59	61	64	64	64	59

HOURLY VALUES OF FES AT WAKKANAI

JUL. 1993

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

HD \ H	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
1	G	G	G	30	G	31	36	G	96	84	G	83	G	G	126	148	72	142	107	58	65	79	59	39
2	33	26	27	25	40	58	67	62	126	135	142	118	74	54	90	65	117	136	91	61	41	33	24	G
3	G	26	29	G	36	35	G	70	94	107	117	80	G	G	G	65	95	59	81	66	38	40	46	40
4	57	32	28	27	29	44	65	69	65	67	58	86	81	85	64	G	G	G	32	40	26	31	G	G
5	G	G	34	G	27	G	34	50	G	G			G	G		G	50	58	45	39	59	G	59	40
6	35	35	30	G	30	39	48	61	63	68	136	G	64	53	G	93	149	57	72	33	64	40	G	G
7	25	G	G	G	G	40	60	71	71	63	66	80	78	58	66	58	38	66	68	116	92	60	60	78
8	67	30	31	G	28	33	70	58	54	64	66		G	G	G	G	G	G	G	G	36	35	G	36
9	27	40	26	G	35	34	41	73	72	66	53	52		104	124	112	61	56	60	41	70		63	80
10	69	24	61	60	34	38	52	75	87	136	94	136	60	59	G	62	G	51	62	40	34	40	60	60
11	93	36	28	27	34	40	59	66	83	71	58			G	G	G	88	57	32	40	69	58		38
12	44	46	35	34	31	33	35	55	53	60			58	72		G	59	G	35	36	36	62	40	82
13	30	60	44	G	28	59	59	69	71	111	68	65	60	58	90	G	54	50	49	48	72	60		36
14	36	26	33		26	38	33	39	53	52	54	58	69	88	51	50	G	G	G	36	31		50	45
15	59	51	37	41	33	G	35	48	58	G					58	52	66	60	30	61	102	93	135	116
16	46	41	30	35	36	44	54	87	90	54	64	62	G			G	G	G	40	44	90	28	30	29
17	33		36	30	26	37	61	67	70	95	92	86	122	195	119	69	50	64	61	54	53	71		40
18	G	32	40	32	G	37	60	60	114	126	117	G	G	118	G	54	G	146	G	54	60	47	72	82
19	55	30	G	35	44	G	53	60	64	G	69	91	G	G	G	G		45	55	49	37	59	G	40
20	G	29	G	G	G	37	56	60	63	62	G	G	52	G	60	G	57	58	116	69	92	80	73	67
21	40	59	60	60	58	40	59	69	67	58		G	59		66	61	69	61	89	60	58	68	94	67
22	40	58	39	41	29	37	35	53	63	57	G		59	66	50	G	37	36	92	60	60	85	26	G
23	24	24	G	34	36	36	56	36	40	61	65	62	63		G	G	G	62	37	39	29	59	50	24
24	33	32	38	47	49	49	65	65	84	67	68	83	G	G	60	61	38	70	64	91	139	69	60	G
25	G	G	40	G	G	33	35	36	51	56	61	G	G	G	G	G	G	G	33	G	29	40	58	G
26	32	G	G	G	G	33	G	G	60	71	G	G	G	G	G	53	G	G		32	35	38	58	41
27	41	26	33	31	26	G	39	38	67	88	G	G	G	G	G	63	138	151	109	123	90	70	62	53
28	33	80	67	31	33	36		50	56	65	82	53	64	G	G	G	G	G	34	34	92	60	46	34
29	33	26	32	28	27	33	65	37	52	G		G	64	90	54	G	82	60	78	49	60	60	32	40
30	30	57	32	28	36	45	43	G	52	G	G	G	G	58	64	84	78	90	140	69	23	45	58	31
31	30	40	33	25	G	34	66	64	63	71	51	59	92	66	G	G	51	55	82	44	34	59	58	G
	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
CNT	31	30	31	30	31	31	30	31	31	31	26	25	28	27	28	31	30	31	30	31	31	29	28	31
MED	33	31	32	28	29	37	54	60	64	65	64	59	58	54	50	50	50	57	60	48	59	59	58	40
U Q	44	41	38	34	36	40	60	69	83	84	82	83	64	72	65	63	72	64	82	61	72	68	60	60
L Q	25	26	27	G	26	33	35	39	54	56	51	G	G	G	G	G	G	G	34	39	35	40	31	24

COMMUNICATIONS RESEARCH LABORATORY, JAPAN

HOURLY VALUES OF FMIN AT WAKKANAI

JUL. 1993

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

D \ H	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
1	15	15	14	15	14	17	20	21	24	28	48	42	50	52	27	36	20	18	16	15	15	16	14	14
2	14	15	14	15	15	14	17	20	18	32	48	44	45	48	40	35	22	20	17	16	14	15	14	14
3	15	16	14	15	14	15	18	21	32	30	44	42		52	49	27	30	20	18	15	14	16	15	17
4	15	16	14	15	15	15	18	18	20	26	34	45	46	32	45	49	46	26	18	16	15	16	15	14
5	15	15	15	14	14	17	20	17	46								32	18	18	15	16	15	15	15
6	15	14	15	14	15	18	18	20	26	21	30	50	50	29	48	46	20	28	20	15	16	15	15	15
7	14	15	15	15	15	17	17	30	22	38	39	42	32	45	46	20	20	20	16	15	14	17	15	15
8	15	16	16	15	16	15	17	29	30	33	41		33	29	48	18	22	30	38	15	15	15	17	15
9	16	14	15	14	15	18	16	20	32	33	66	71		39	32	26	21	18	17	15	15		15	15
10	15	15	15	15	15	16	18	17	23	26	34	44	33	46	28	46	20	16	18	15	14	15	15	15
11	16	15	15	15	15	17	18	18	21	34	45					17	17	17	16	15	15	14		16
12	14	15	14	14	15	16	17	18	29	32			40	45		29	28	18	18	15	15	14	15	15
13	15	15	15	15	15	16	18	24	29	22	27	29	46	28	26	28	18	17	21	15	15	14		15
14	16	15	15		15	15	17	21	46		39	43	32	42	30	27	22	29	18	16	15		15	15
15	15	15	15	14	14	18	18	18	18	48						29	26	20	17	15	14	15	15	15
16	15	15	15	15	16	16	22	20	21	23	45	32					21	18	20	15	15	17	16	15
17	16		15	15	16	16	18	21	44	26	42	44	42	44	34	26	22	16	20	15	14	14		14
18	15	14	15	15	15	15	20	20	27	44	44		28	23	49	24	20	28	46	16	15	16	16	15
19	17	15	15	18	16	15	17	29	34	49	45	45	51	58	48			23	21	16	16	15	16	17
20	16	16	16	15	16	15	22	21	32	34	32	48	51	28	27	21	18	17	16	23	24	16	16	16
21	15	14	15	15	14	18	20	29	32	47			39		42	26	23	26	20	15	15	15	15	15
22	14	15	14	15	14	14	16	18	22	44			46	46	33	48	46	20	17	15	15	15	14	15
23	16	15	15	15	15	16	24	18	32	40	39	35	32		52	49	51	18	21	15	14	15	15	15
24	15	15	15	15	15	17	18	30	33	32	43	44		54	32	32	23	18	18	16	15	15	15	15
25	15	15	15	15	18	15	20	20	26	40	44	52	52	52	50	49	48	29	17	18	15	17	16	16
26	18	18	16	14	16	18	44		23	44	53	52			50	22	20	18		16	15	15	15	15
27	14	16	15	15	15	16	18	18	26	38	52	56	28	22	52	39	21	18	18	16	15	15	15	16
28	16	16	16	14	15	15		17	29	33	47		32	30	27	22	20	18	20	15	15	15	15	14
29	15	14	14	15	15	15	17	28	29	31		52	28	27	24	24	29	18	17	15	14	15	15	16
30	15	15	15	15	15	14	18	21	29	27	54	52	55	44	43	34	32	18	17	15	14	15	17	16
31	18	15	16	15	15	15	18	18	26	24	34	29	28	27	24	24	18	18	16	14	16	15	15	15
	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
CNT	31	30	31	30	31	31	30	30	31	29	25	22	23	24	26	28	30	31	30	31	31	29	28	31
MED	15	15	15	15	15	16	18	20	29	33	44	44	40	43	41	28	22	18	18	15	15	15	15	15
U Q	16	15	15	15	15	17	20	21	32	40	47	52	50	47	48	37	29	23	20	16	15	16	15	16
L Q	15	15	15	15	15	15	17	18	23	26	36	42	32	28	28	24	20	18	17	15	14	15	15	15

HOURLY VALUES OF FOF2 AT KOKUBUNJI

JUL. 1993

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

D \ H	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
1	91	86	80	86	80	102	94	92	80	A	73	84	A		75	81	95	97	84	80	69	93	69	A
2	68	69	73	60	57	51	68	70	62	58	A	76	70	68	80	73	88	83	82	83	73	84	A	92
3	82	72	78	70	70	60	A	A	79	A	A	51	85	75	85	85	89		92	93	96	87	94	76
4	81	70	69	92	78	78	82	77	70	A	A	A	A	A	78	A	75	72	74	80	76	80	67	81
5	69	58	61	61	50	59	94	88	77	53	99	101	A	51	68	69	85	80	96	81	84	71	63	62
6	94	A	58	56	58	61	84	82	73	76	A	A	A	A	73		81	A		A	A	94	A	52
7	77	78	78	56	56	62		69	A	93	A	A	A	A	70	68	90	74	86	88	82	69	58	70
8	70	70	60	67	56	76	75	82	76	A	A	A	A	A	60	68	74	97	89	82	76	67	68	68
9	94	70	63	57	A	57	93	A	N	89	A	A	A	51	52	59	73	66	64	69	A	58	57	58
10	59	67	56	57	57	59	57	A	A	52	A	A	97	A	A	55	A	A	98	A	A	A	A	A
11	A	57	57	49	52	47	55	A	A	A	A	A	A	A	A	A	101	A	66	61	68	60	A	63
12	61	A	56	A	A	A	A	49	A	A	A	A	A	A	A	A	A	A	71	62	69	63	57	60
13	57	57	59	45	46	70	64	74	A	68	A	54				A			52		61	A	72	56
14	A	33	45	40	36	A	A	A	A	A	A	A	A	A	A	A	A	A	72	69	74	60	58	44
15	39	46	43	42	44	57	60	72	68	72	68	A	A	99	A	80	106	83	78	76	57	57	57	50
16	A	56	51	48	46	56	94	94	52	A	A	68	A	A	A	A	68	A	94	A	70	62	70	68
17	58	57	57		52	61	62	70	61	46	56	71	63	A	73	67	69	56	62	74	71	A	A	A
18	A	58	66	50	A	57	61	78	72	A	66	A	A	A	59	58	A	A	61	70	81	77	A	A
19	A	55	62	62	49	58	57	A	73	A	74	A	A		64	73	69	A	104	A	76	61	70	A
20	A	A	57	57	49	58	98	84	A	A	A	A	55	76	83	A	70	78	80					
21					A	49	100	71	101	A	A	A	A		A	A	A	66	70	69	83	77	68	73
22	73	60	60	57	56	74	70	72	99	109	A	A	C	89	84	95	91	73	64	A	67	76	69	72
23	58	57	57	48	51	48	68	72	74	A	A	A	64	A	A			A	82	82	74	74	61	57
24	59	A	61	58	57	A	58	72	81	94	A	80	A	A	A	A	A	70	92	68	82	72	52	73
25	63	58	62	57	61	66	A	88		A	A	A	A	80	78		A	76	73				A	
26	73	71	69	56	48	63	71		83		A	A	A	72	A	77	A	A	82	46	60	60	76	58
27	55	53	57	57	55	66	60	94	70	A	A	A	A	A	72	73	77	89	82	93	93	83	86	74
28	68		68	63	83	74	94	72	77	A	A	A	A	A	83	100	101	91	90		77	73	72	60
29	71	70	68	63	58	57	94	76	72	A		46	A	A	83									
30											C	C	C	C	C	C	C	C	C	C	C	C	C	C
31	C	C	C	C	C	C	C	C	C	C	C	C			C	C								
	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
CNT	22	23	28	26	25	26	24	22	20	11					18	16	18	16	27	19	23	23	20	21
MED	68	58	60	57	56	60	70	75	74	72					74	73	83	77	82	76	74	72	68	63
U Q	77	70	68	62	58	66	94	84	79	93					83	80	91	86	90	82	82	80	71	73
L Q	59	57	57	50	49	57	60	72	70	53					68	67	73	71	70	69	69	61	58	57

COMMUNICATIONS RESEARCH LABORATORY, JAPAN

HOURLY VALUES OF FES AT KOKUBUNJI

JUL. 1993

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

D \ H	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
1	100	101	76	94	70	63	58	72	72	60	62	73	85		64	72	91	56	G	G	65	28	48	36
2	55	35	50	97	53	42	62	50	55	48	60	87	G	63	67	62	58	117	53	57	74	75	100	60
3	52	60	52	24	G	G	58	89	63	85	111	47	60	59	G	62	89		48	154	75	51	98	68
4	66	40	G	32	G	G	34	46	65	78	118	134	90	73	62	58	40	46	38	31	28	33	48	42
5	29	28	G	G	G	G	34	63	54	52	88	120	75	57	G	G	53	42	58	75	37	31	63	80
6	100	84	70	74	33	48	44	48	46	73	76	83	104	150	100	99	G	116	102	140	59	113	135	57
7	54	59	62	35	33	28	39	50	80	135	142	98	73	75	61	41	58	G	61	38	34	73	62	74
8	60	40	76	30	28	129	59	51	60	60	69	105	105	113	43	41	G	G	42	54	26	53	32	62
9	50	59	42	62	82	69	100	119	82	61	47	62	55	G	51	52	70	60	62	33	67	49	34	48
10	62	49	51	47	G	48	61	59	100	103	83	102	103	131	93	48	78	78	105	132	133	96	89	99
11	98	49	34	35	34	34	G	61	90	132	67	105	62	97	100	56	121	117	64	41	35	47	86	44
12	80	78	61	75	62	61	58	G	56	63	87	60	123	84	66	52	53	110	30	G	G	34	G	25
13	44	52	47	27	25	27	43	62	78	63	50	58				56			G		62	70	60	60
14	56	36	36	30	31	29	45	58	110	103	62	55	63	94	61	46	45	54	49	33	G	G	G	G
15	G	28	33	G	34	G	G	G	G	50	59	142	110	122	70	50	94	58	G	G	30	30	30	40
16	62	38	31	31	82	44	40	40	97	138	165	50	133	89	64	68	76	70	102	66	56	29	53	28
17	G	56	51		35	54	52	57	51	54	59	49	51	60	50	48	50	G	32	64	60	93	74	100
18	72	73	58	42	54	74	60	120	90	62	52	134	58	44	G	57	62	62	62	55	55	64	90	126
19	100	62	54	68	50	32	60	79	50	72	61	132	131		73	61	78	108	159	137	61	96	70	96
20	77	61	58	35	33	42	G	48	105	136	97	87	52	G	60	59	62	61	80					
21					54	42	100	64	89	142	57	96	63		61	102	83	60	44	43	66	91	57	54
22	64	76	38	32	60	59	40	47	62	86	108	101	51	77	59	G	59	47	61	97	63	46	78	52
23	72	34	39	47	52	48	33	52	69	94	61	108	G	59	97		G	47	70	67	G	38	60	61
24	54	59	43	G	28	54	32	46	47	81	88	86	61	136	144	74	48	68	48	61	64	61	57	59
25	31	G	29	35	37	42	68	72	82	105	73	66	79	62	G		50	43	G	G			58	G
26	56	51	34	24	G	G	48	G	54	G	78	55	56	54	61	57	137	145	56	G	G	25	G	G
27	69	54	G	28	G	G	40	50	G	130	83	135	80	96	58	58	58	50	61	62	G	64	70	61
28	60	46	33	34	G	43	39	52	58	80	136	62	70	96	54	G	G	45	41		G	29	G	G
29	51	G	38	25	26	G	38	48	40	78		54	60	74	73									
30											C	C	C	C	C	C	C	G	G	G	G	G	G	G
31	C	C	C	C	C	C	C	C	C	C	C	C			C	C								
	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
CNT	28	28	28	27	29	29	29	29	29	29	28	29	28	25	28	26	27	27	29	26	27	27	28	28
MED	60	52	42	34	33	42	44	52	63	78	74	87	66	75	61	56	58	58	53	54	55	49	59	56
U Q	72	60	56	47	53	54	59	63	85	104	92	106	96	96	71	62	78	78	63	67	64	73	76	65
L Q	51	37	33	27	13	14	36	47	52	60	60	59	57	59	52	48	48	45	35	31	G	30	33	32

COMMUNICATIONS RESEARCH LABORATORY, JAPAN

HOURLY VALUES OF FMIN AT KOKUBUNJI

JUL. 1993

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

D \ H	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
1	14	14	14	14	14	14	14	16	26	33	37	34	40		36	34	33	21	14	14	14	14	14	14
2	14	14	14	14	14	14	14	15	21	33	30	34	52	40	38	34	20	28	14	14	14	14	14	14
3	14	14	14	14	14	14	14	29	32	34	33	33	32	33	53	34	21		14	15	14	15	14	14
4	14	14	18	20	14	14	14	15	32	39	36	42	38	38	28	26	23	20	14	14	14	14	14	14
5	14	14	20	15	14	14	14	29	23	33	37	39	39	38	38	49	30	14	14	20	14	14	14	14
6	14	14	14	14	14	14	14	14	22	32	34	32	34	34	29				14	22	35	14	14	14
7	14	14	14	14	14	14	14	20	21	26	40	35	34	33	30	23	36	21	15	14	14	14	14	14
8	14	14	15	14	14	14	14	24	16	30	35	32	33	30	27	20	46	48	23	16	16	14	14	14
9	14	14	14	14	14	14	14	17	16	26	54	38	33	50	35	33	38	22	14	15	14	14	14	14
10	14	21	14	14	14	14	14	16	23	33	34	33	36	32	28	22	15	16	14	14	14	14	14	14
11	14	14	14	14	14	14	14	20	20	32	32	34	34	33	26	40	17	14	14	20	14	14	14	14
12	14	14	14	14	14	14	14	14	22	21	34	35	36	38	34	32	18	15	14	15	14	14	14	14
13	14	14	14	14	14	14	14	14	16	24	32	32				36			38		14	14	14	14
14	14	14	14	14	14	14	14	15	16	32	32	33	33	32	28	24	22	15	14	14	14	14	14	14
15	21	14	14	14	14	18	18	18	34	30	35	36	43	35	34	21	22	17	18	20	14	14	14	14
16	14	14	14	14	14	15	14	17	20	29	33	34	32	29	30	26	21	14	14	14	14	14	15	14
17	14	16	14		16	14	14	17	30	33	42	29	33	34	32	28	20	14	14	14	14	14	15	14
18	14	14	14	14	14	14	14	15	23	32	34	29	29	28	44	21	20	15	15	14	17	14	14	14
19	14	16	14	14	14	14	14	17	30	34	34	34	33		28	24	18	18	14	15	14	14	14	14
20	14	14	14	14	14	14	21	26	30	30	33	32	33	53	42	44	32	20	14					
21					29	14	14	22	34	29	38	34	36		38	35	32	18	15	15	21	14	14	17
22	14	14	14	14	14	14	14	18	27	34	36	37	38	38	36	57	30	16	14	14	14	15	14	14
23	14	14	14	14	14	14	33	16	32	18	34	35	36	43			46	35	14	21	16	21	14	14
24	14	14	14	32	14	17	15	18	24	44	34	34	35	35	30	30	18	21	14	14	14	14	14	14
25	14	14	14	14	14	14	15	16	24	20	26	35	26	26	24		29	28	39					
26	16	14	14	18	18	18	21	23	30	28	44	33	35	35	35	33	33	17	14		C	29	33	38
27	14	16	14	15	18	29	30	29	45	39	37	44	39	32	33	35	34	22	14	14	14	22	14	17
28	14	17	15	14	14	14	16	20	30	34	43	39	38	34	30	44	44	23	14		14	14	14	
29	14	14	14	15	15	21	20	15	32	39		42	40	36	38									
30											C	C	C	C	C	C	C	14	14	14	14	14	14	14
31	C	C	C	C	C	C	C	C	C	C	C	C			C	C								
	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
CNT	28	28	28	27	29	29	29	29	29	29	28	29	28	25	27	25	26	26	29	24	26	27	27	26
MED	14	14	14	14	14	14	14	17	24	32	34	34	35	34	33	33	26	18	14	14	14	14	14	14
U Q	14	14	14	14	14	14	15	21	31	34	37	36	38	38	38	35	33	22	14	15	14	14	14	14
L Q	14	14	14	14	14	14	14	15	21	28	33	33	33	32	28	24	20	15	14	14	14	14	14	14

COMMUNICATIONS RESEARCH LABORATORY, JAPAN

HOURLY VALUES OF FOF2 AT YAMAGAWA

JUL. 1993

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

D \ H	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
1	82	86	85	81	78		71	66	66	81	82	A	82	83	78	82	101	96	79	A	A	76	77	66
2	67	75	81	88	80		63	73	70	62	58		80	72	A	90	85	A	88	79	71	80	78	78
3	78	76	74	72	62	A	57	82	78	54	61	A	75	72	80	88	A	76	81	A	88	86	86	88
4	87	86	84	77	78	72	75	86	76	A	A	A	82		80	85	A	92	84	A	74	76	76	76
5	66	66	66	62	62	58	72	80	72		A	A	67	80	85	80	80	91	86	88	85	82	74	77
6	80	73	79	66	64	66	A	78	66	A	64	A	71	73	A	91	90	88	A	84	A	85	A	A
7	78	82	77	72	76	66	54	66	63	85	98	65		64	A		81	86	86	78		80	66	
8		79	66	60	54	52	54	68	66	75	67	74	64		A	A	80	94	99	73	A	72	84	64
9	77	78	54	70	63	60	52	62		60	62	56	62	62	59	58	66	74	80	87	65	A	A	62
10	52	61	57	69	52	62	A	53	62	A	A	A	A	A	A	61	68	59	A			A	A	51
11	A	A			45	47	51	66	63	81	N	A	A	A	A	A	85	74	80	A	A		A	54
12	A	A	63	A	A	A	A	A	A	A	53	A	A	A	A	A		54	A	60	A		63	51
13	54	52	52	57	50	47	54	64	50	A	A	66	75	A	A	A	A	N	A	A	63	63	A	A
14	A	A	56	54	52	A	A	50	64	A	A	A	A	A		A			65	66	67		79	89
15	58	50	A	50	42	A	54	A	58	60	65	70	A	65	75	95	90	87	71	A	A	51		A
16	53	52	51	52	47	A		54	58	64	68	60	A	A	A	99	A	A	A	77	65	54	62	62
17		63	A	57			A	62	66	A		60	A	64	68	67	68	66		72	73	66	A	A
18	62	52	A	54	52	A	52	61	61	68	74	A	74	66	74	70	68	64		76	78	85	A	A
19		A	66	52	53	47		63	74	74	76	64	A	78	80	82	81	74	A	73	78	78	76	A
20	A		A	61	51	62	A	A	62	61		A	76	82	91	86	76	68	71	82	84	84	73	66
21	74	A	67	46	43	34	51	A	A	A	A	A	A	A	A	61	66	70	66	71	78	62	73	66
22	61	55	61	62	65	56		A	84	A	A	67	74		87	97	90	85	86	82	77	76	76	75
23	A	77	66	57	53	51	52	73	72	61	A	A		63	77	80	85	87	87		73	73	62	A
24	67	65	62	55	53	44	54	63	69	70	70	71	70		73		87	94	101	100	88	86		65
25	66	74	66	64	67	62	66	79	71	74	A	A	68	A	94	92	77	81	87	82	67	79	77	88
26	82	88	51	50	A	47	59	70	67	66	N	72	75	77	75	87	97	100	80	66	62	66	66	66
27	60	55	54	79	52	50	51	63	74	76	70	74	75		77	82	78		90	87		86	83	86
28	83	83	77	77	66	65	67	66	78	62	A	A	69	77	90	101	103	102	96	90	87		78	
29	89	76	74	63	57	58	65		65	66	67	67	70	74	84	92	100	96	90	101	90	82		78
30	79	A	72	71	72	61	50	64	76	76	A		A	81	81	98	112	102	94	88	85	86	A	83
31	72	66	74	60	54	A	52	90	94	57	66	65	64	67	74	85	90	90	90	86	65	62	72	67
	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
CNT	23	24	26	29	28	21	22	25	28	21	16	14	19	18	20	24	25	26	23	23	22	25	20	22
MED	72	74	66	62	54	58	54	66	66	66	67	66	74	72	79	86	85	86	86	82	76	78	76	66
U Q	80	78	74	71	65	62	65	75	74	75	72	71	75	78	84	92	90	94	90	87	85	84	78	78
L Q	61	58	57	54	52	47	52	62	63	61	63	64	68	65	74	80	76	74	80	73	67	66	69	64

COMMUNICATIONS RESEARCH LABORATORY, JAPAN

HOURLY VALUES OF FES AT YAMAGAWA

JUL. 1993

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

D \ H	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
1	24	31	G	38	41	G	31	39	48	G	60	92	80	74	64	50	76	79	107	94	91	76	G	38
2	40	G	53	48	29	G	39	44	45	44	G	G	G	46	81	63	52		41	79	41	40	58	33
3	26	40	G	41	G		39	G	61	56	57	69	78	72	69	53	96	84	91	91	148	94	94	46
4	48	29	G	G			32	40	52	73	75	80	76	G	60	64	91	160	73	83	59	38	29	79
5	35	30	24	30	24	28	37	40	46		70	83	83	174	59	G	54	76	76	91	84	83	81	68
6	46	35	37	G	25		31	50	59	68	G	108	64	77	134	48	67	76	126	93	103	136	94	148
7	104	60	59	G	24	25	34	50	46	66	88	72	G	66	78		71	61	44	40		41	58	33
8	56	48	68	39	37	23	58	38	46	61	96	63	124		79		86	91	96	85	84	44	46	41
9	38	58	51	33		68	38	36		60	54	50	G	G	73	46	41	56	51	84	29	57	72	G
10	30	46	39	G		G		39	56	56	106	92	93	54	54	43	51	64	79	G		69	85	135
11	85	45		G	24			38	52	94	109	142	57	72	94	92	94	83	80	72	71		40	G
12	49	67	84	71	70	69		40	44	52	49	70	96	54	58	49		48	69	40	60	G	56	29
13	24	32	40	46		25	31	G	48	65	96	71	72	84	98	92	102	77	62	111	90	94	89	84
14	84	71	59	40	27	57	40	50	67	115	151	118	84	61	G	70	G	G	39	32	32		30	24
15	29	24		30	34		35		60	G	48	53	54	G	50	G	G	79	G	59	78	52		31
16	G	40	33	44	28			36	40	65	80	51	117	82	145	124	88	79	92	60	30	58	24	23
17		41		90	G		84	50	60	64		48	63	58	G	44	G	47		36	37	69	69	85
18	47	79	59	40	39	45	55	55	51	45	42	74	G	82	51	41	44	51		G	91	92	50	69
19		111	43	G	25	30	G	49	59	82	72	100	137	72	72	58	G	54	63	50	G	69	132	148
20	114	G	59	39	31	36	85	102	70	54		60	58	G	G	G	61	73	50	40	43	46	54	86
21	103	85	66	84	57	24		103	94	81	129	76	65	60	61	G	54	49	47	33	30	29	32	38
22	58	37	40	31	G	25	G	152		147	94	54	G	G	146	79	G	79	G	48	40	145	107	59
23	91	44	45	31	29	29	G	41	50	69	68	150		45	51	G	62	64	57		27	45	44	48
24	40	66	90	50	49	26	G	G	36	G	42	52	G	G	57		46	44	38	25	83	82	G	28
25	G	30	G	46	37		G	G	44	46	133	97	60	97	84	70	78	76	70	90	37	25	G	43
26	G	G	G				40	G	G	52	G	57	57	50	62	93	52	68	72	40	G	G	37	G
27	G	G	G	110	58	41	G	68	56	56	55	62	54	G	G	G	57		57	64	G	59	68	59
28	41	36	44	36	38	G	35	G	54	68	92	66	56	49	44	84	64	G	71	40	49	G	25	G
29	G	30	38	44	26	G	29	G	92	57	60	G	G	G	54	54	G	51	55	36	32	68		60
30	66	71	39	71	32	G	30	G	108	52	125	136	151	57	53	G	G	44	42	33	32	30	33	45
31	89	51	40	26	72	145	59	72	54	50	G	44	43	43	58	G	39	G	37	G	56	45	55	40
	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	28	30	26	22	26	30	29	30	29	31	30	30	31	28	30	29	29	30	29	29	29	31
MED	41	40	40	39	30	26	34	40	52	58	70	70	62	56	60	50	54	64	62	49	43	57	54	43
U Q	75	60	59	46	39	41	40	50	60	68	96	92	83	72	79	70	76	79	77	84	83	79	76	69
L Q	25	30	28	30	25	G	29	G	46	52	48	53	43	G	51	G	39	48	43	36	31	39	31	29

COMMUNICATIONS RESEARCH LABORATORY, JAPAN

HOURLY VALUES OF FMIN AT YAMAGAWA

JUL. 1993

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

D \ H	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
1	15	15	29	15	15		16	16	20	32	35	35	39	38	38	33	20	17	15	15	15	16	40	15
2	15	N	24	15	15		16	16	39	18		22	53	52	40	36	36		27	27	15	26	15	15
3		38	44	15	15		15	45	16	30	24	40	34	35	36	36	27	17	16	15	15	15	15	15
4	23	15	28	15	15	26	15	15	18	34	36	36	36		35	29	26	23	16	15	15	15	24	15
5	24	15	16	15	15	15	16	32	22		37	36	34	33	35	46	35	16	23	15	24	15	15	15
6	15	15	15	35	15	15	26	15	16	16	48	34	35	34	33	28	36	24	15	23	15	15	15	15
7	34	16	15	39	15	15	15	17	16	32	29	35		35	34		18	24	15	15		15	39	15
8	15	15	15	27	15	15	15	15	44	18	33	33	35		40		43	24	15	15	15	15	16	15
9	16	15	15	15	15	15	16	15		26	32	42	51	50	34	32	21	16	15	15	15	15		27
10	23	16	15		33			15	16	34	33	34	34	36	33	30	33	17	15			15	15	27
11	15	16		202	17	15	33	15	16	33	34	35	34	33	35	48	26	16	26	15	15		15	16
12	15	16	15	24	16	24		15	15	23	36	38	36	38	36	35		17	15	15	15		27	16
13	16	16	15	16	17	15	16	34	39	18	64	34	34	33	24	32	22	16	30	15	15	15	16	16
14	15	15	15	16	15	28	23	15	15	28	39	29	34	34		29			15	15	15		16	16
15	16	15		15	15		16		21	35	35	38	38	52	38	49	46	16	15	15	15	15		15
16	42	15	15	16	17			15	16	36	36	36	44	33	39	24	18	22	16	15	15	15	15	16
17		16		15			32	16	26	29		34	35	34	38	50	47	16		16	15	43	15	15
18	23	15	15	15	23	15	17	16	18	22	50	34	48	27	27	22	18	16		43	35	15	27	16
19		16	33	29	15	16		23	16	18	34	38	33	39	38	38	47	16	42	15	43	16	42	32
20	15		15	15	15	23	15	15	21	33		38	38	52	54	49	43	16	15	15	15	16	16	16
21	15	15	15	15	17	15	36		18		36	38	39	40	38		35	16	15	15	15	15	15	15
22	15	28	15	15	44	15		15		27	34	39	54		35	37		16		15	15	15	15	15
23	15	15	15	15	15	16	23	15	16	21	35	36		52	36	56	33	27	15		15	15	15	15
24	15	15	15	15	15	15	16	15	18	18	48	39	53		38		34	16	16	15	15	15		15
25	39	15	33	15	15	15	24	45	16	38	35	36	36	35	35	30	21	17	43	39	15	15	15	15
26	16	15	16	16		15	16	15	18	30		36	35	36	33	29	27	16	29	15		44	15	27
27	26	16	34	16	15	15	28	16	16	23	36	36	40		52	51	35		16	15		15	15	24
28	15	26	15	15	15	15	15	36	17	21	30	33	33	34	28	26	20		15	15	16		15	
29		15	15	15	15	15	15		16	18	28	38	54	55	38	36		34	15	15	15	15		15
30	15	15	15	15	16	28	15	39	16	26	28		39	35	38	23	21	16	15	15	15	15	15	15
31	15	15	15	15	15	26	44	16	16	23	27	47	48	47	33	51	18	16	15	17	15	15	15	15
	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
CNT	27	29	28	30	29	24	26	28	29	29	27	30	29	26	30	27	27	27	28	29	27	27	27	30
MED	15	15	15	15	15	15	16	16	16	26	35	36	36	36	36	35	27	16	15	15	15	15	15	15
U Q	23	16	20	16	16	19	24	20	20	32	36	38	46	47	38	48	36	22	19	15	15	15	16	16
L Q	15	15	15	15	15	15	15	15	16	19	32	34	34	34	34	29	21	16	15	15	15	15	15	15

HOURLY VALUES OF FOF2 AT OKINAWA

JUL. 1993

LAT. 26.3N LON. 127.8E 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	83	87	73	88	88	80	54	66	85	86	85	A	A	90	85	87	91	91	87	A	62	76	71	66
2	66	74	77	88	A	A	54	62	70	66	72		80	80	76	87	92	90	88	78	66	78	66	68
3	76	77	66	67	66	59	63	75	72	A	67	80	76	78	80	85	82	78	88	A	84	A	A	82
4	77	81	76	76	81	76	78	90	A	A	A	70	82	85	91	91	102	114	90	83	78	74	66	66
5	64	66	64	64	62	62	66	78	67	61	64		80	90	92	84	90	A	104	84	A	A	72	77
6	76	80	80	74	67	66	78	82	70	A	66	69	73	87	94	81	90	91	90	90	88	72	66	74
7	74	64	62	66	60	52	62	54	70	91	94	63	71	76	75	A	79	91	90	81	81	72	42	43
8	53	42	56	57	36	36	55	61	70	72	77	68	A	A	78	80	91	93	91	81	66	78	66	66
9	55	38	55	54	A	46	50	60	55	60	67		64			A	68	78	87	88	66	60	61	58
10	52	51	45	42	44	43	50	65	45	56	A	A	A	51		68	77	72	86	77	54	55	A	
11	41	52	47	48	51	36	47	58	68	74	A	A	A	A	A	A	95	107	86	45	58	61	55	54
12	A	A	60	A	40	41	26	35	A	50	A	A	A	A	A	A	49	A	A	61	A	37	41	54
13	54	54	52	51	54	52	54	44	54	A	A	65	76	87	90	80	64	65	76	A	45	A	33	29
14	45	54	41	42	41	36	27	54	71	56	A	A	A	A	A	A	A	78	A	66	66	55	42	
15	42	43	42	42	41	38	44	55	55	58	70	67	73	86	90	105	114	91	66	61	58	55	A	54
16	52	53	53	55	53	28	33	54	61	61	61	58	67	84	A	A	A	85	90	77	63	64	61	64
17	59	62	63	52	58	52	52	66	61	56	A	61	63	67	76	72	76	75	A	78	54	A	37	A
18	A	42	A	42	44	34	41	43	61	A	81	65	65	76	91	86	81	82	81	84	81	66	65	63
19	A	A	54	63	53	A	33	66	77	75	A	A	66	90	90	94	94	85	77	A	78	A	A	64
20	66	62	62	60	62	52	42	66	48	66	63	77	78	91	105	102	90	82	87	87	87	77	65	64
21	66	77	68	41	A	A	45	66	53	55	A	62	65	59	65	65	71	74	72	74	A	65	59	60
22	60	54	54	54	55	54	52	72	66	57	47	75	81	90	90	A	107	104	111	108	87	78	66	73
23	76	76	78	65	62	54	56	75	66	64	65	71	67	66	79	90	105	112	105	90	A	54	39	58
24	61	54	53	52	45	A	45	66	66	50	67	72	81	80	85	90	95	107	110	110	89	78	72	72
25	76	66	66	66	60	60	55	A	77	A	77	72	84	95	A	94	A	104	108	78	74	72	71	78
26	76	78	64	52	54	47	52	62	62	67	66	71	85	77	80	94	90	91	83	A	72	60	66	42
27	62	66	67	62	44	34	42	66	87	67	76	78	77	70	81	86	90	91	91	89	82	80	85	83
28	78	76	78	75	67	66	61	75	71	62	62	67	76	78	87	91	94	91	75	89	N	80	80	77
29	75	82	75	47	36	41	45	67	70	65	78	77	75	77	84	94	92	87	92	86	80	85	72	66
30	62	62	64	60	65	51	38	56	82	61	A	77	87	86	86	92	63	91	88	88	88	76	66	66
31	72	76	77	72	63	38	54	82	69	64	64	72	82	75	80	88	93	75	90	81	66	A	53	A
	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
CNT	28	29	30	30	28	27	31	30	29	25	21	22	25	26	24	24	28	29	28	26	26	25	27	27
MED	65	64	64	58	54	51	52	66	68	62	67	70	76	80	85	88	90	91	88	82	73	72	66	66
U Q	76	76	73	66	62	59	55	72	71	67	77	75	81	87	90	93	94	92	91	88	82	78	71	73
L Q	54	53	54	51	44	38	42	56	61	56	64	65	67	76	79	82	78	78	84	77	63	60	53	58

COMMUNICATIONS RESEARCH LABORATORY, JAPAN

HOURLY VALUES OF FES AT OKINAWA

JUL. 1993

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

D \ H	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
1	G	G	G	G	G	60	37	42	48	68	60	78	100	64	78	73	66	79	42	69	48	36	32	45
2	44	41	29	34	83	51	42	49	58	48	46	G	G	64	78	71	59	G	G	G	28	33	39	41
3	60	32	23	G	28	27	30	38	66	46	70	G	G	G	G	G	50	57	48	96	83	72	40	40
4	59	28	25	G	G	G	32	41	58	64	44	58	69	76	57	61	66	41	G	31	32	41	35	33
5	70	62	40	41	55	27	42	48	40	43	G	G	G	G	49	61	78	129	96	72	103	86	93	40
6	37	36	29	G	G	G	28	36	73	96	G	60	94	G	57	82	G	60	64	43	92	29	38	47
7	46	38	G	G	G	G	G	34	G	G	55	G	G	57	70	92	64	46	36	44	40	33	39	34
8	38	24	G	G	G	G	28	41	73	86	59	84	112	99	50	64	51	52	50	47	45	42	39	39
9	33	G	23	G	44	32	G	33	G	66	48	G	G	G	G	46	G	68	51	66	31	28	26	24
10	22	26	G	G	G	G	28	43	56	58	118	81	72	49	47	48	59	44	54	61	71	48	38	28
11	33	28	25	33	48	42	32	47	60	62	97	124	117	170	88	84	90	90	83	70	58	30	33	33
12	59	91	68	78	60	33	28	39	44	45	58	62	70	128	80	66	61	79	60	49	60	33	40	33
13	43	40	49	46	35	32	28	44	70	66	83	142	84	96	74	70	60	52	96	65	83	80	59	34
14	48	36	32	60	42	36	32	68	67	79	80	108	84	118	100	137	80	68	81	48	33	32	33	58
15	22	24	G	24	G	G	29	40	42	G	70	54	54	G	50	47	69	55	37	34	32	60	48	40
16	29	40	32	26	23	68	39	36	43	47	50	60	45	92	114	96	155	136	92	68	34	82	38	32
17	26	45	58	41	40	G	25	40	G	50	68	57	44	48	47	44	49	50	67	44	59	70	80	59
18	69	59	49	59	26	29	29	69	81	88	51	44	44	50	44	79	62	48	70	72	88	60	66	66
19	79	69	61	70	49	59	38	53	72	125	95	96	178	142	144	69	45	82	62	84	115	127	92	38
20	41	33	26	G	G	24	34	38	78	83	76	46	G	G	50	G	G	48	66	59	40	36	25	28
21	39	84	66	81	71	40	30	36	45	47	44	48	44	55	52	42	51	48	45	44	108	40	40	34
22	58	40	29	31	32	33	32	37	36	67	42	43	44	56	64	96	44	45	46	30	41	43	28	40
23	57	59	42	40	37	32	24	32	42	44	42	52	52	49	50	55	44	58	87	83	68	48	38	46
24	59	40	80	36	41	45	24	44	43	44	45	52	G	G	G	46	46	56	54	57	91	42	70	57
25	40	35	43	37	G	G	32	72	42	95	73	58	45	61	107	91	110	100	82	71	33	G	59	33
26	70	58	34	30	26	26	31	41	70	90	68	49	63	61	79	62	56	47	44	65	58	79	39	36
27	G	G	G	G	G	G	36	36	G	G	44	G	G	G	G	G	45	49	43	35	29	G	G	G
28	G	G	G	37	G	43	G	35	42	55	G	G	G	G	G	45	41	45	G	39	35	G	G	34
29	G	G	G	G	G	G	G	G	G	39	G	G	G	G	G	60	46	42	64	61	94	49	40	25
30	G	34	46	34	43	27	31	G	43	G	79	G	G	57	48	G	G	G	G	G	G	44	36	G
31	G	38	G	G	33	G	42	67	G	G	G	G	G	G	G	G	40	G	38	G	45	58	36	32
	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
CNT	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31
MED	40	36	29	31	28	27	30	40	44	55	55	52	44	55	50	61	51	52	54	57	48	42	39	34
U Q	59	45	46	41	43	40	34	47	67	79	73	62	72	76	78	79	66	68	70	69	83	60	48	41
L Q	22	26	G	G	G	G	28	36	40	44	44	G	G	G	44	45	44	45	42	39	33	33	33	32

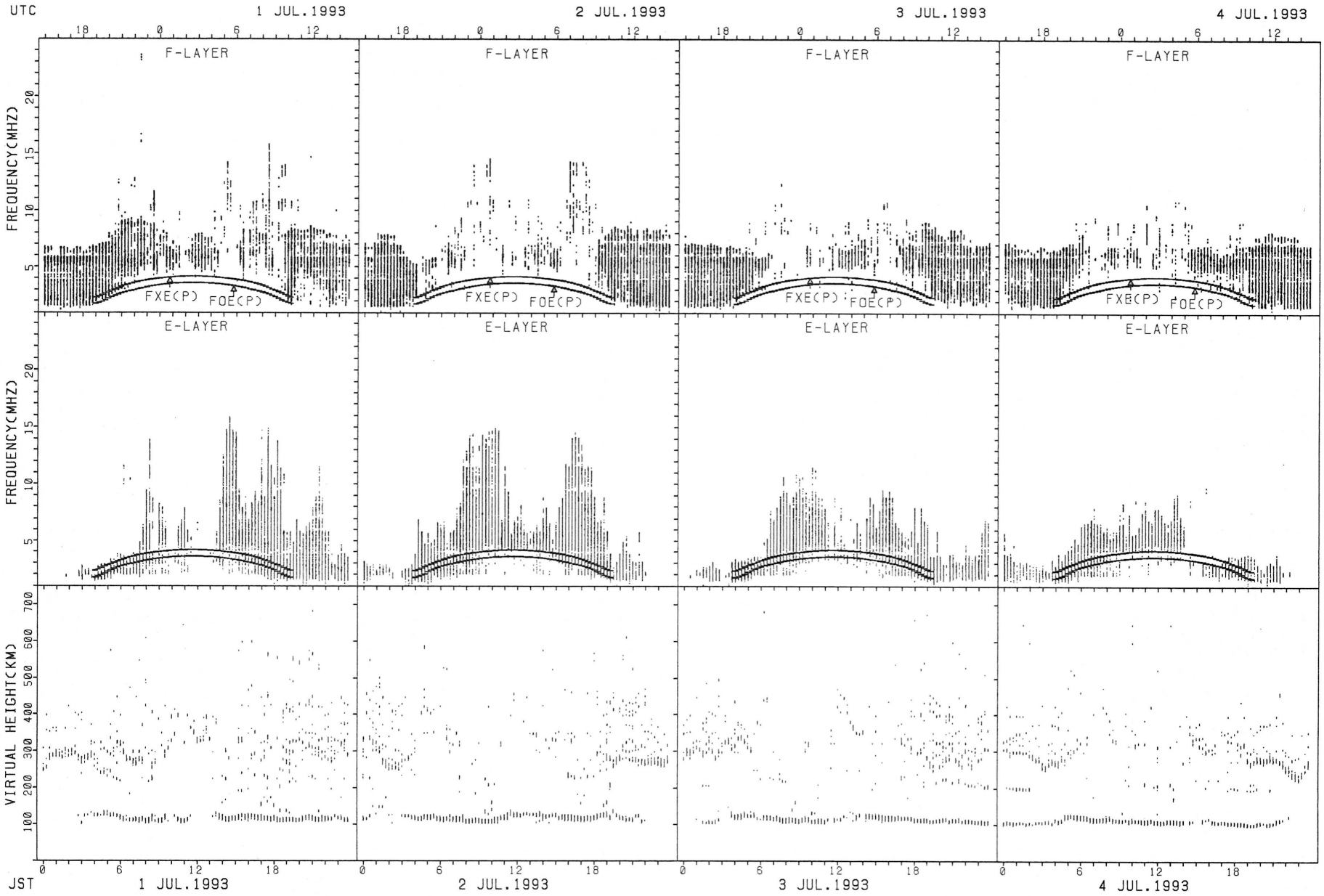
HOURLY VALUES OF FMIN AT OKINAWA

JUL. 1993

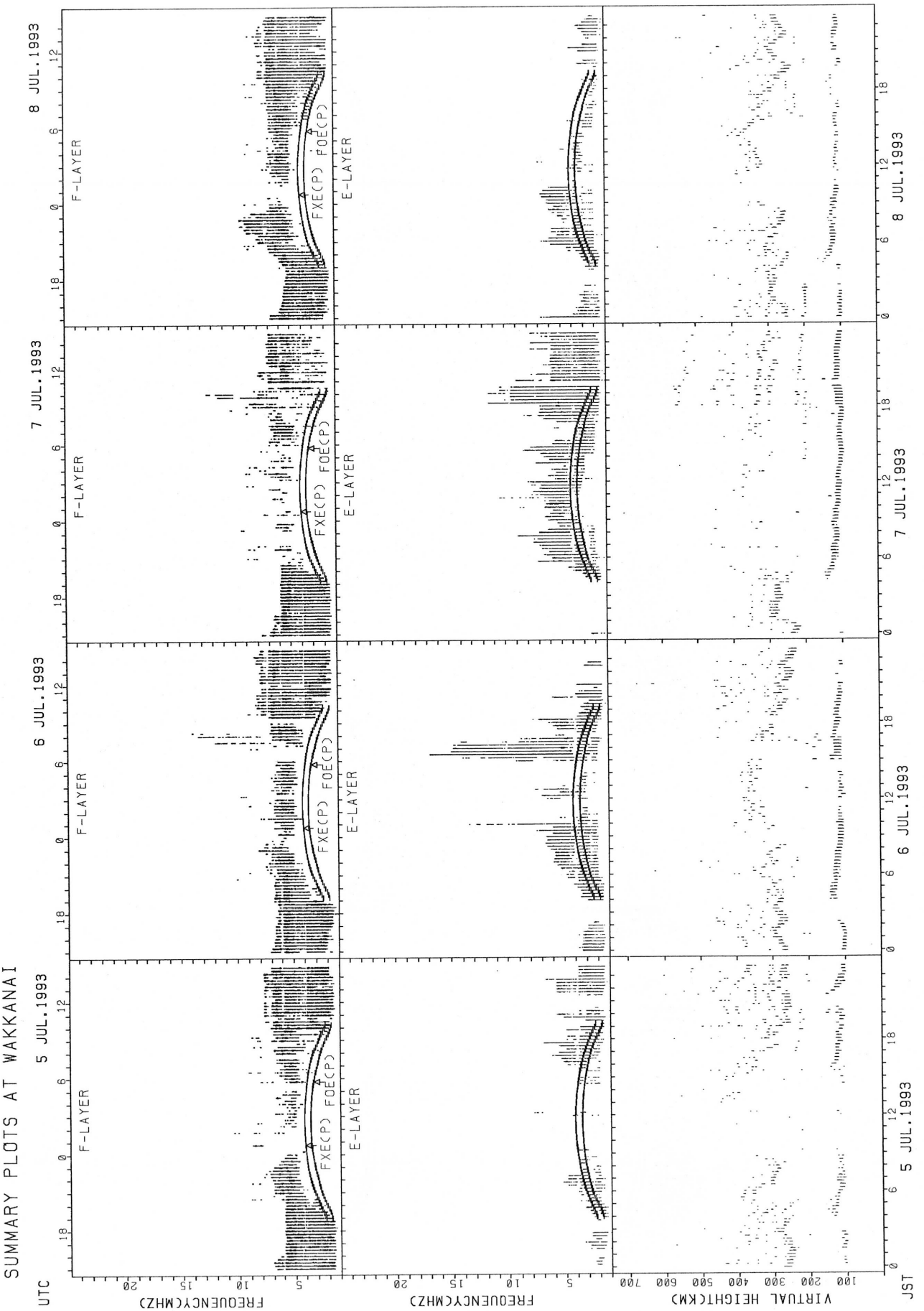
LAT. 26.3N LON. 127.8E SWEEP 1MHz TO 25MHz AUTOMATIC SCALING

H / D	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
1	15	14	15	15	15	14	15	17	23	28	29	37	39	40	37	32	28	23	15	15	14	15	14	14
2	14	15	14	15	15	14	15	16	22	28	30		55	44	46	38	35	39	26	27	15	15	14	15
3	15	15	15	15	15	14	14	15	17	26	32	53	35	55	56	52	28	22	14	15	14	14	14	15
4	15	15	15	15	15	14	15	14	21	30	29	36	40	36	35	33	26	24	15	14	14	14	15	15
5	15	15	15	15	15	14	14	14	21	30	47			55	42	29	28	27	16	15	17	15	15	14
6	14	15	15	15	17	15	15	14	16	22		32	32	30	30	29	27	30	14	16	15	14	14	15
7	15	14	14	15	15	15	14	18	23	27	34	33	36	32	32	29	24	22	17	16	15	14	14	15
8	15	15	14	15	16	15	15	16	17	32	26	34	33	30	30	29	27	22	17	20	14	15	14	15
9	15	17	15	15	15	15	18	16	18	26	30	29	34	53	53	28		21	21	14	14	15	14	15
10	15	14	14	15	15	15	14	14	14	15	18	23	27	27	23	21	22	15	14	14	14	14	14	15
11	14	14	15	15	14	15	15	14	15	15	17	16	20	27	20	21	17	14	14	14	14	14	15	15
12	15	15	14	14	14	14	14	14	14	16	20	20	26	24	20	20	17	15	14	14	14	14	14	15
13	14	14	14	14	14	14	15	15	14	14	17	21	26	21	20	21	17	14	14	14	14	14	14	14
14	15	14	14	14	15	15	14	14	15	15	17	18	20	18	22	20	16	14	14	15	14	14	15	14
15	15	15	14	15	15	15	14	15	16	21	23	30	29	28	28	27	18	15	14	14	14	14	15	14
16	14	15	14	14	15	15	14	15	15	17	18	20	24	28	26	18	17	16	14	14	14	15	15	15
17	15	14	14	15	14	15	16	14	15	17	20	26	32	29	26	21	18	15	14	14	14	14	14	14
18	15	14	14	14	14	14	14	14	15	16	16	21	28	26	26	18	17	14	14	14	14	14	15	14
19	15	14	14	14	14	14	15	15	15	15	18	21	24	27	26	27	17	16	15	14	14	14	14	15
20	14	15	15	14	14	14	14	14	16	16	20	23	28	28	22	20	18	14	14	14	14	14	15	14
21	16	15	14	15	14	14	14	15	15	18	18	24	32	28	30	24	17	16	14	15	14	14	14	14
22	15	15	14	14	14	14	14	14	15	18	20	32	28	27	23	21	18	15	14	14	15	15	15	15
23	14	15	15	14	14	14	14	14	14	16	20	26	22	23	29	26	17	15	14	15	14	15	15	15
24	14	15	15	14	14	14	16	15	15	18	21	26	28	24	23	22	17	15	14	14	14	14	14	15
25	15	15	15	14	15	15	14	14	15	16	21	24	29	28	29	21	18	16	14	14	14	15	15	15
26	14	15	15	14	14	15	15	15	16	20	18	30	28	27	21	22	27	26	20	24	14	15	15	14
27	15	15	16	18	16	16	15	16	32	27	37	53	59		59	52	35	29	17	16	15	18	15	16
28	15	16	15	15	16	14	18	16	17	24	49	58	59	56	28	27	27	26	15	15	15	16	23	15
29	17	20	14	16	17	16	20	18	30	30			53	55	55	38	35	30	24	16	14	15	14	17
30	15	18	15	14	16	15	14	15	24	29	35	56	55	49	33	54	51	39	32	18	16	15	16	16
31	16	16	15	15	14	15	14	15	22	27	32	33	55	56			52	47	16	21	15	15	15	15
	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
CNT	31	31	31	31	31	31	31	31	31	31	29	28	30	30	30	30	30	31	31	31	31	31	31	31
MED	15	15	15	15	15	15	14	15	16	20	21	28	30	28	28	26	20	16	14	15	14	14	15	15
U Q	15	15	15	15	15	15	15	16	21	27	31	33	39	44	35	29	28	26	17	16	15	15	15	15
L Q	14	14	14	14	14	14	14	14	15	16	18	22	27	27	23	21	17	15	14	14	14	14	14	14

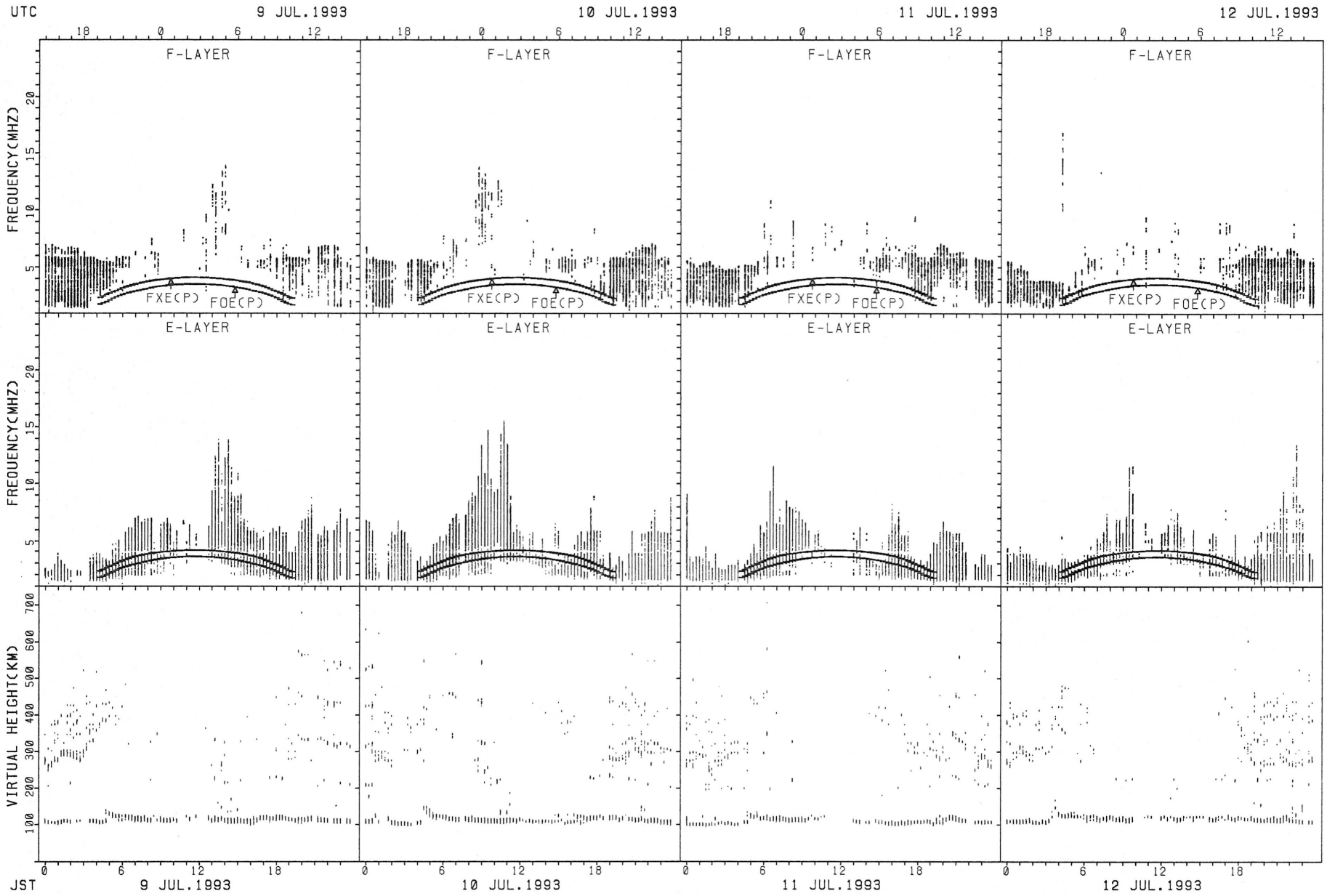
SUMMARY PLOTS AT WAKKANAI



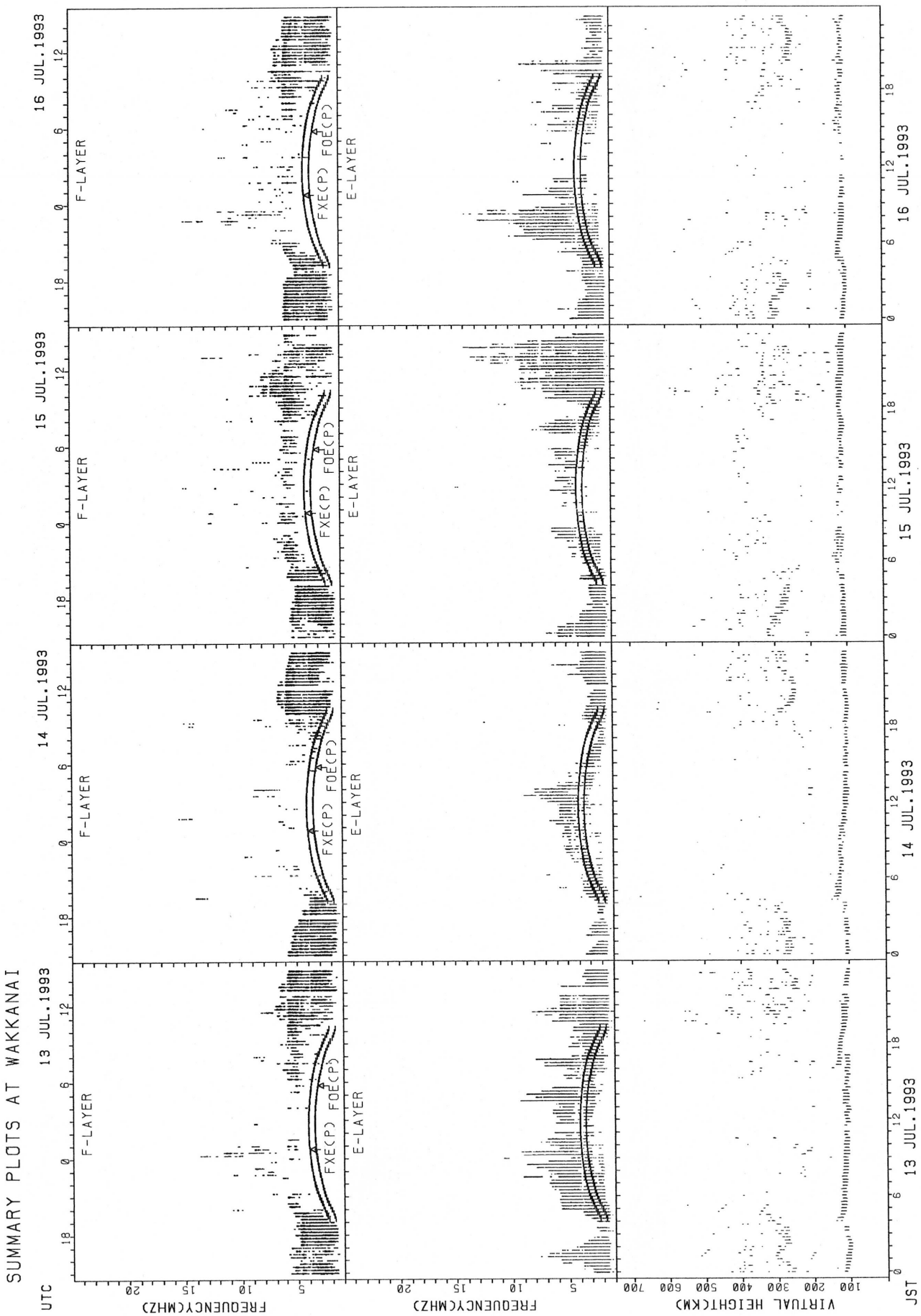
FXE(P): PREDICTED VALUE FOR FXE
FOE(P): PREDICTED VALUE FOR FOE


SUMMARY PLOTS AT WAKKANAI
UTC
JST
5 JUL.1993
6 JUL.1993
7 JUL.1993
8 JUL.1993
F-LAYER
E-LAYER
FXE(P) FOE(P)
FREQUENCY(MHZ)
VIRTUAL HEIGHT(KM)
FXE(P): PREDICTED VALUE FOR FXE
FOE(P): PREDICTED VALUE FOR FOE

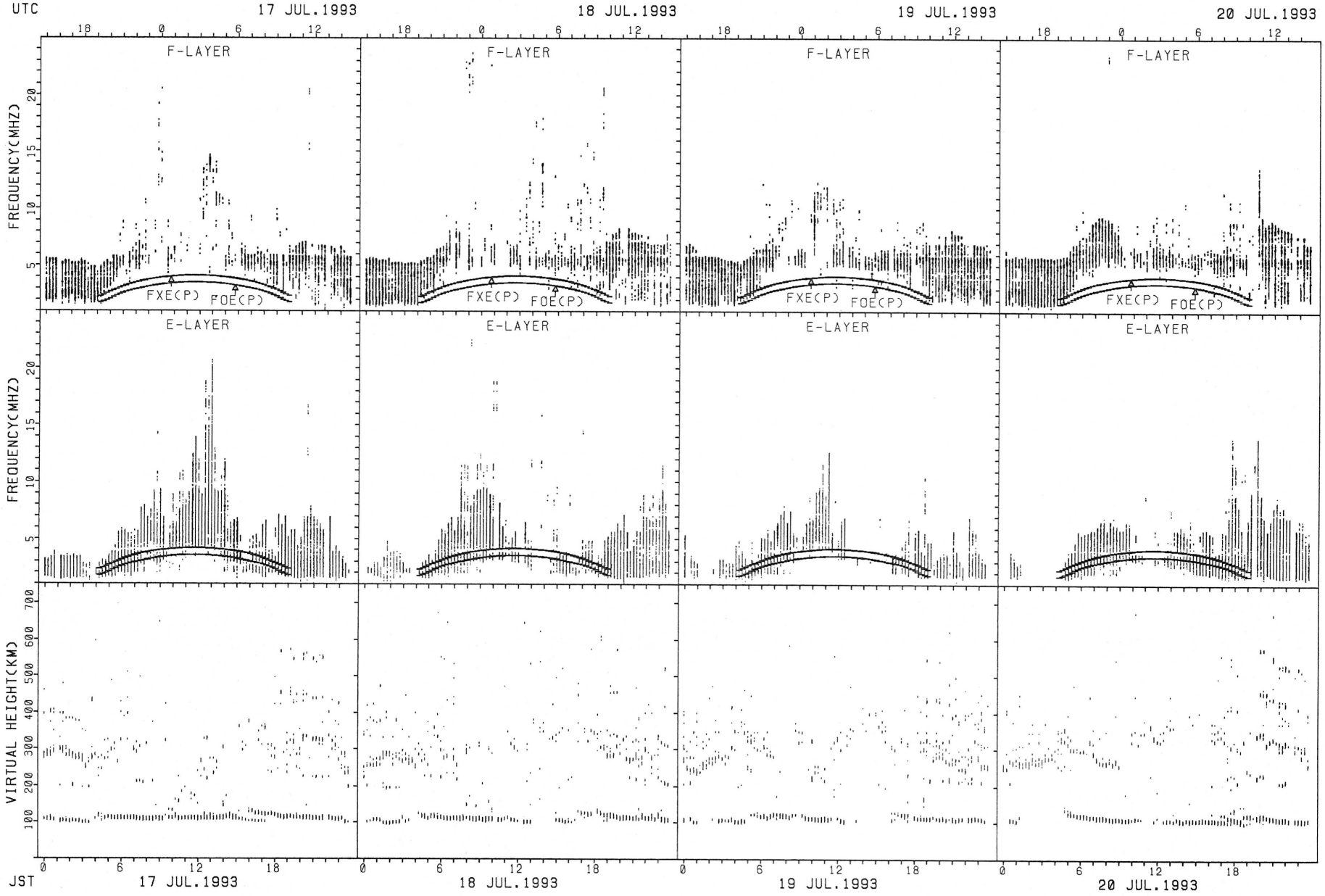
SUMMARY PLOTS AT WAKKANAI



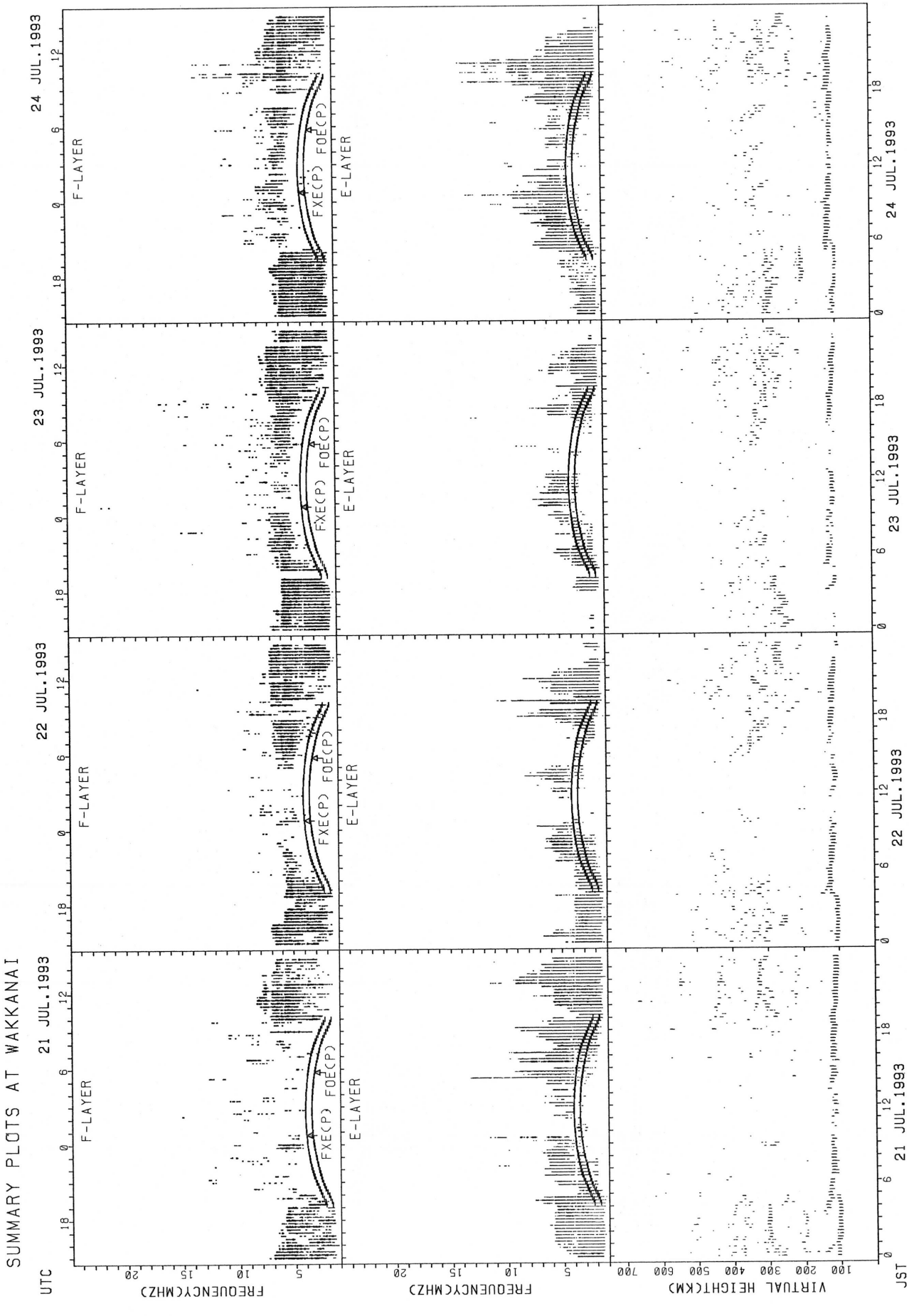
FXE(P); PREDICTED VALUE FOR FXE
FOE(P); PREDICTED VALUE FOR FOE

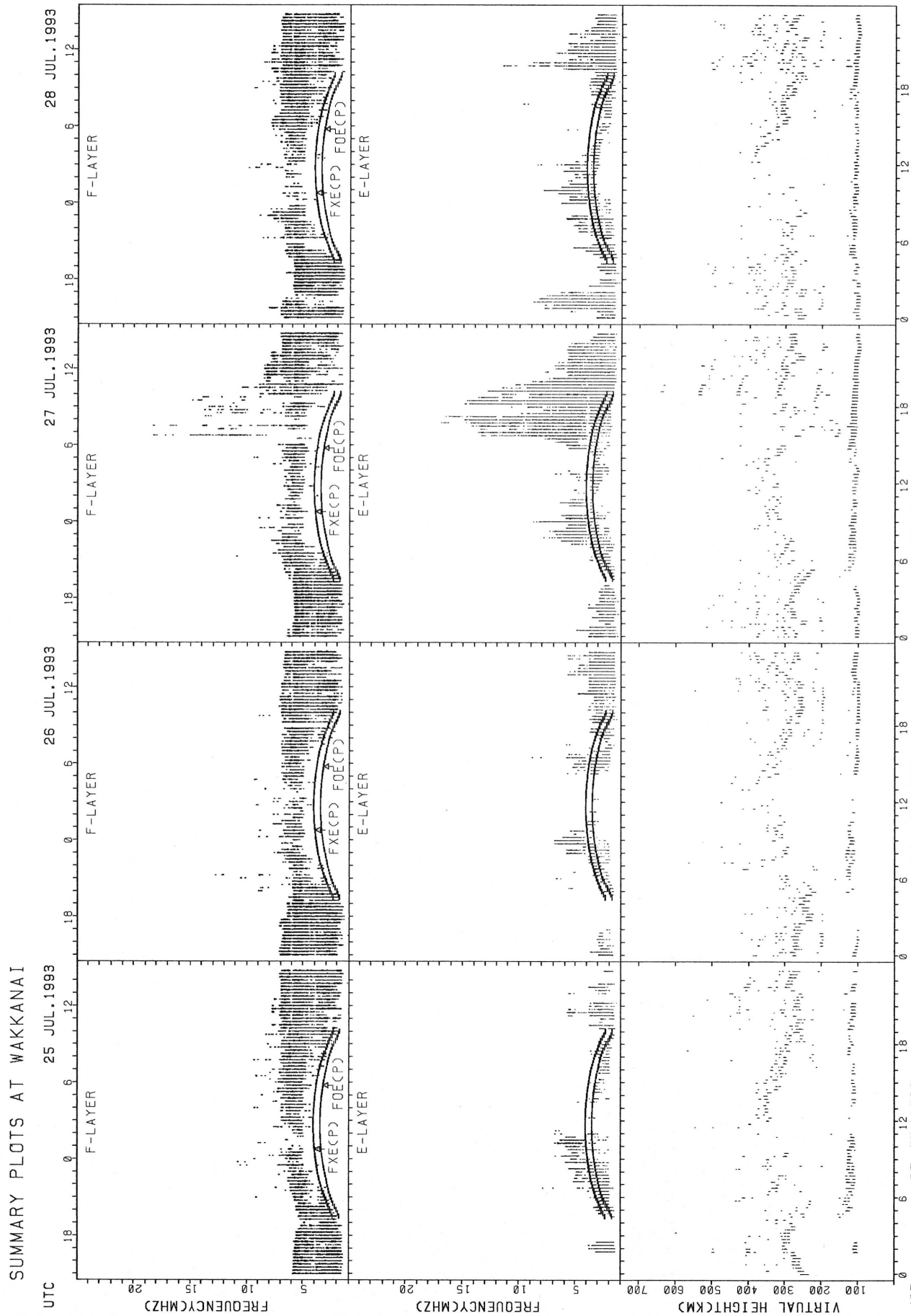

SUMMARY PLOTS AT WAKKANAI
UTC
JST
13 JUL.1993
14 JUL.1993
15 JUL.1993
16 JUL.1993
F-LAYER
E-LAYER
FXE(P) FOE(P)
FREQUENCY(MHZ)
VIRTUAL HEIGHT(KM)
FXE(P): PREDICTED VALUE FOR FXE
FOE(P): PREDICTED VALUE FOR FOE

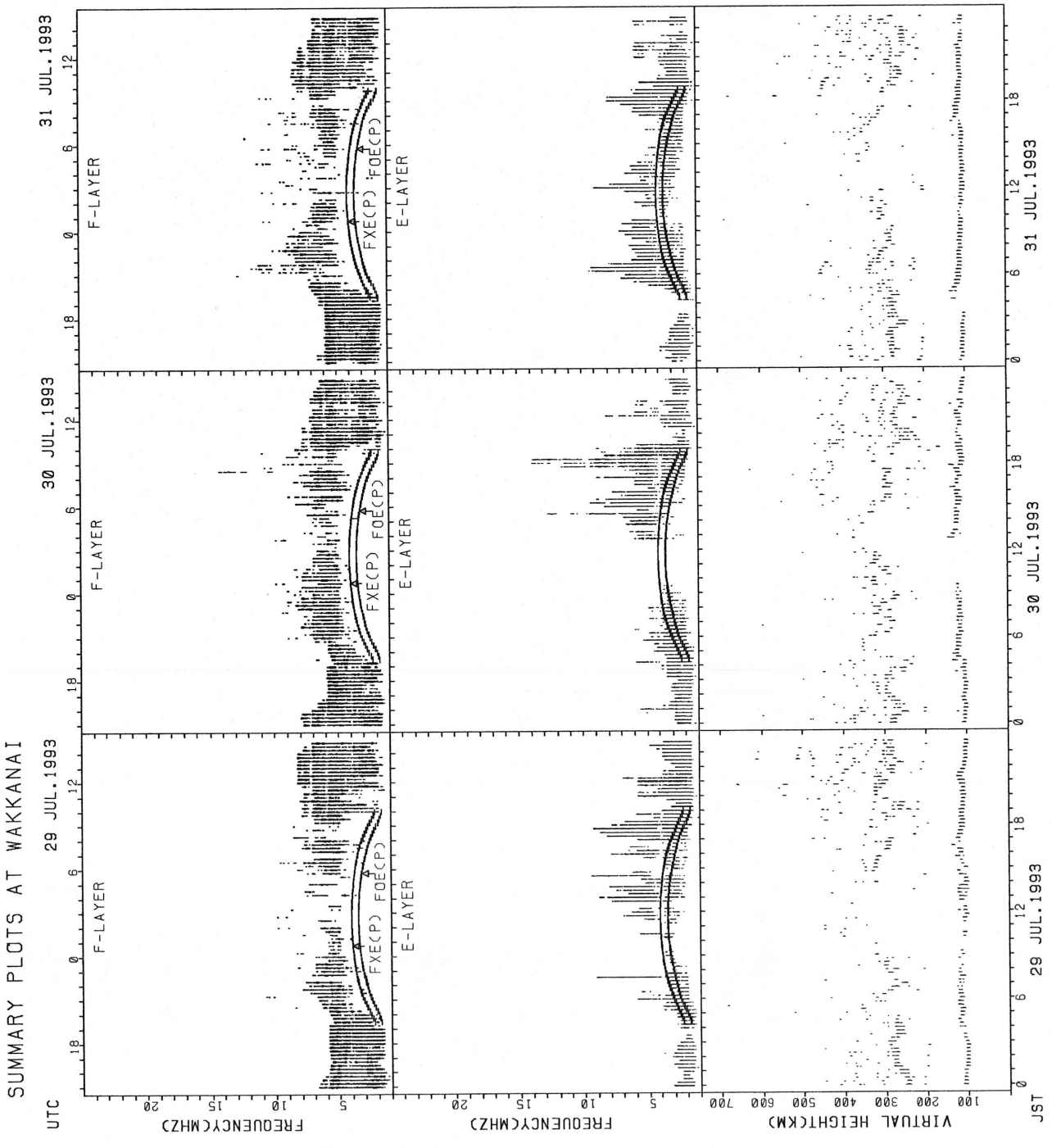
SUMMARY PLOTS AT WAKKANAI



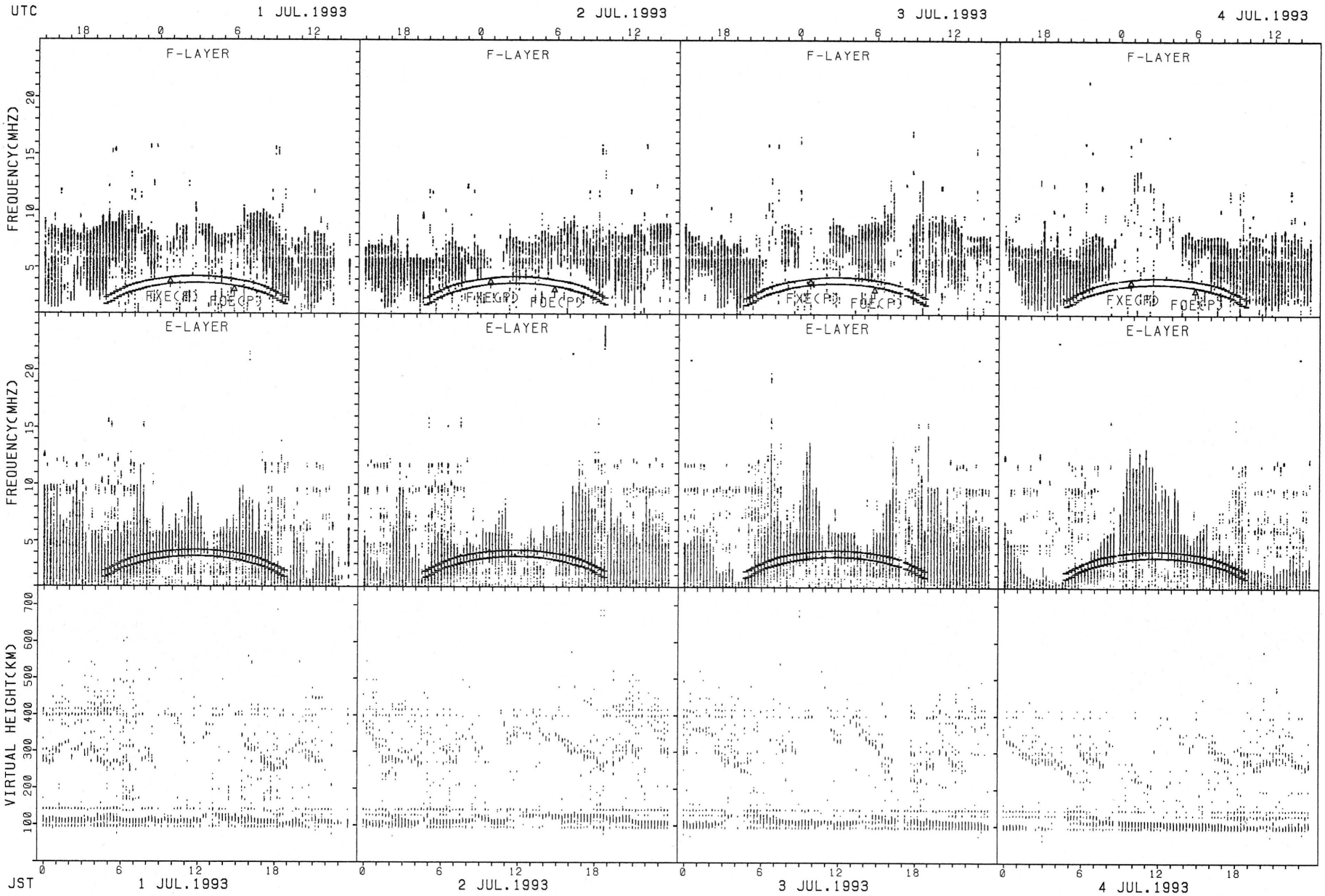
FXE(P): PREDICTED VALUE FOR FXE
FOE(P): PREDICTED VALUE FOR FOE


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

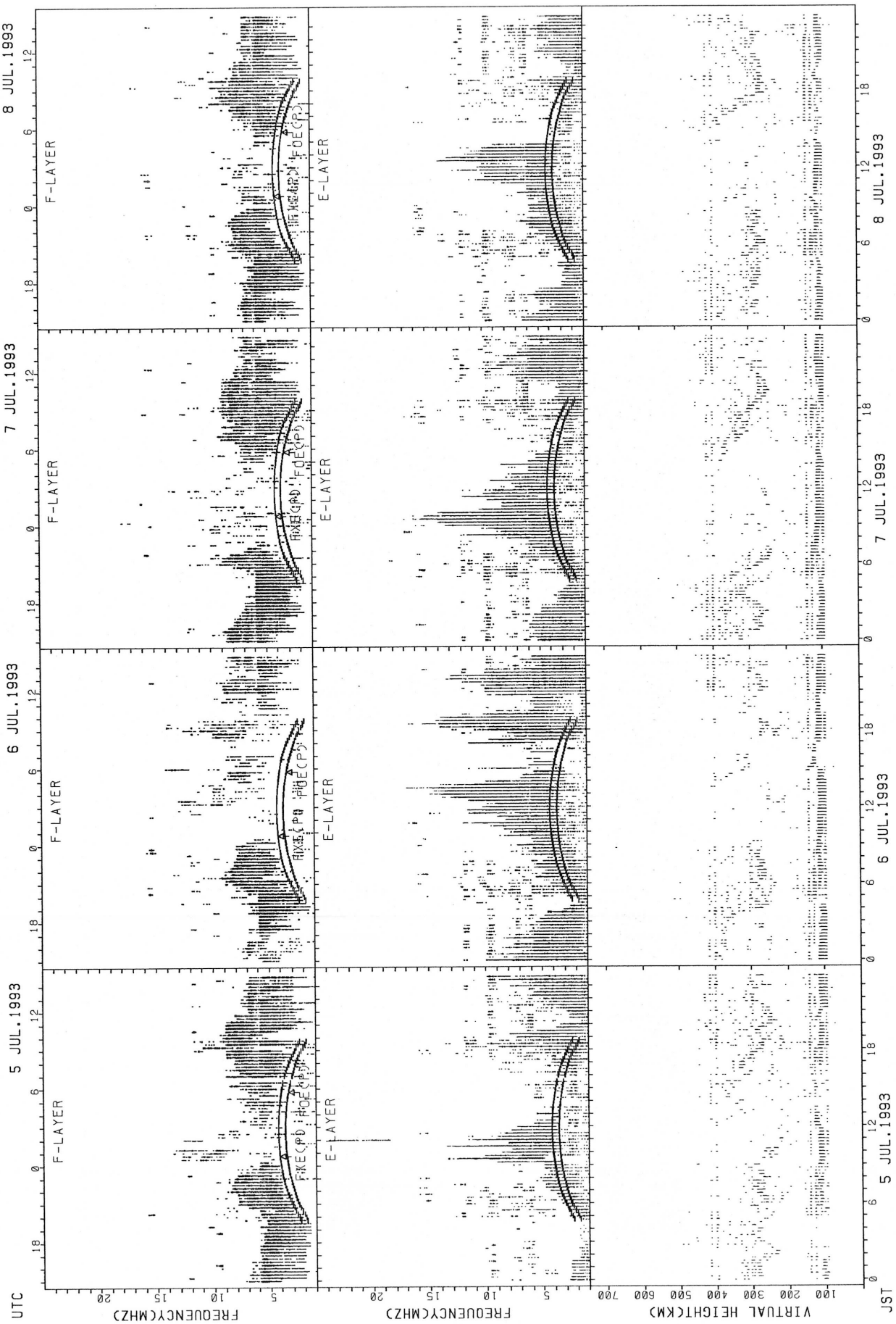

SUMMARY PLOTS AT WAKKANAI
UTC
25 JUL.1993
26 JUL.1993
27 JUL.1993
28 JUL.1993
F-LAYER
E-LAYER
FXE(P) FOE(P)
FREQUENCY(MHZ)
VIRTUAL HEIGHT(KM)
JST
FXE(P): PREDICTED VALUE FOR FXE
FOE(P): PREDICTED VALUE FOR FOE

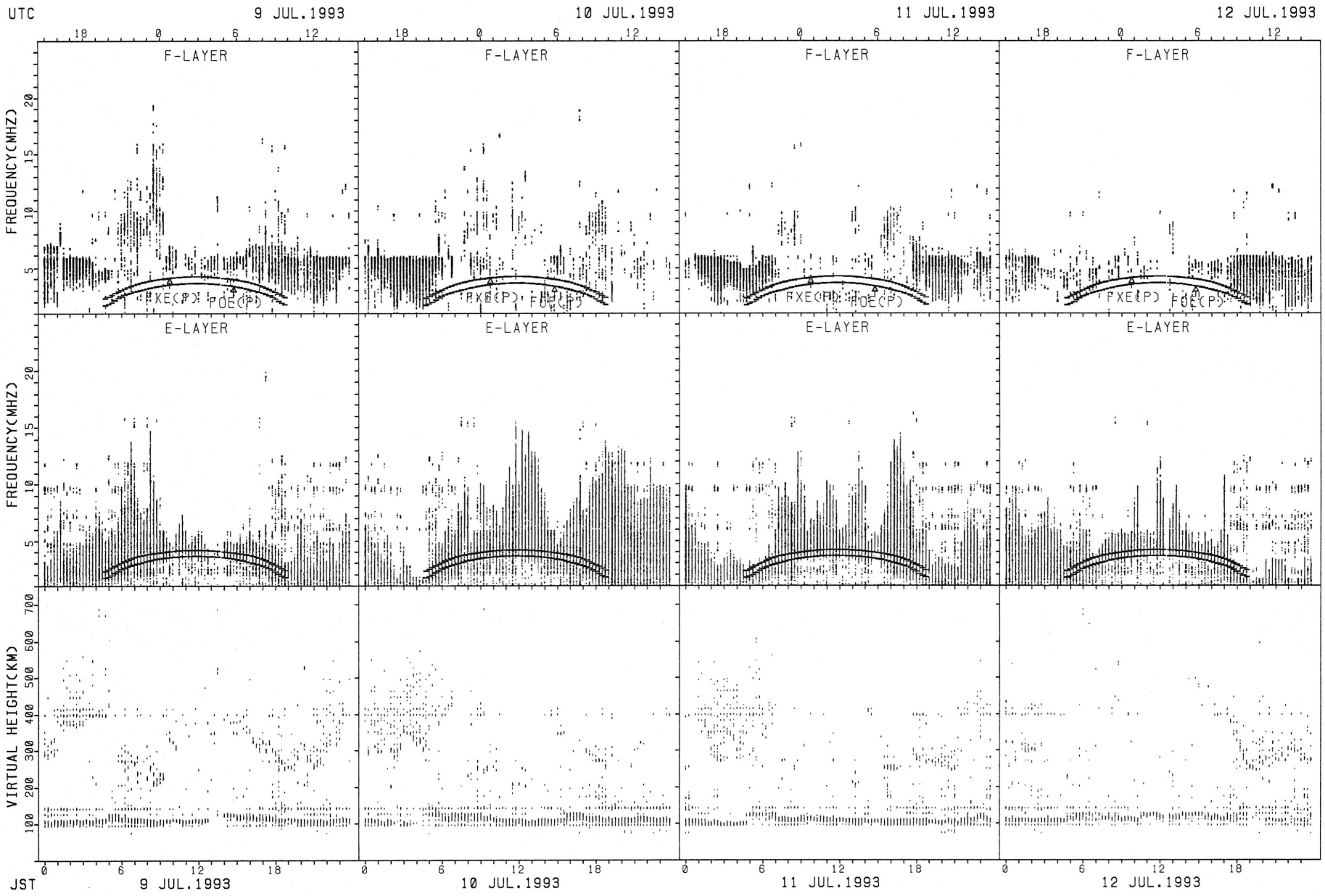

SUMMARY PLOTS AT WAKKANAI
UTC
29 JUL.1993
30 JUL.1993
31 JUL.1993
F-LAYER
E-LAYER
FXE(P)
FOE(P)
FREQUENCY(MHZ)
VIRTUAL HEIGHT(KM)
JST
FXE(P): PREDICTED VALUE FOR FXE
FOE(P): PREDICTED VALUE FOR FOE

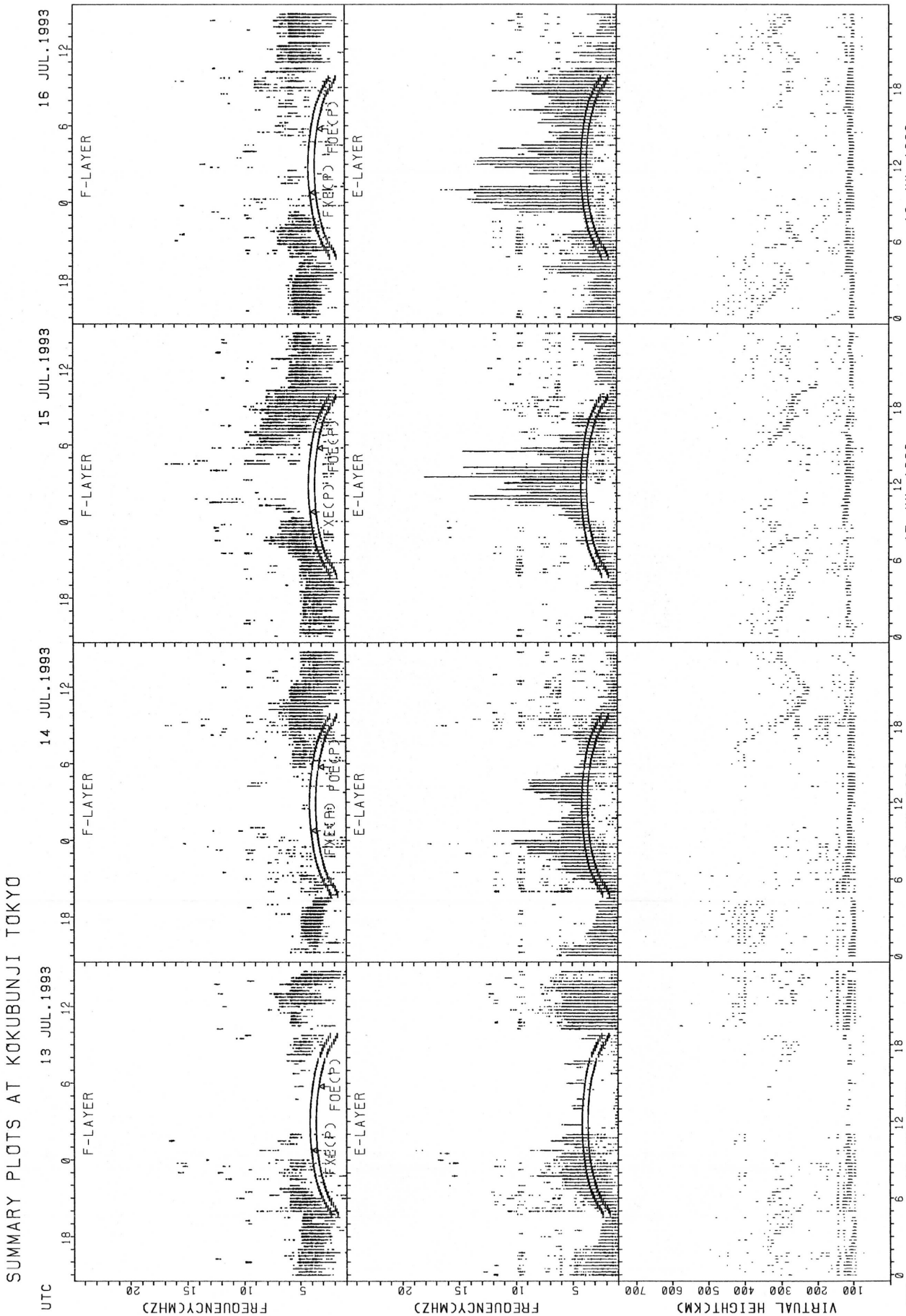
SUMMARY PLOTS AT KOKUBUNJI TOKYO

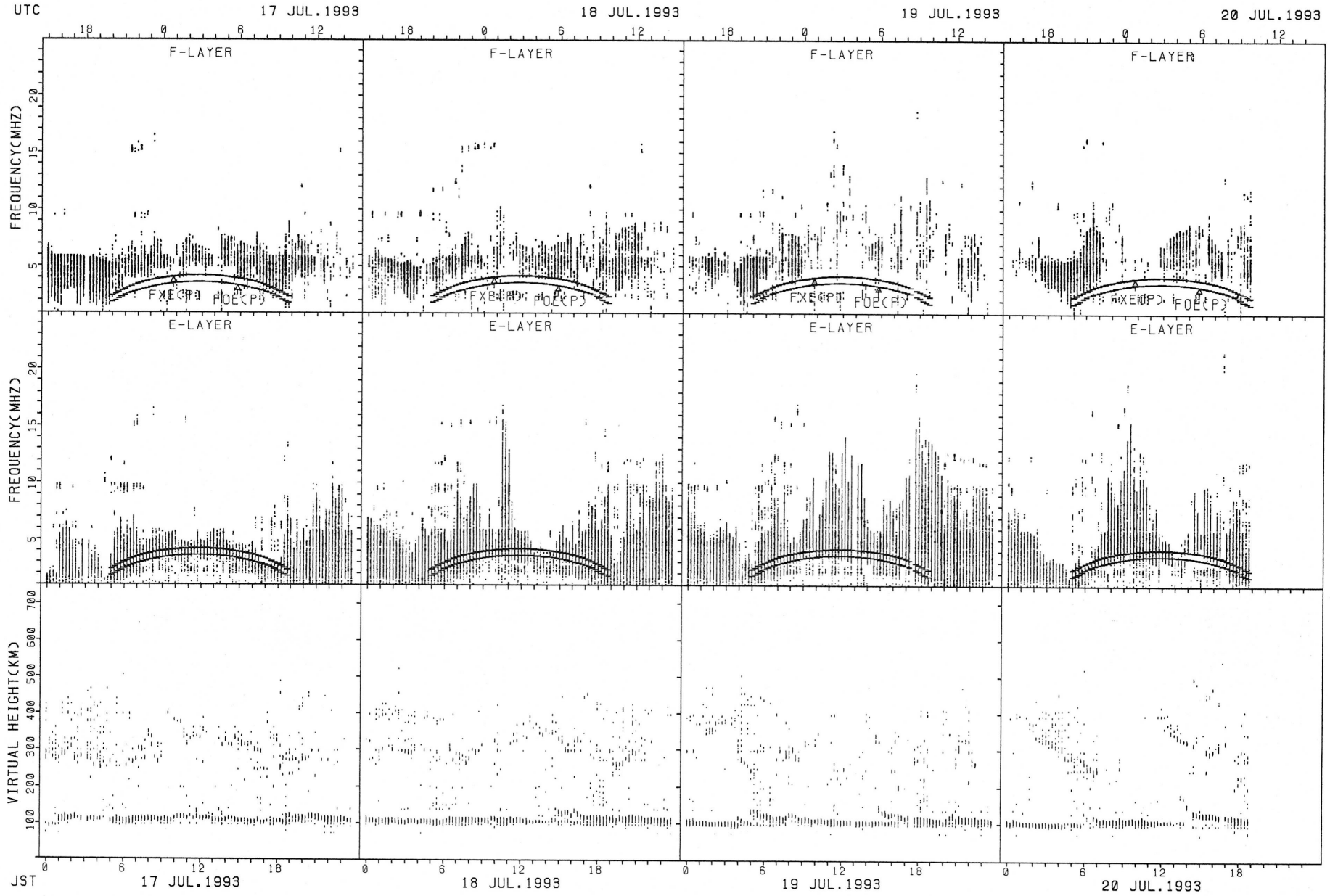


FXE(P): PREDICTED VALUE FOR FXE
FOE(P): PREDICTED VALUE FOR FOE

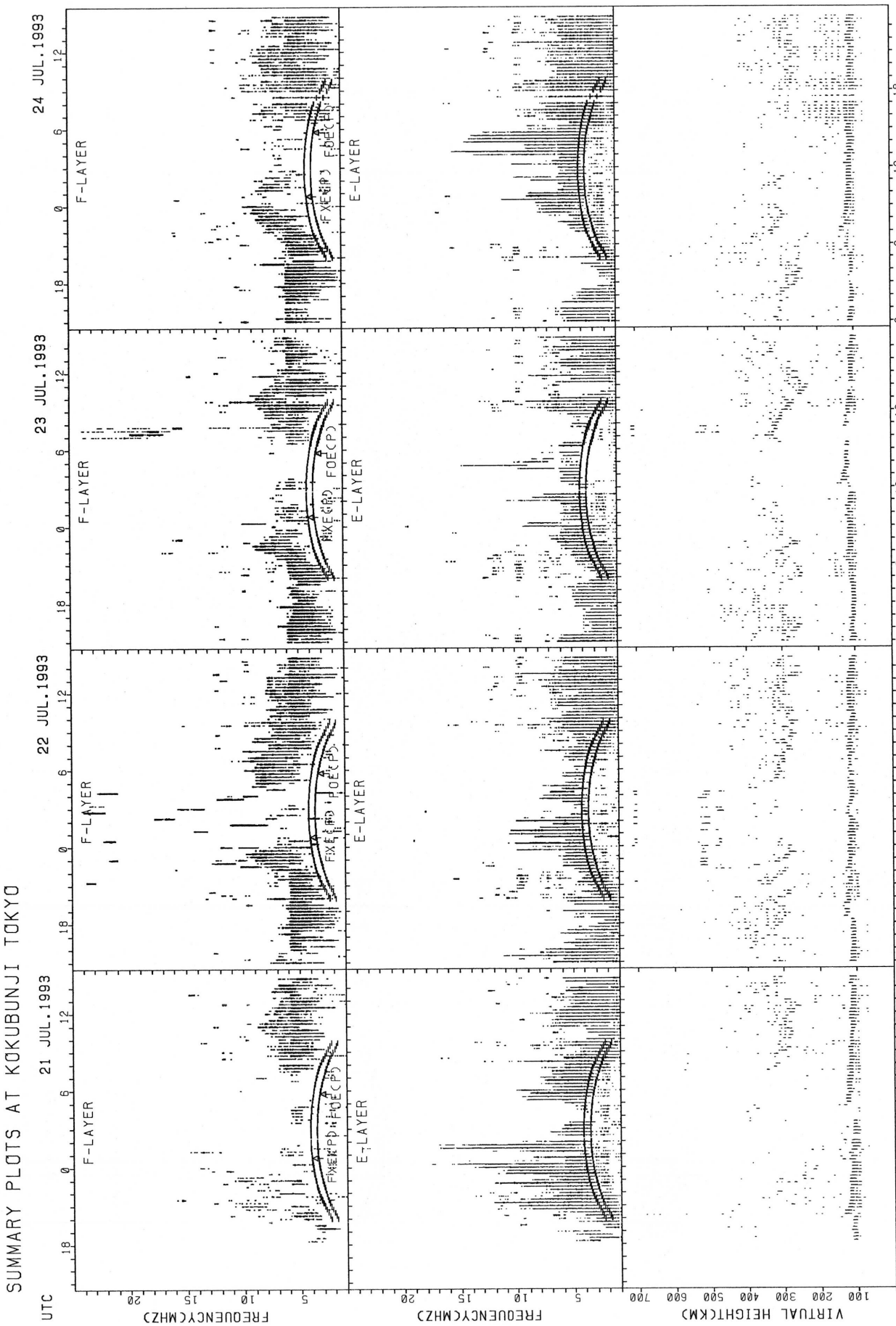

SUMMARY PLOTS AT KOKUBUNJI TOKYO
5 JUL.1993
6 JUL.1993
7 JUL.1993
8 JUL.1993
F-LAYER
E-LAYER
FREQUENCY(MHZ)
VIRTUAL HEIGHT(KM)
UTC
JST
FXE(P); PREDICTED VALUE FOR FXE
FOE(P); PREDICTED VALUE FOR FOE

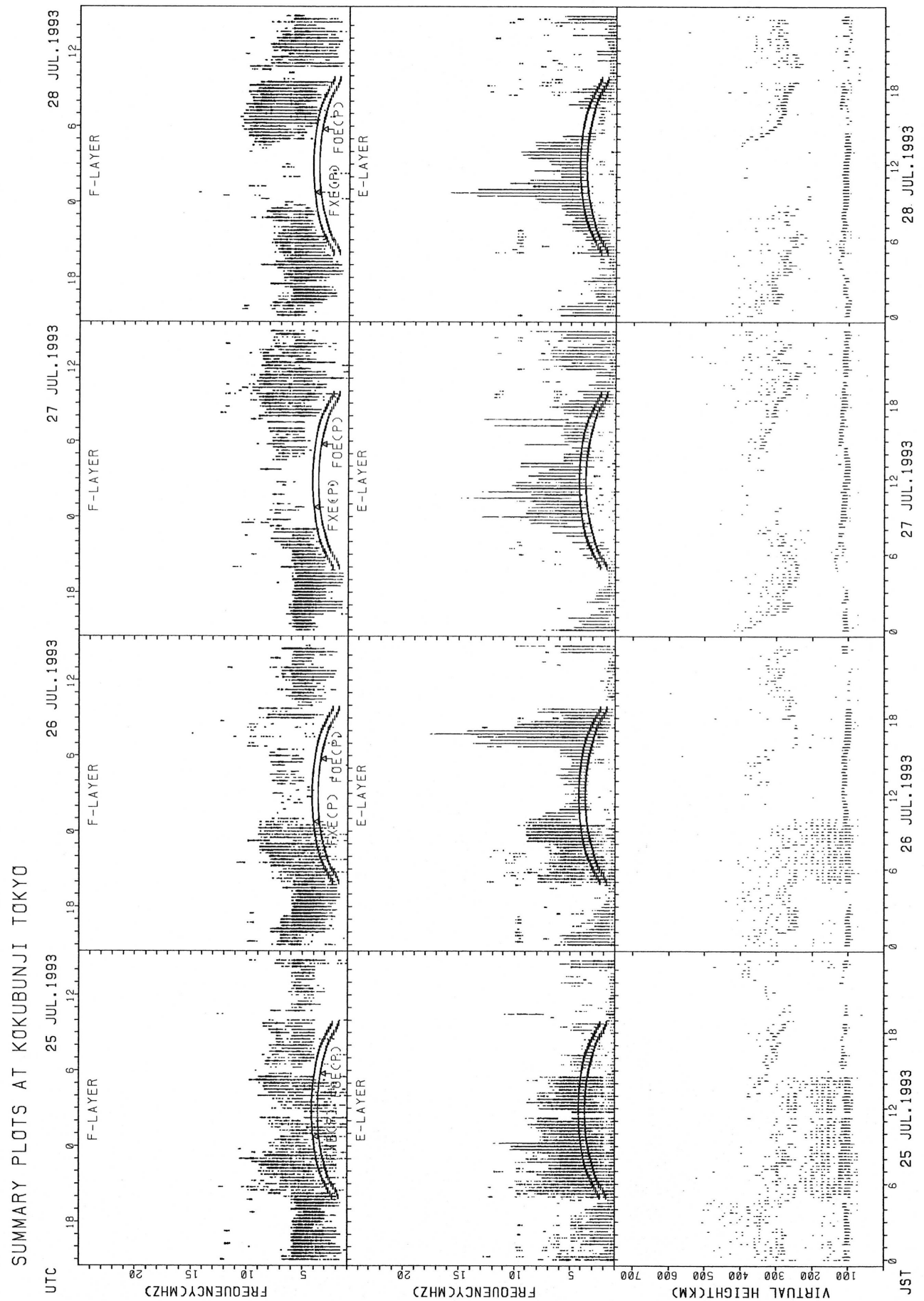

SUMMARY PLOTS AT KOKUBUNJI TOKYO
UTC
9 JUL.1993
10 JUL.1993
11 JUL.1993
12 JUL.1993
F-LAYER
E-LAYER
FREQUENCY(MHZ)
VIRTUAL HEIGHT(KM)
FXE(P)
FOE(P)
JST
FXE(P): PREDICTED VALUE FOR FXE
FOE(P): PREDICTED VALUE FOR FOE

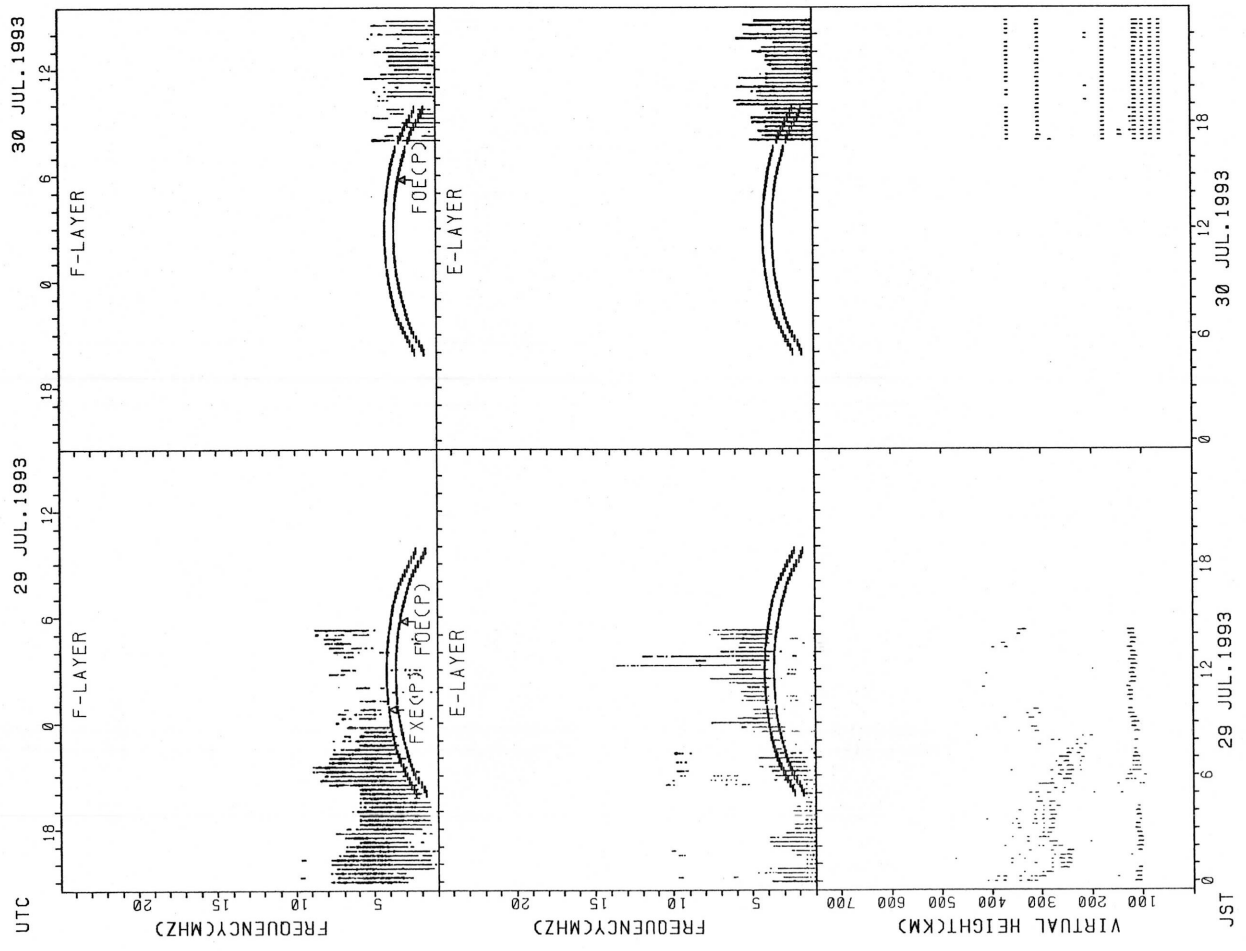

SUMMARY PLOTS AT KOKUBUNJI TOKYO
UTC
JST
13 JUL.1993
14 JUL.1993
15 JUL.1993
16 JUL.1993
F-LAYER
E-LAYER
FXE(P)
FOE(P)
FREQUENCY(MHZ)
VIRTUAL HEIGHT(KM)
FXE(P): PREDICTED VALUE FOR FXE
FOE(P): PREDICTED VALUE FOR FOE

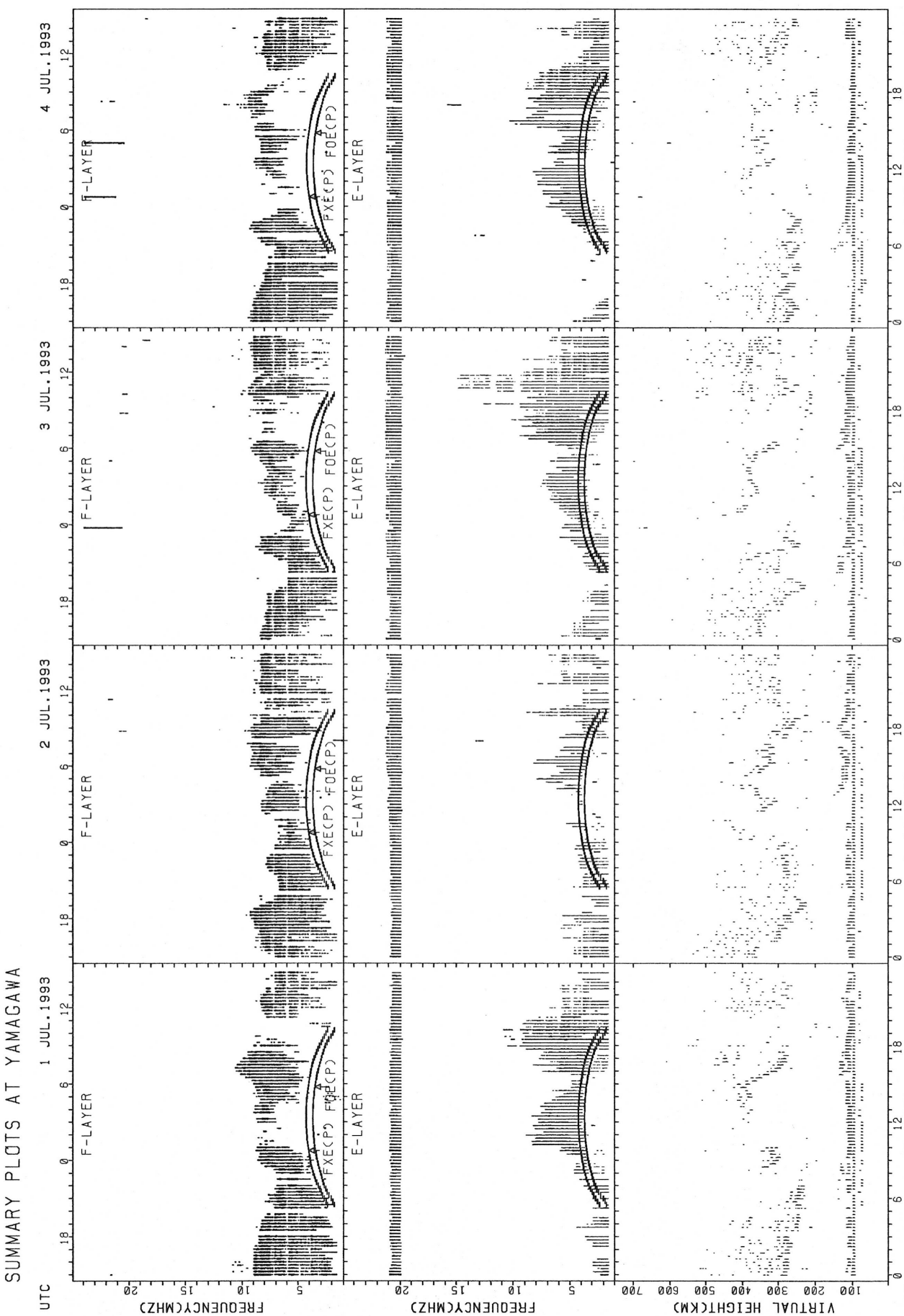


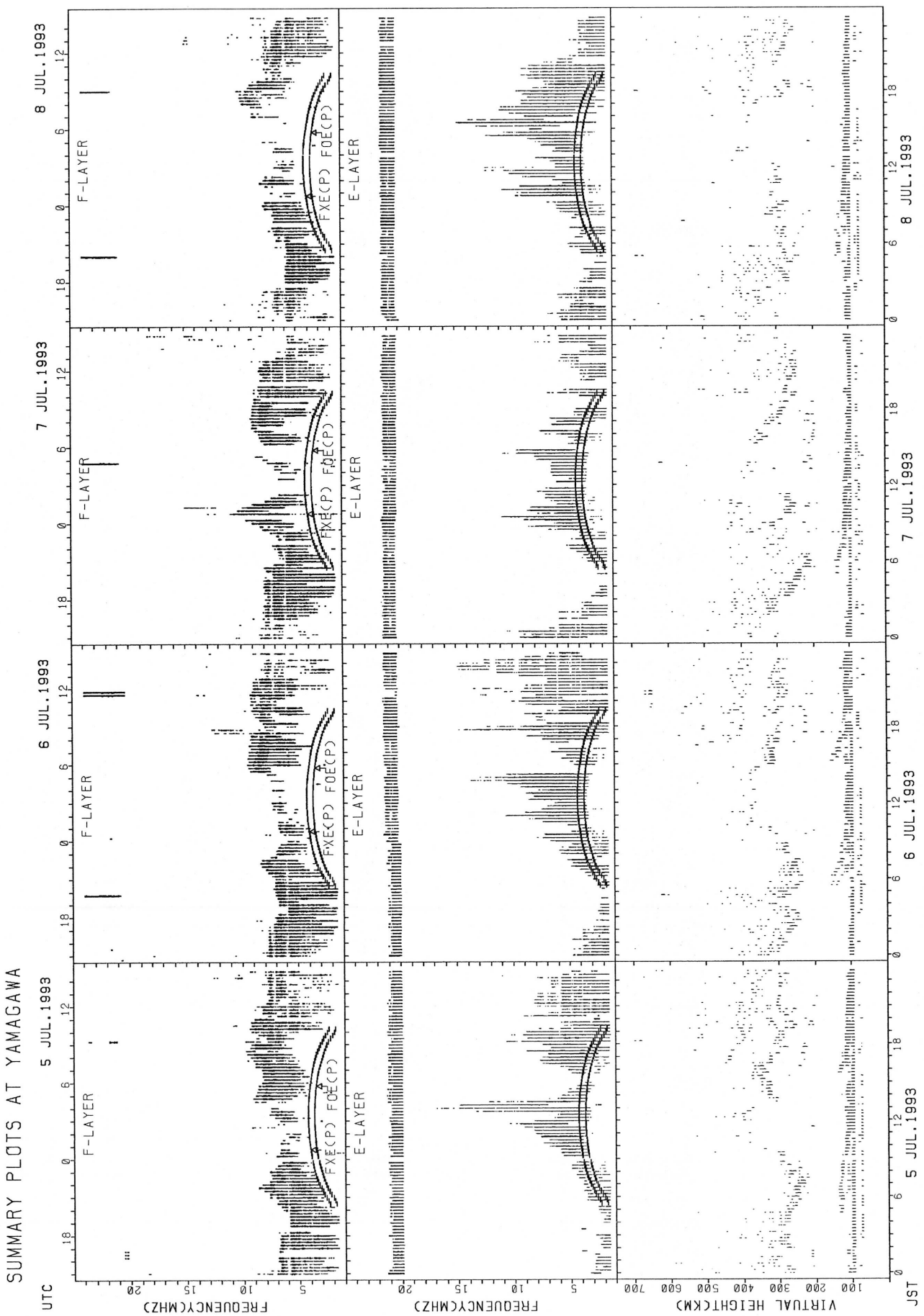
FXE(P): PREDICTED VALUE FOR FXE
FOE(P): PREDICTED VALUE FOR FOE


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

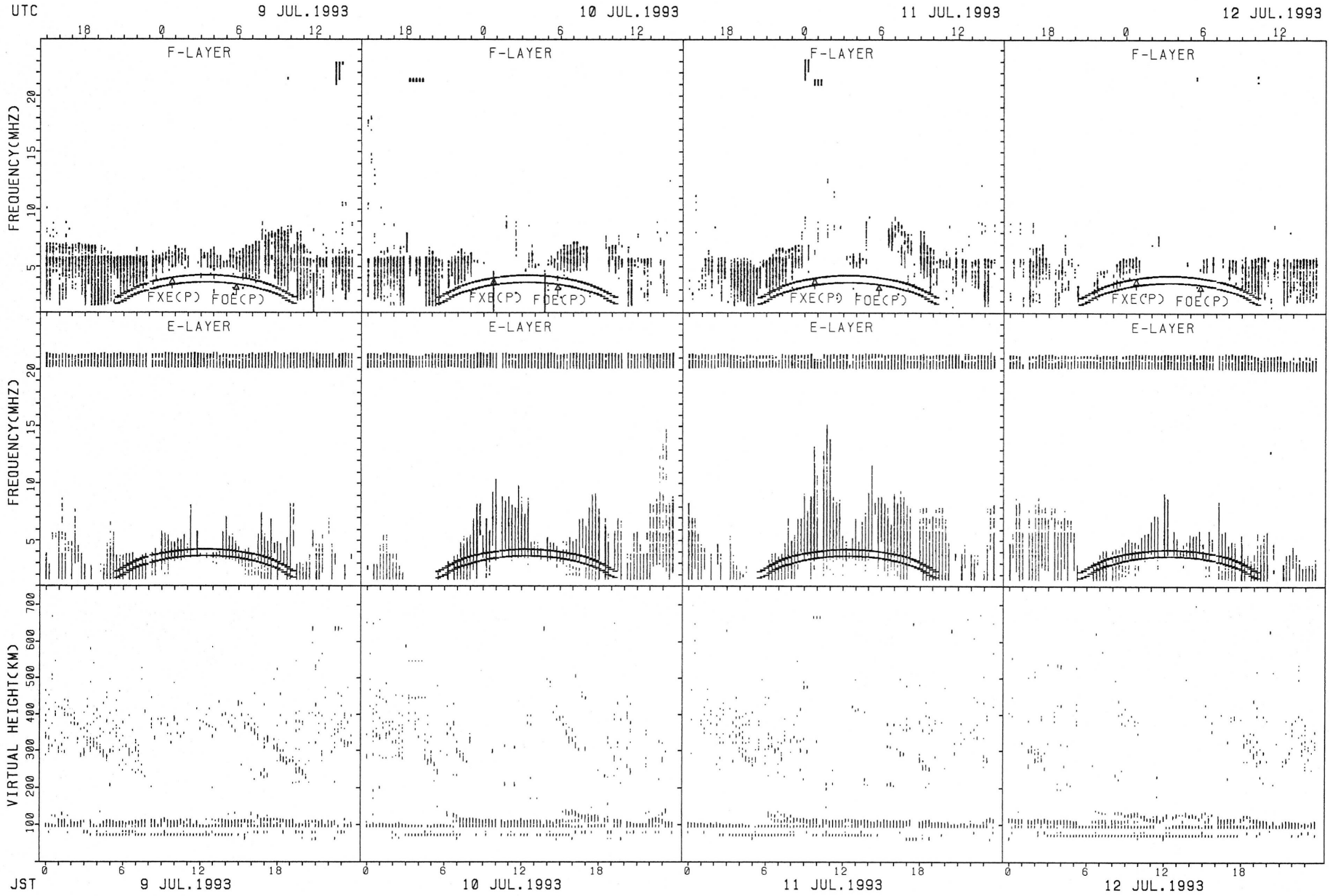

SUMMARY PLOTS AT KOKUBUNJI TOKYO
UTC
JST
25 JUL.1993
26 JUL.1993
27 JUL.1993
28 JUL.1993
F-LAYER
E-LAYER
FXE(P) FOE(P)
FREQUENCY(MHZ)
VIRTUAL HEIGHT(KM)
FXE(P): PREDICTED VALUE FOR FXE
FOE(P): PREDICTED VALUE FOR FOE


SUMMARY PLOTS AT KOKUBUNJI TOKYO
UTC
29 JUL.1993
30 JUL.1993
F-LAYER
E-LAYER
FXE(P)
FOE(P)
FREQUENCY(MHZ)
VIRTUAL HEIGHT(KM)
JST
FXE(P); PREDICTED VALUE FOR FXE
FOE(P); PREDICTED VALUE FOR FOE

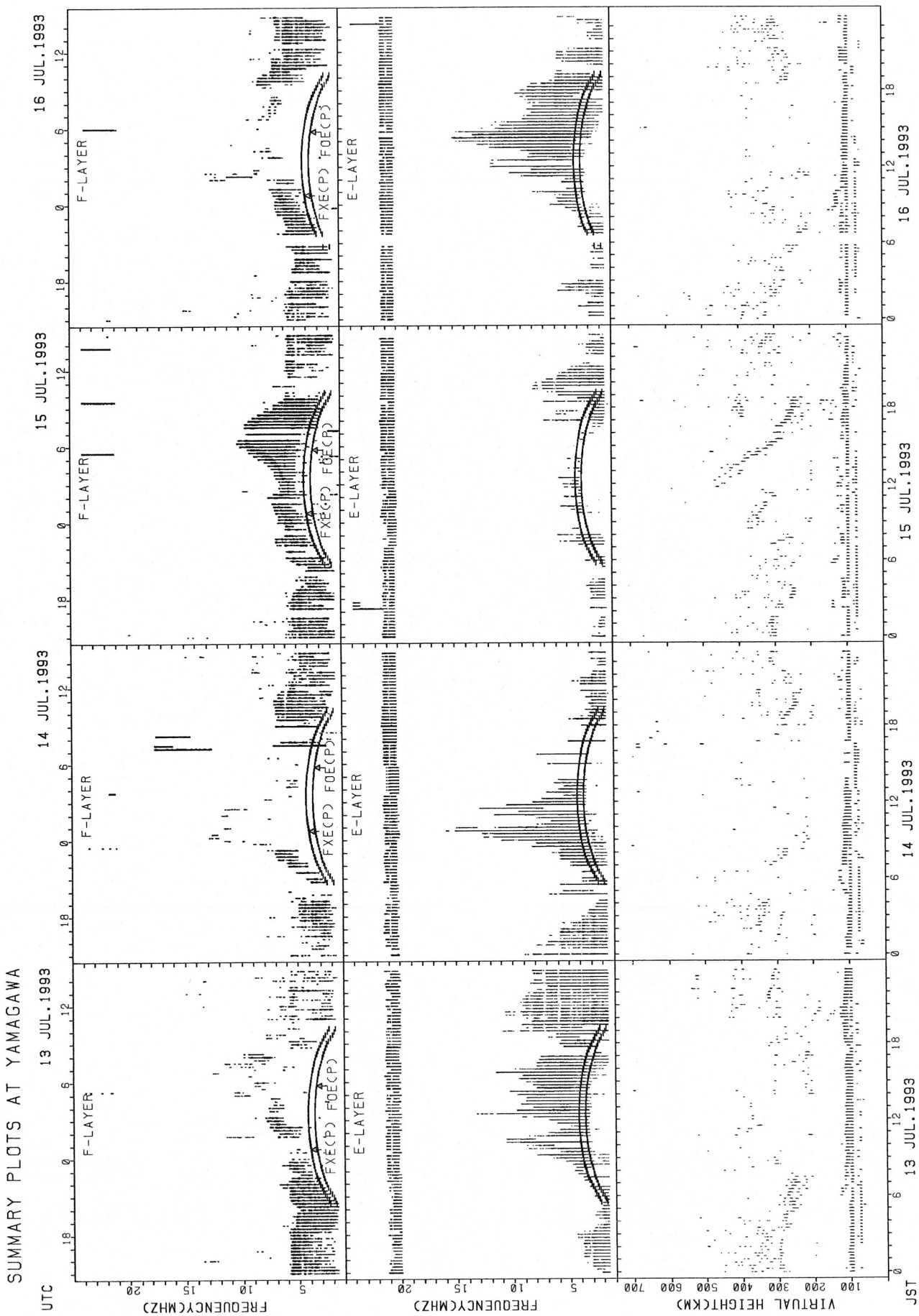

SUMMARY PLOTS AT YAMAGAWA
UTC
JST
1 JUL.1993
2 JUL.1993
3 JUL.1993
4 JUL.1993
F-LAYER
E-LAYER
FXE(P)
FOE(P)
FREQUENCY(MHZ)
VIRTUAL HEIGHT(KM)
FXE(P); PREDICTED VALUE FOR FXE
FOE(P); PREDICTED VALUE FOR FOE


SUMMARY PLOTS AT YAMAGAWA
UTC
5 JUL.1993
6 JUL.1993
7 JUL.1993
8 JUL.1993
F-LAYER
E-LAYER
FXE(P)
FOE(P)
FREQUENCY(MHZ)
VIRTUAL HEIGHT(KM)
JST
FXE(P); PREDICTED VALUE FOR FXE
FOE(P); PREDICTED VALUE FOR FOE

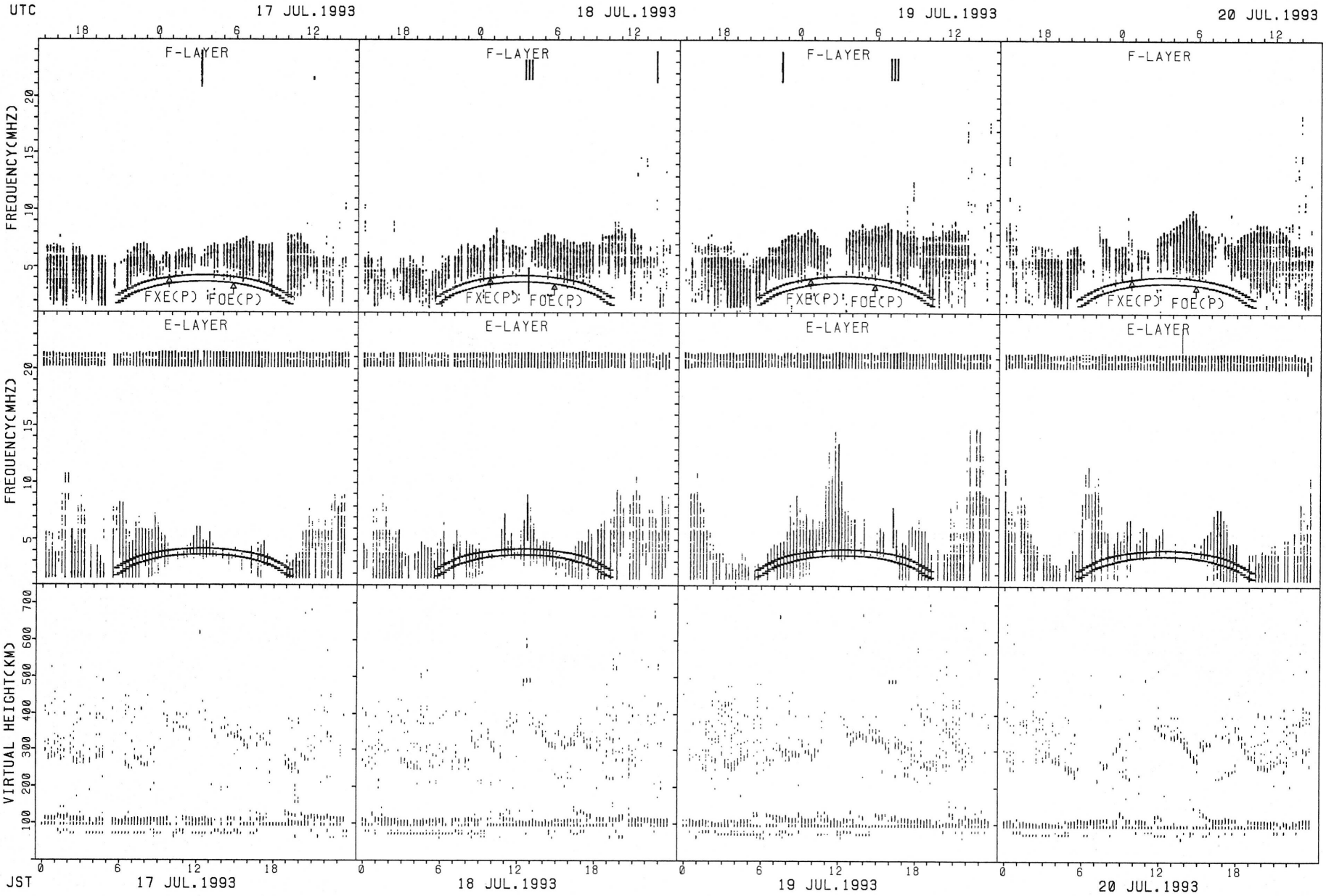
SUMMARY PLOTS AT YAMAGAWA



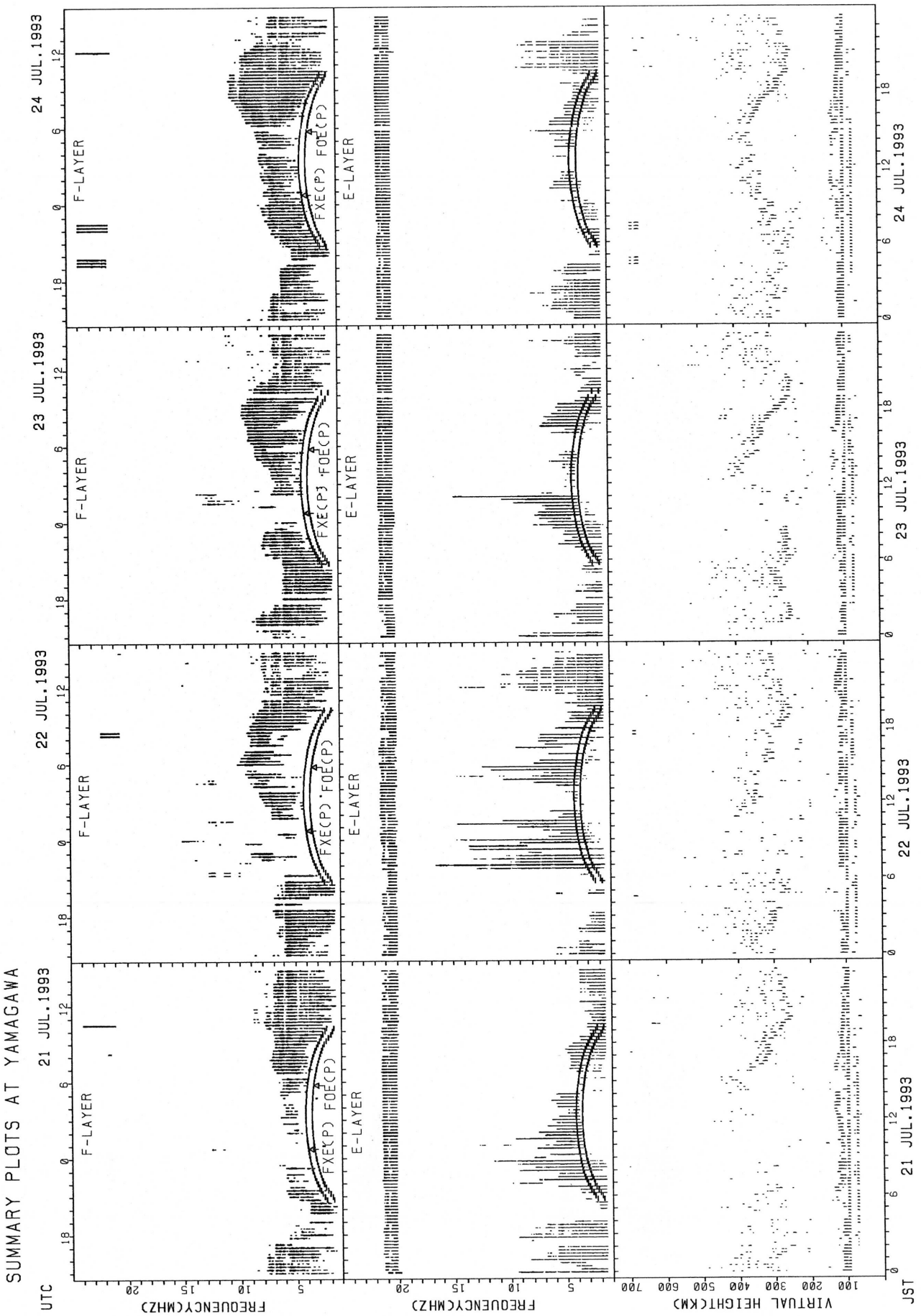
FXE(P); PREDICTED VALUE FOR FXE
FOE(P); PREDICTED VALUE FOR FOE


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

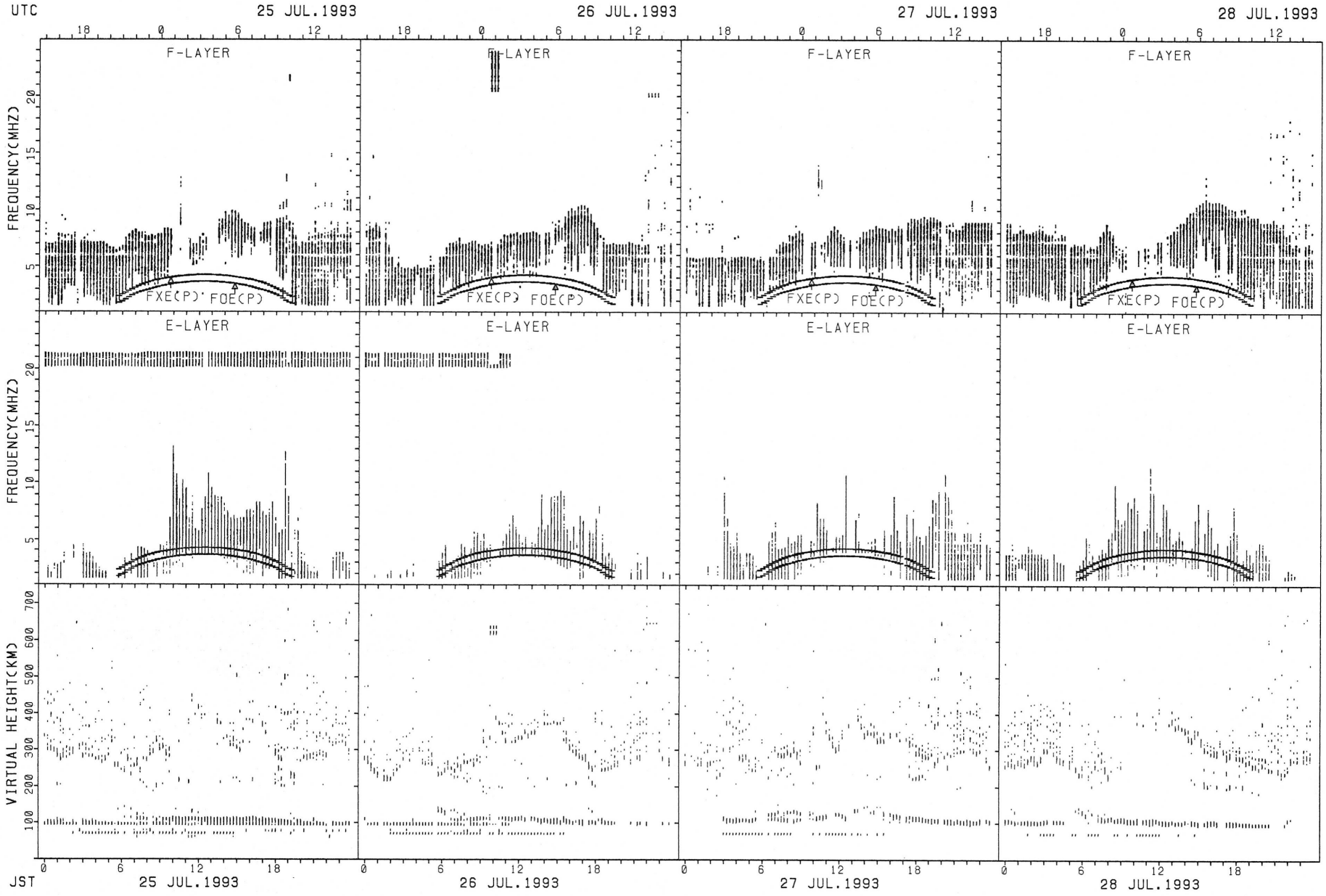
SUMMARY PLOTS AT YAMAGAWA



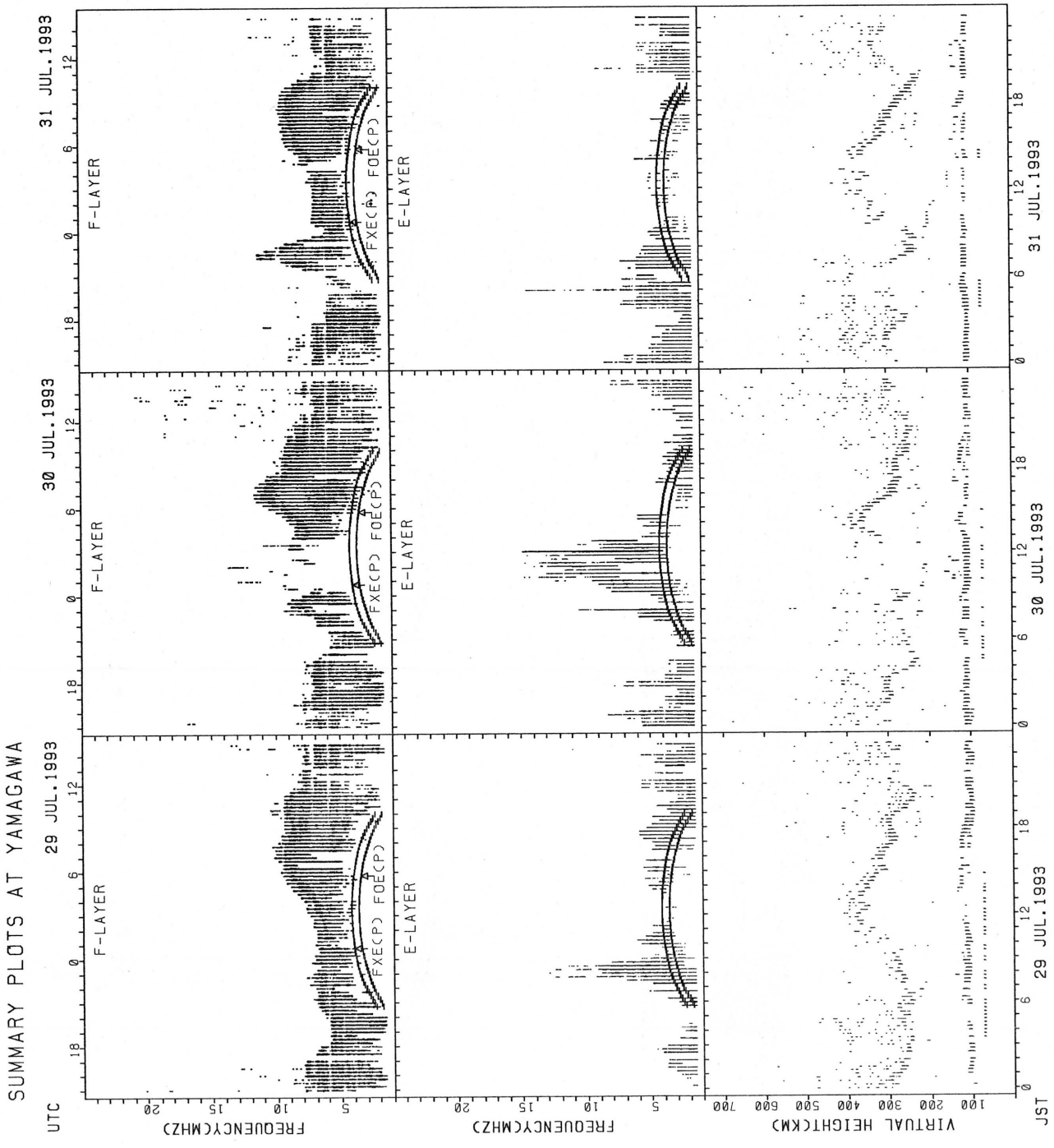
FXE(P); PREDICTED VALUE FOR FXE
FOE(P); PREDICTED VALUE FOR FOE


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

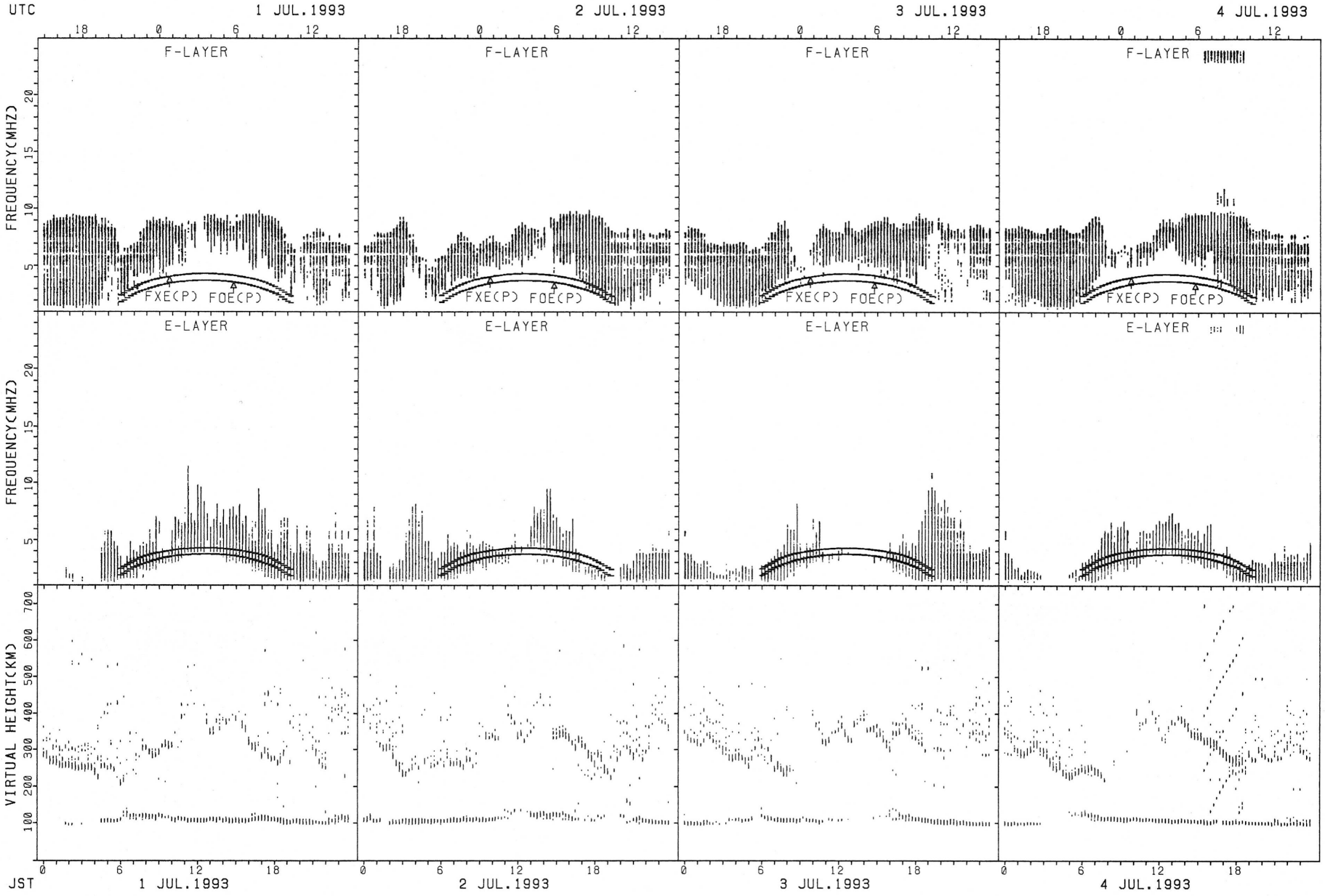
SUMMARY PLOTS AT YAMAGAWA



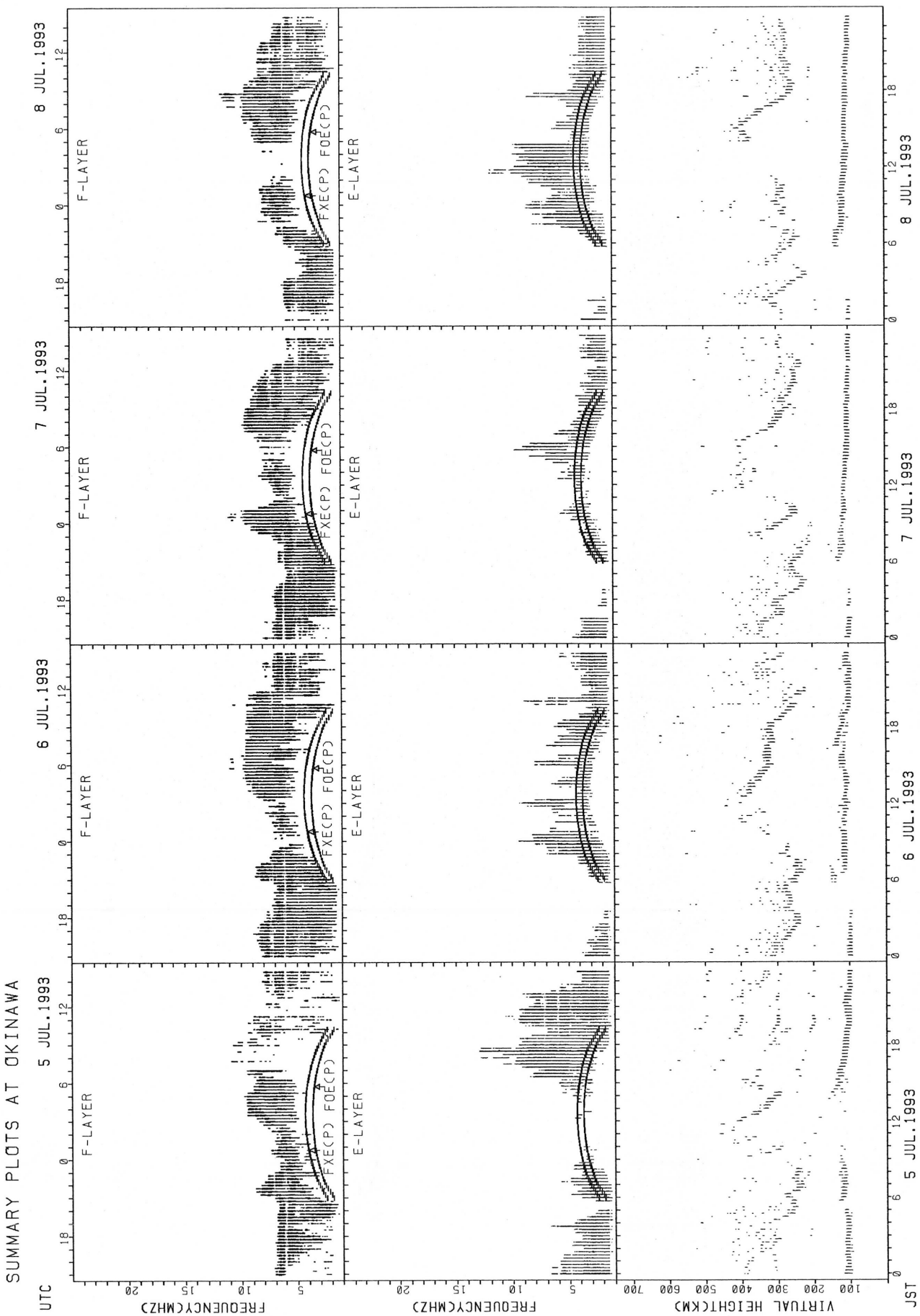
FXE(P): PREDICTED VALUE FOR FXE
FOE(P): PREDICTED VALUE FOR FOE

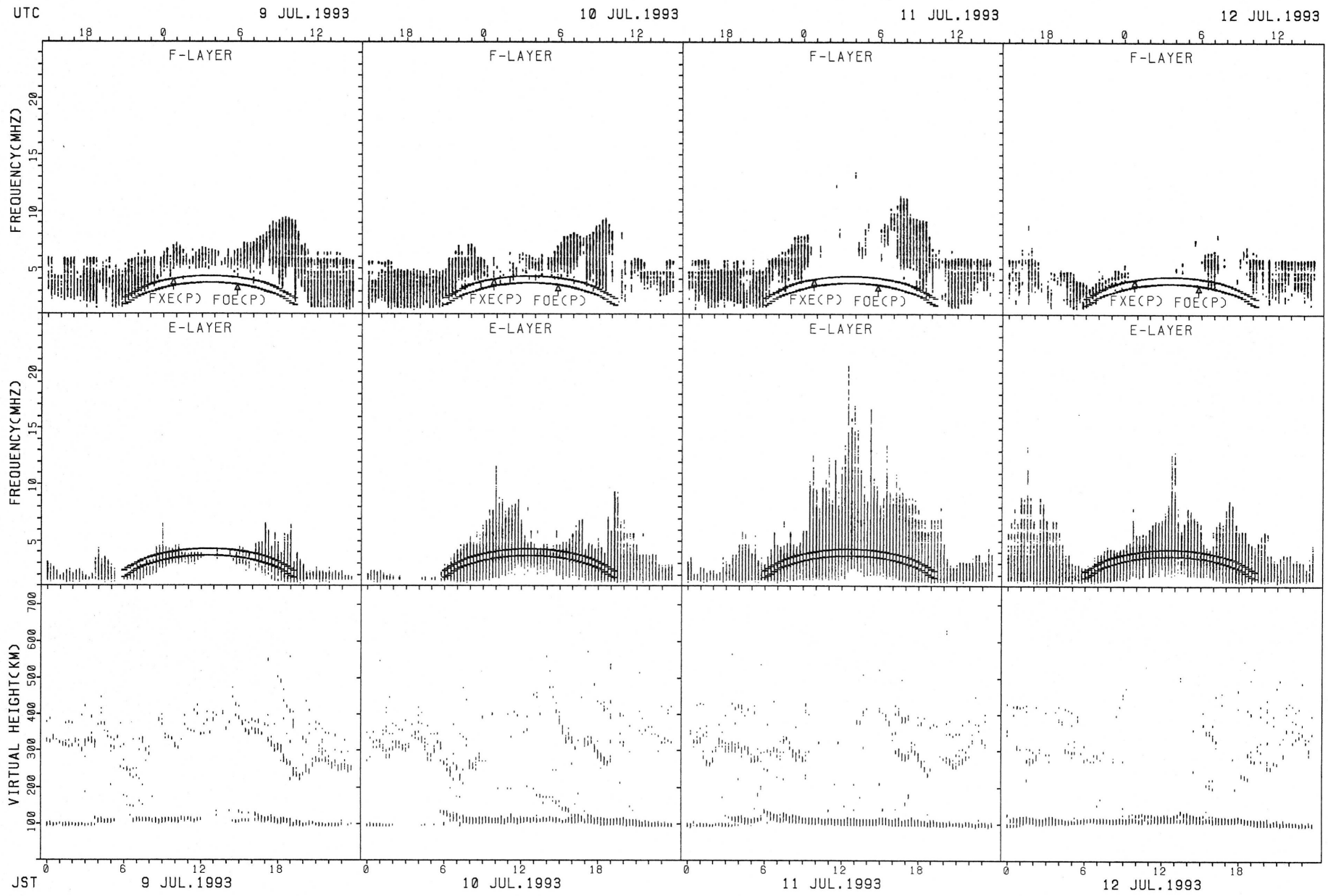

SUMMARY PLOTS AT YAMAGAWA
29 JUL.1993
30 JUL.1993
31 JUL.1993
F-LAYER
E-LAYER
FXE(P) FOE(P)
FREQUENCY(MHZ)
VIRTUAL HEIGHT(KM)
UTC
JST
FXE(P): PREDICTED VALUE FOR FXE
FOE(P): PREDICTED VALUE FOR FOE

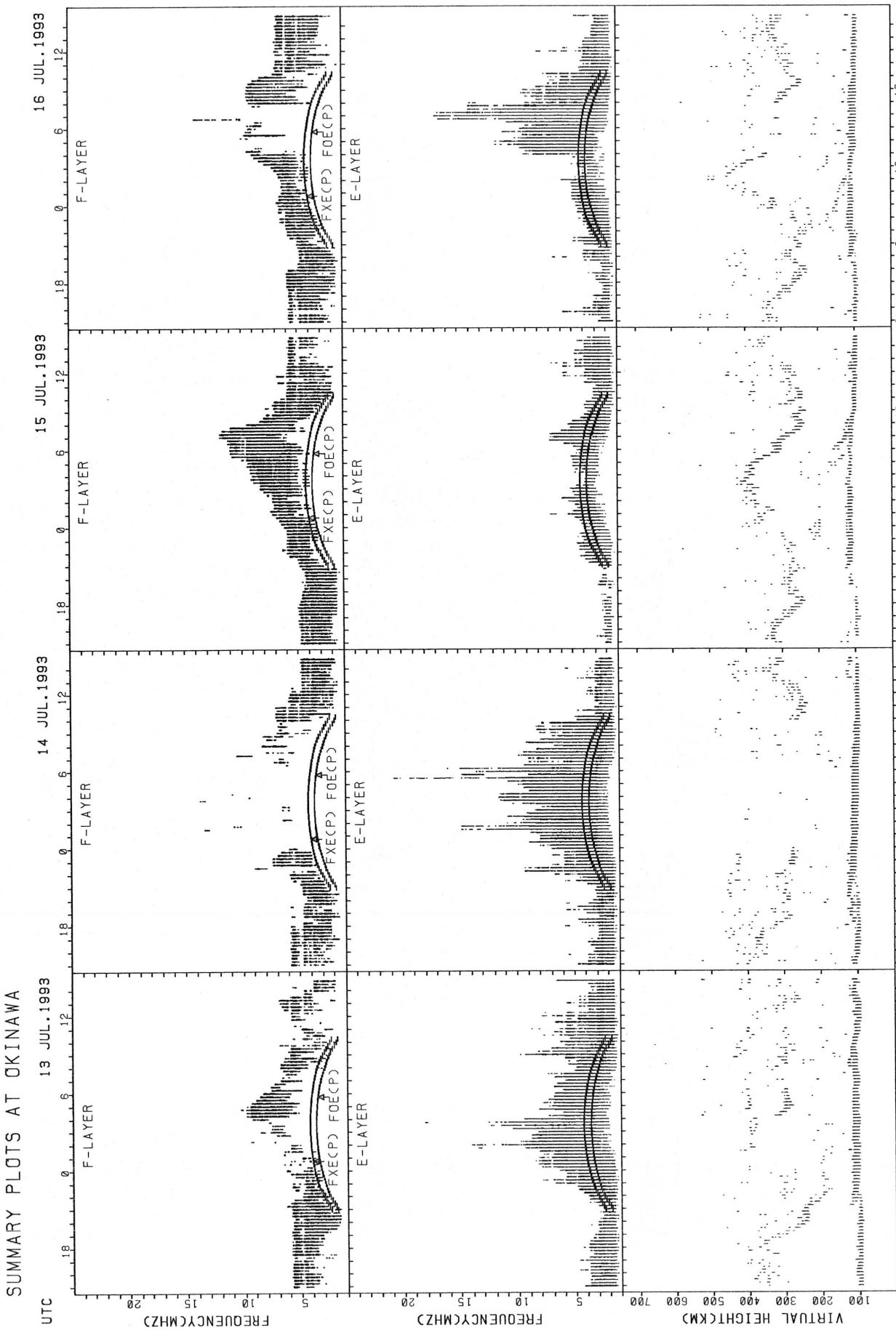
SUMMARY PLOTS AT OKINAWA

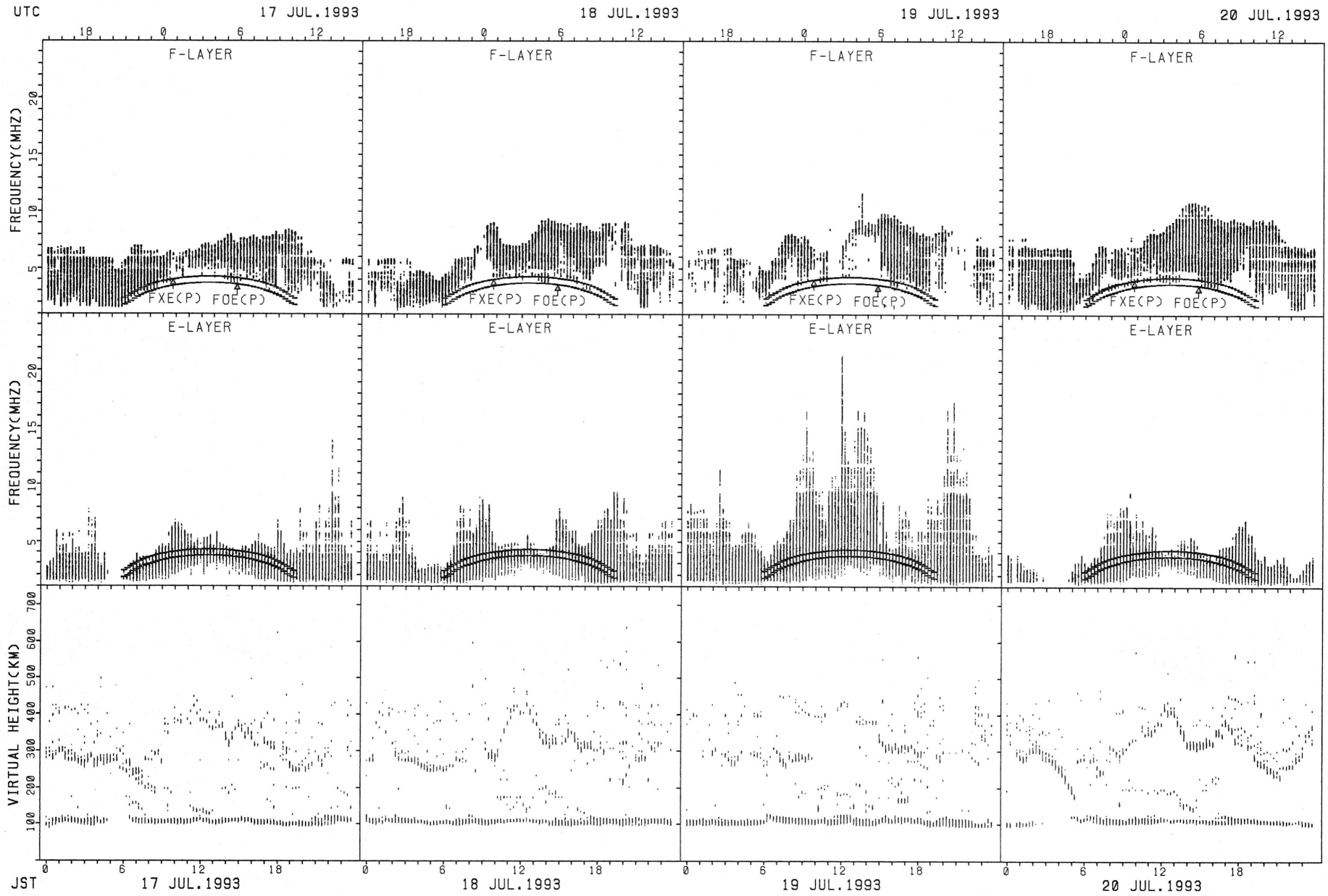


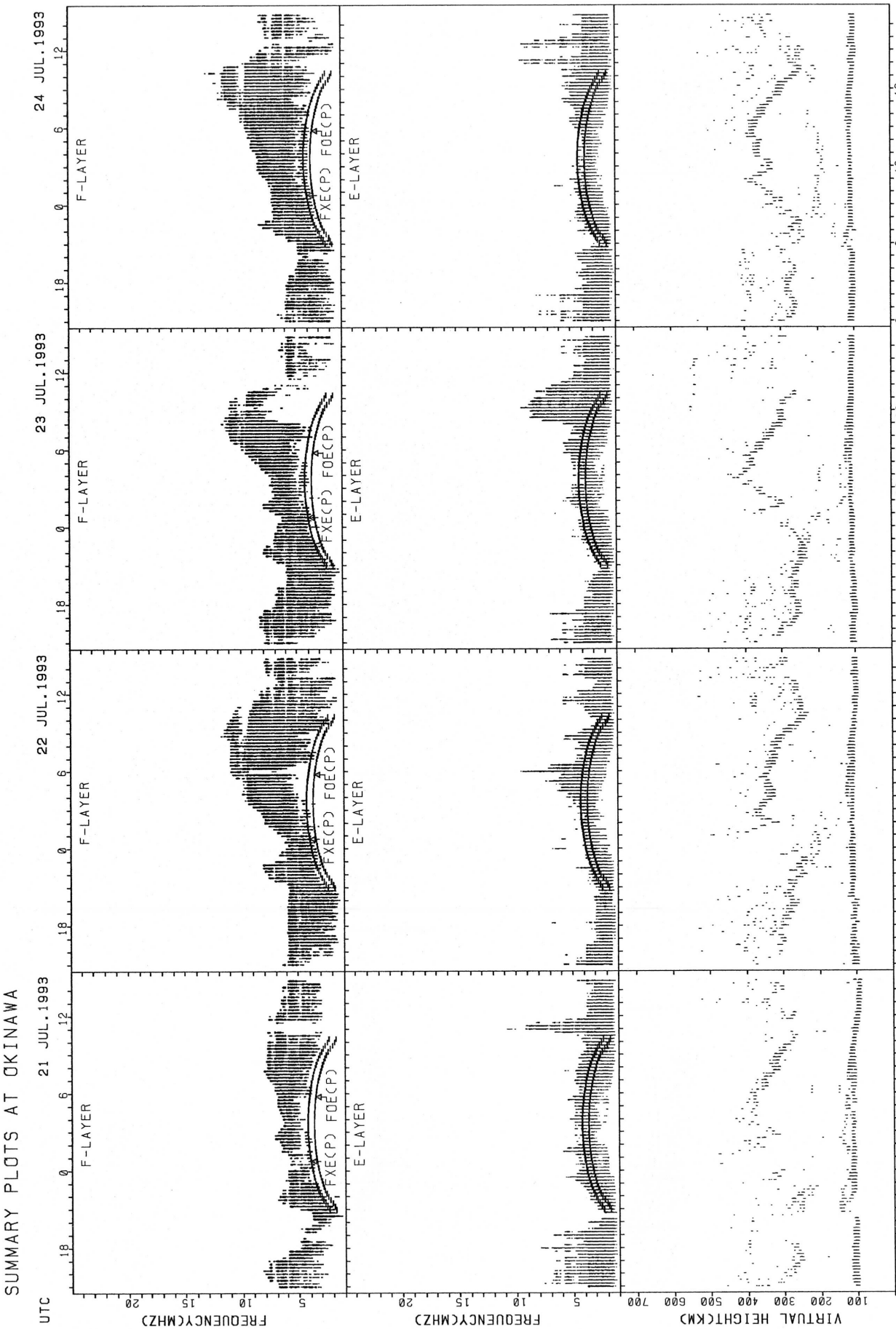
FXE(P): PREDICTED VALUE FOR FXE
FOE(P): PREDICTED VALUE FOR FOE


SUMMARY PLOTS AT OKINAWA
UTC
JST
5 JUL.1993
6 JUL.1993
7 JUL.1993
8 JUL.1993
F-LAYER
E-LAYER
FXE(P) FOE(P)
FREQUENCY(MHZ)
VIRTUAL HEIGHT(KM)
FXE(P): PREDICTED VALUE FOR FXE
FOE(P): PREDICTED VALUE FOR FOE

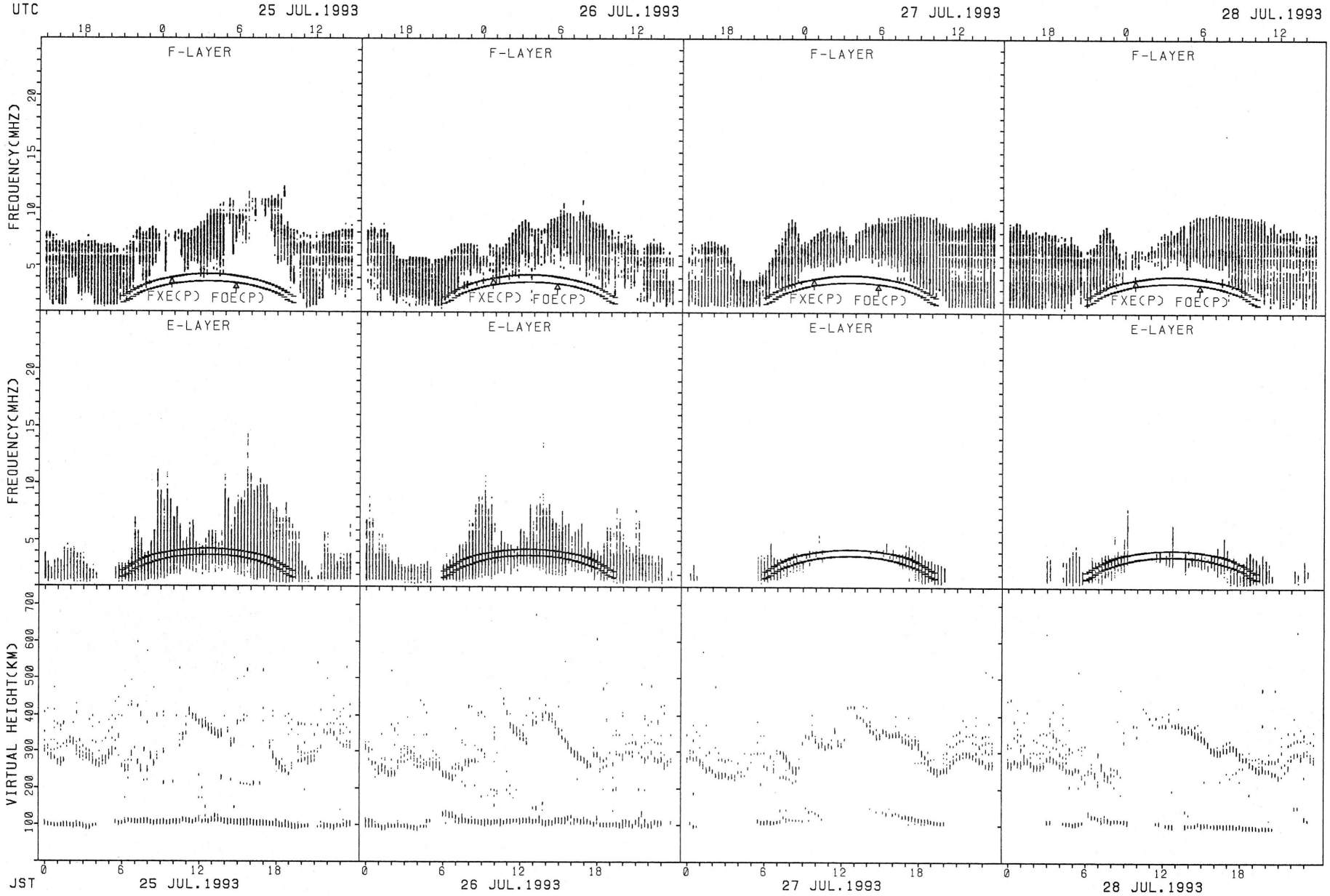

SUMMARY PLOTS AT OKINAWA
UTC
9 JUL.1993
10 JUL.1993
11 JUL.1993
12 JUL.1993
F-LAYER
FXE(P) FOE(P)
FREQUENCY(MHZ)
E-LAYER
VIRTUAL HEIGHT(KM)
JST
FXE(P): PREDICTED VALUE FOR FXE
FOE(P): PREDICTED VALUE FOR FOE


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

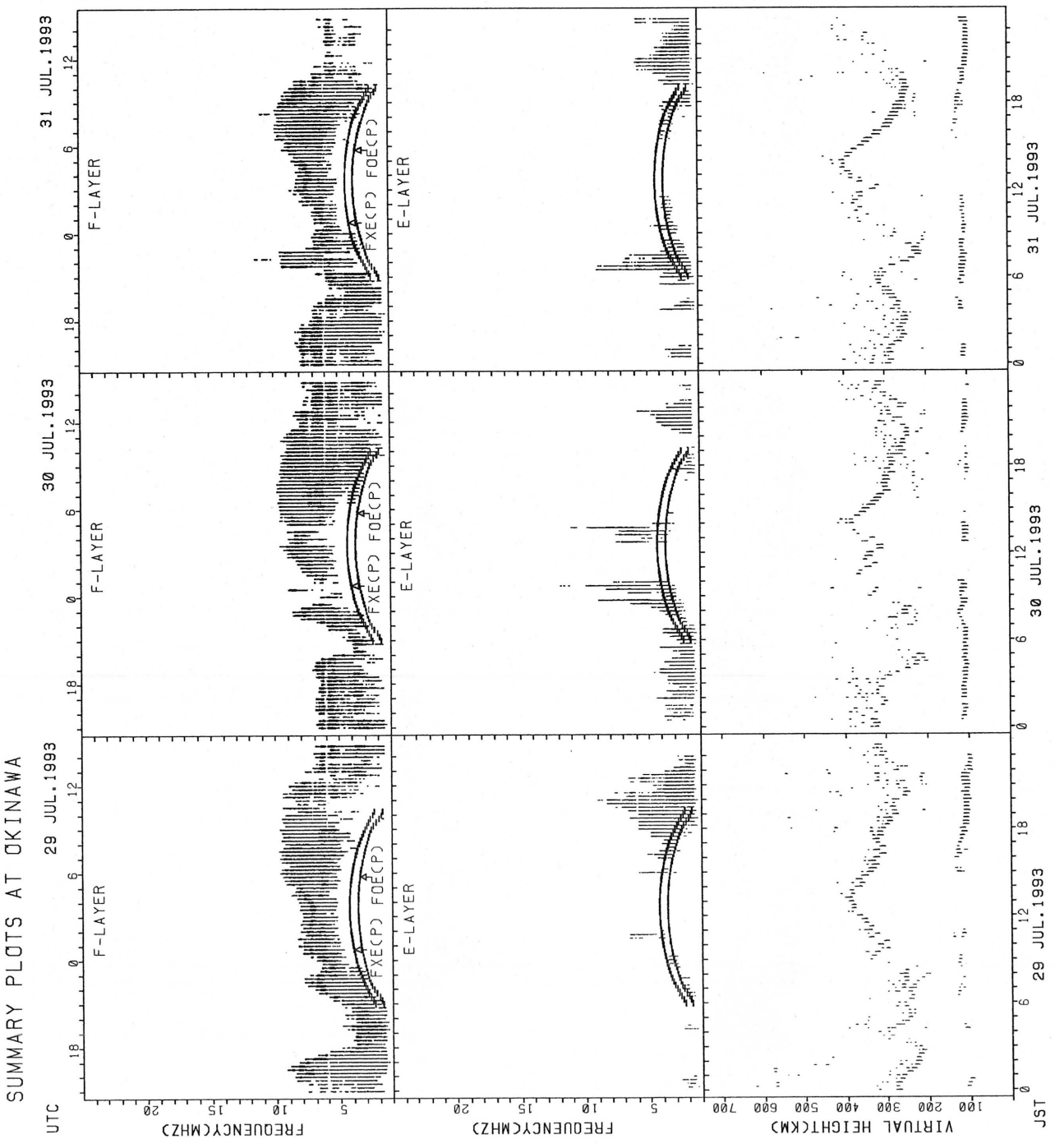

SUMMARY PLOTS AT OKINAWA
UTC
17 JUL.1993
18 JUL.1993
19 JUL.1993
20 JUL.1993
F-LAYER
FXE(P) FOE(P)
E-LAYER
FREQUENCY(MHZ)
VIRTUAL HEIGHT(KM)
JST
FXE(P): PREDICTED VALUE FOR FXE
FOE(P): PREDICTED VALUE FOR FOE


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

SUMMARY PLOTS AT OKINAWA



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


SUMMARY PLOTS AT OKINAWA
UTC
29 JUL.1993
30 JUL.1993
31 JUL.1993
F-LAYER
E-LAYER
FXE(P) FOE(P)
FREQUENCY(MHZ)
VIRTUAL HEIGHT(KM)
JST
FXE(P): PREDICTED VALUE FOR FXE
FOE(P): PREDICTED VALUE FOR FOE

MONTHLY MEDIANS OF H'F AND H'ES

JUL. 1993 135E MEAN TIME(UTC+9H) AUTOMATIC SCALING

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

	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
CNT								11										12		16	11	12		
MED								302										319		289	330	312		
U Q								316										329		304	346	323		
L Q								278										297		238	320	293		

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	25	25	25	20	24	27	28	28	30	26	20	16	16	15	15	16	20	23	27	29	31	28	24	24
MED	109	107	105	107	113	125	121	117	116	115	115	113	113	113	115	119	118	121	119	117	115	115	115	111
U Q	113	111	109	110	122	131	123	120	121	117	120	115	120	129	125	126	122	125	119	121	121	119	121	112
L Q	107	105	104	104	107	121	119	115	115	111	111	110	108	109	109	113	115	119	117	113	111	112	112	109

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	13	11				15	17	15									14	16	24	10	16	14	10	11
MED	352	364				304	282	296									303	296	290	284	315	314	327	364
U Q	370	380				418	335	316									312	322	316	290	350	350	374	400
L Q	332	316				250	264	256									268	280	238	268	279	292	292	324

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	27	27	26	25	23	23	27	27	28	29	29	30	27	24	25	24	24	24	25	21	21	26	24	24
MED	107	103	105	103	105	115	119	115	113	111	111	111	109	109	113	113	118	115	111	111	109	109	109	108
U Q	111	109	109	108	111	131	123	121	117	118	115	115	115	117	121	123	123	119	115	118	117	115	113	112
L Q	103	101	103	99	99	109	113	113	110	109	109	107	107	105	106	109	107	110	106	109	105	105	106	101

MONTHLY MEDIANS OF H'F AND H'ES

JUL. 1993 135E MEAN TIME(UTC+9H) AUTOMATIC SCALING

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

	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
CNT		11	11	10				10	19									24	21	17	11	12		
MED		324	340	343				269	278									292	276	284	280	331		
U Q		356	360	368				290	294									322	289	296	310	364		
L Q		302	316	324				256	256									256	245	261	270	305		

H'ES

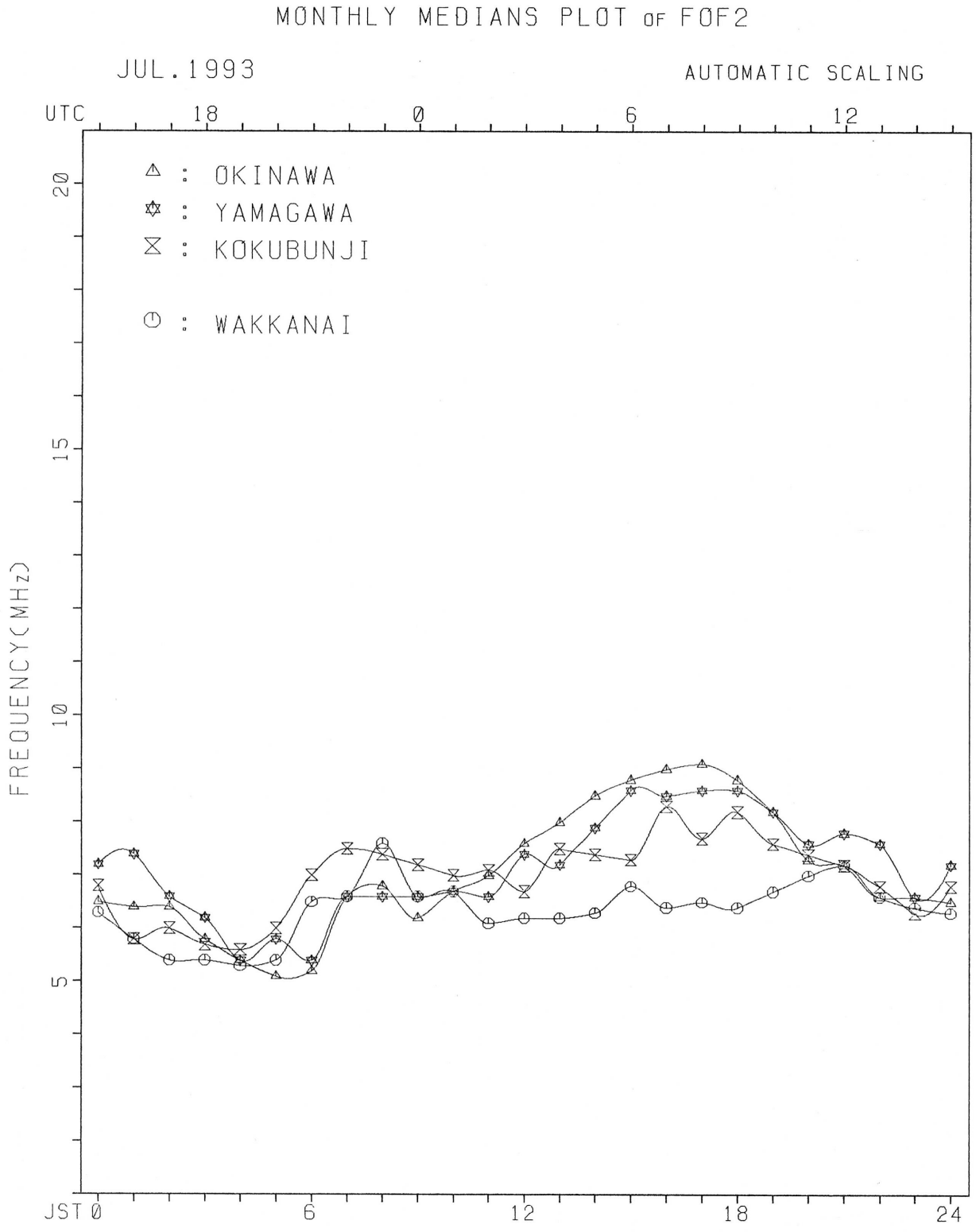
	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
CNT	24	27	22	24	23	16	20	22	28	27	25	29	23	22	27	20	22	27	27	28	26	26	26	27
MED	107	105	106	105	107	110	123	117	117	113	111	109	109	109	109	110	114	117	113	107	105	111	109	109
U Q	111	109	111	111	109	122	130	119	122	121	122	117	119	127	123	121	127	123	117	113	111	115	111	113
L Q	103	103	101	101	101	107	110	109	112	109	107	107	107	107	107	107	103	107	107	102	101	105	105	103

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		11	12					14	18									23	25	21	15			
MED		322	311					260	260									310	288	278	280			
U Q		336	345					270	304									318	308	289	300			
L Q		298	288					246	250									286	275	260	266			

H'ES

	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
CNT	25	26	22	19	19	20	27	29	25	26	26	21	19	20	24	26	27	28	27	28	30	28	29	29
MED	107	106	105	107	109	107	113	119	117	113	115	113	111	115	110	117	119	117	115	109	107	106	103	103
U Q	117	111	111	111	111	111	131	124	123	119	123	124	121	126	129	125	125	123	117	111	111	113	109	112
L Q	101	99	99	99	103	105	107	111	113	111	109	111	107	107	107	107	107	105	109	104	103	101	101	99


MONTHLY MEDIANS PLOT OF FOF2
JUL. 1993
AUTOMATIC SCALING
UTC
18
0
6
12
△ : OKINAWA
✡ : YAMAGAWA
⧖ : KOKUBUNJI
◷ : WAKKANAI
FREQUENCY(MHz)
20
15
10
5
JST 0
6
12
18
24

IONOSPHERIC DATA STATION KOKUBUNJI

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

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

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	88	86	84	84	87	91	86														X 77	X 82	X 77	R
2	X 69	X 71	75	63	X 63																78	87	86	X 90
3	X 87	X 79	77	76	75																96	X 93	X 80	81
4	X 80	X 75	X 70	X 70	X 70																X 82	X 83	X 82	X 78
5	X 70	X 69	X 65	X 58	X 55																X 90	X 75	76	X 73
6	X 77	76	63	65	69	64	77														X 87	X 90	95	74
7	87	86	76	72	63	64															X 85	X 80	72	75
8	75	77	72	67	63	68			80												X 80	X 75	X 73	76
9	X 71	X 70	62	61	56	53															X 70	X 68	X 60	64
10	65	63	61	X 60	58	58															X 72	65	A	A
11	61	62	62	58	56	52															X 70	X 61	X 57	61
12	63	64	65	X 54	X 50		50	53													X 65	X 64	X 59	X 59
13	X 57	X 54	X 50	X 50	X 49																X 65	70	X 71	59
14	X 59	46	49	48	43																X 69	X 59	X 51	X 49
15	X 48	X 48	X 48	X 48	X 44																X 61	X 60	X 59	X 54
16	55	55	57	X 54	X 50																X 75	X 63	X 67	73
17	68	65	62	60	58	54															X 75	A	O X 59	A
18	X 59	60	55	54	53	54															X 84	83	66	A
19	62	61	60	61	54	62															82	74	81	A
20	67	X 63	63	58	X 58	62	79														C	C	C	C
21	C	C	C	C	X 38	50															X 81	X 78	X 70	72
22	X 74	65	63	63	62																X 75	78	80	73
23	66	62	56	54	54	55															X 77	X 74	X 67	X 70
24	69	X 65	X 61	X 64	61																X 83	X 82	X 77	78
25	X 69	61	X 59	57	55	61															O X 72	X 66	O X 69	61
26	73	78	71	X 59	X 56			82												R	X 69	X 70	X 71	X 66
27	61	62	62	62	X 56															X 93	X 95	X 84	X 83	X 76
28	74	77	68	X 68	X 75															C	X 82	X 79	X 76	X 72
29	75	80	69	X 62	X 60															C	C	X 79	X 81	75
30	X 76	X 72	X 70	X 65	X 64															O X 82	R	X 62	R	A
31	A	X 65	X 61	X 59	X 60															Y	C	C	C	C
	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
CNT	29	30	30	30	31	14	4	2	1											2	27	28	27	23
MED	69	65	62	60	58	60	78	68	80											X 88	X 77	X 75	X 72	73
U 0	75	76	70	65	63	64	82														X 83	X 82	X 80	76
L 0	62	62	60	57	X 54	54	64														X 70	X 66	X 66	61

JUL. 1993 FXI (0.1MHZ) COMMUNICATIONS RESEARCH LABORATORY, JAPAN

IONOSPHERIC DATA STATION KOKUBUNJI

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

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

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	F 78	J F 77	F 74	F 75	F 79	F 84	F 77	80	74	64	73	83	82	79	75	80	94	94	82	65	J R 71	76	70	R
2	63	65	F 67	F 55	57	51	61	68	59	60	58	72	69	68	74	77	82	81	77	74	F 71	F 77	F 77	84
3	81	73	F 68	F 68	67	58	59	R 65	77	I A 70	68	66	84	73	84	89	83	83	83	93	F 88	V 87	74	F 74
4	74	69	64	64	64	61	69	73	66	A	A	A	79	76	77	71	74	73	67	73	76	V 77	76	72
5	64	62	59	52	49	52	73	75	77	63	A	A	U R 64	U R 67	67	68	74	77	85	85	84	69	F 70	67
6	J R 71	F 68	F 56	F 56	F 61	F 55	68	80	V 75	71	A	A	A	A	75	J R 80	70	I A 72	I A 75	I A 79	J R 81	84	F 85	J F 67
7	F 76	F 77	67	F 60	F 53	F 55	77	67	I A 61	65	I A 77	I A 71	I A 64	I A 64	65	69	76	73	82	83	79	74	F 64	F 66
8	J R 67	F 66	F 63	F 59	F 55	F 60	74	73	72	60	66	I A 69	76	I A 66	59	62	70	77	79	71	74	69	66	F 67
9	65	64	F 54	J F 56	F 45	F 45	I A 51	U A 63	I A 61	56	63	56	58	62	58	60	63	66	65	64	64	62	54	F 56
10	F 56	F 54	F 53	54	F 50	F 50	V 55	55	A	52	A	A	A	A	A	60	55	57	A	51	66	F 58	I A 58	I A 54
11	F 52	F 53	F 53	F 47	F 47	F 43	53	56	I A 57	59	57	A	48	A	57	J R 69	A	A	69	61	64	55	51	F 53
12	F 56	55	F 57	48	44	I R 38	F 45	47	V 50	51	A	A	A	A	49	49	50	I A 50	53	56	59	58	53	53
13	51	48	44	44	43	47	56	J R 60	60	56	51	60	A	U R 62	B	R 56	U R 61	57	51	I Y 51	59	F 62	65	F 51
14	53	F 40	F 42	F 41	34	35	41	J R 53	A	A	A	49	A	A	R 55	52	49	52	55	65	63	53	45	43
15	42	42	42	42	38	44	47	63	63	60	66	A	A	A	66	77	81	79	70	72	55	54	53	48
16	F 46	F 47	F 50	48	44	45	65	63	57	55	I A 62	63	A	A	A	64	I A 66	63	66	65	69	V 56	61	F 65
17	58	F 54	F 54	F 51	F 48	46	57	58	60	U R 59	60	69	63	R 64	70	67	64	56	58	68	69	I A 60	53	I A 58
18	J R 53	F 52	F 47	F 46	F 45	F 48	58	65	65	59	69	A	65	63	64	67	J R 66	60	63	R 69	78	73	59	A
19	F 55	F 52	F 50	F 55	F 46	F 54	59	68	70	66	72	A	75	A	67	70	67	I A 66	U R 70	74	F 75	F 65	F 71	A
20	F 60	58	F 55	46	F 51	F 53	F 71	74	I A 64	A	A	I A 58	67	77	82	J R 82	68	65	I A 68	C	C	C	C	C
21	C	C	C	C	32	F 42	52	64	59	I A 57	57	I A 59	U R 61	56	A	A	A	64	65	70	75	72	64	F 65
22	68	58	F 56	F 55	F 54	59	61	58	84	76	I A 65	68	67	I A 67	82	83	80	71	68	71	69	F 69	F 72	F 64
23	F 59	F 55	F 48	F 44	F 46	F 48	60	74	70	V 69	J R 63	J R 62	63	Y	A	U R 77	R 68	J R 70	77	81	71	68	61	64
24	F 62	59	55	58	F 53	42	53	66	77	80	81	77	69	65	I A 68	70	68	70	71	70	77	76	71	70
25	J R 63	53	53	F 47	F 44	F 51	67	70	84	I A 72	I A 70	67	I A 65	75	80	I Y 80	78	75	73	J R 82	U R 66	61	R 63	F 54
26	F 64	F 64	63	53	F 47	52	63	73	78	I S 71	J S 78	70	70	72	74	76	A	A	77	I R 72	63	64	65	60
27	F 55	F 54	F 56	F 53	50	54	59	R 68	70	I A 77	69	73	I A 71	63	70	72	75	79	82	87	89	78	77	J R 70
28	67	F 68	F 62	62	69	64	J R 71	67	76	69	A	65	70	I A 77	89	100	100	90	87	I C 83	76	73	70	J R 66
29	F 66	F 72	61	56	54	55	77	75	62	67	63	62	66	71	81	87	90	90	78	C	C	73	75	F 67
30	J R 70	J R 66	64	59	58	59	64	70	67	90	68	72	I A 80	80	86	96	106	95	87	U R 76	R	R 56	R	A
31	A	59	55	J R 53	54	58	68	92	93	R	A	A	A	A	A	77	R	U R 69	73	Y	C	C	C	C
	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
CNT	29	30	30	30	31	31	31	31	29	27	22	21	23	21	25	30	27	29	30	28	27	29	28	25
MED	63	F 58	F 56	F 54	F 50	52	61	67	67	64	66	67	67	67	70	72	70	71	72	72	71	69	65	65
U Q	68	F 66	63	58	55	58	69	73	76	71	70	72	75	76	80	80	81	79	79	80	77	75	72	67
L Q	55	F 53	F 53	F 47	45	45	55	63	60	59	62	61	64	64	64	67	66	64	66	65	64	59	58	54

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

IONOSPHERIC DATA STATION KOKUBUNJI

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

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

H / D	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														510		480	440	420	U L 340					
2						L 320	400	420	470	470	U A 480		510			U A 500	460		U L 380					
3						L		470	460		500	530	500	U A 500	500									
4							400	L 430	L								460	L 430	U L 380					
5						L	L 400	430	460	470			510	U A 480	470	470	450	430						
6						L	L 400	430	470							U A 470	L 460							
7						U L 360	360	L 430		470						480	U L 440	L 410	U L 370					
8						L	U L 380	U L 440	450						480	450	450	400	L					
9						270					450	460	540	460	U A 430	440	440	400						
10						L 310	U A 340	U A 400		U A 440						430								
11							370								U A 460									
12								H 400							450	430	U A 410		350	L				
13						L	370		U A 430		470	U A 460						L						
14						270	340					U A 460				440	420	U A 400	L 350					
15							400	410	435	440						450	410	400	L 320					
16							U L 370	410	420			470												
17							U L 400		470	460	470	460	480	R 470	490	450	440		U L 380					
18									U A 470		470		490	490	480	460								
19								U L 490	450							U A 470								
20						L	U L 400	L 420					500	480			440							
21						300	U A 350		U A 450		480			460										
22						L	400	420	U A 460	480			500			480	450	U L 430						
23							L	L 450			490		510			470	L		U L 360					
24							400	440	470			U A 500	500	U A 510		U A 470	500	L 420	U L 370					
25							L								U S 510	L 520	460	420						
26								L U L 450	L 460		U A 480	520		500	500	U A 470								
27								L U L 430	490		R 480				500	U L 480	U A 450	U L 430	U L 440					
28								L U L 470	450						480	460	440	410						
29							L	L U L 430	L		490	510	U A 520	500		R 480	440		L					
30										450	L 480	490		490	495	480	460	420						
31								L									L 450							
	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	17	20	17	8	12	10	11	12	13	23	21	14	11					
MED						305	400	430	460	465	480	480	500	490	480	470	450	420	U L 370					
U Q						L 320	L 400	U L 445	470	470	485	510	510	500	500	480	460	L 430	U L 380					
L Q						270	365	420	450	445	470	460	500	475	465	450	440	400	L 350					

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

IONOSPHERIC DATA STATION KOKUBUNJI

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

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

H / D	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
1						A 175	A 245	A 300	A	A	A	A	A	A 380	A	A 345	A 315	270	210	B				
2						A 230	A	A	A	A	U A 370	A	380	B	360	350	320	265	215	B				
3						175	250	300	A	A	A	A	A	A	A	A 355	A 325	B	A	B				
4						A	250	290	325	345	A	A	A	A	A	A	A	A	A	B				
5						170	260	330	A 345	A	A	U A 375	A	A	B	R 360	315	280	210	B				
6						185	245	A 300	325	A	A	A	A	A	A	345	B	B	A	B				
7						170	245	300	A 335	A	A	A	A	A	A	A	325	275	A	B				
8						165	245	290	305	A	A	A	A	A	A	340	320	275	220	B				
9						A	A 255	A	A	A	A	A	A	R	355	A	315	A	A	B				
10						185	245	295	320	U A 335	350	A	A	A	A	A	325	265	U A 210	B				
11						A 170	230	285	A 315	A	A	A	A	A	A	A	A	A	A	B				
12						A	230	275	A	A 335	A	A	360	A	A 340	330	295	255	A	B				
13						A	230	280	A 300	A 315	A	A	A	B	B	A	A	A	A	B				
14						A	230	280	A	A	A	A	A	A	A	A	A	A	A	B				
15						A	225	300	340	365	A	A	A	A	A	A	310	A	195	E				
16						A	A	U A 285	A	A	A	A	A	A	A	A	A	A	A	B				
17						A	A	A	A	A	A	A	A	A	A	A	A	260	A	B				
18						A	A	A	A	A	A	A	A	390	R 355	345	315	280	U A 210	B				
19						A	240	295	325	A 350	A	A	A	A	A	A	A	A	A	B				
20						A	240	275	A	A	A	A	A	A	385	B	330	A 280	U A 200	C				
21						A	235	290	330		A	A	A	R	355	335	305	275	U A 215	B				
22						A	245	305	335	U A 365	U A 370	A	A	U A 375	A	A	A	A	A	B				
23						A	A	A 295	U A 320	A	A	A	A	A	B	B	B	B	A	B				
24						A	240	310	335	U A 355	A	A	A	A	A	A	A	A	A	B				
25						A	260	A	A 325	A	A	A	A	A	S	A	A	A	B	B				
26						U S 160	240	S	A	A	A	A	A	A	A	A	A	A	A					
27						A	R 255	300	R	A	A	A	A	A	A	345	A	A 285	A					
28						A	240	A	325	A	A	B	A	A	A	B	R	A	A					
29						A	230	U A 270	A	A	365	A	A	A	A 365	A	U A 330	A	A					
30						A	225	A	A	A	A	A	B	A	R	B	B	260	A					
31						A	A	A	A	A	B	B	B	A	A	A	B	A	B					
	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
CNT						9	25	21	16	8	4	1	2	3	7	10	14	13	9	1				
MED						170	240	295	325	A 348	368	U A 375	370	380	355	345	318	275	210	E				
U Q						185	248	300	335	U A 360	U A 370			390	365	350	325	280	215					
L Q						168	230	282	A 320	A 335	358			U A 375	355	340	315	262	205					

JUL. 1993 FOE (0.01MHZ) COMMUNICATIONS RESEARCH LABORATORY, JAPAN

IONOSPHERIC DATA STATION KOKUBUNJI

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

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

D \ H	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
1	JA 85	JA 92	JA 70	JA 82	JA 59	JA 45	JA 50	JA 71	JA 63	JA 54	JA 56	JA 66	JA 79	G 38	JA 57	JA 67	90	52	G 21	20	JA 48	27	JA 35	JA 34
2	JA 55	JA 30	JA 44	JA 87	JA 42	28	JA 51	JA 42	JA 44	41	JA 52	JA 83	42	JA 60	JA 57	JA 55	JA 53	JA 111	JA 45	JA 43	JA 64	JA 71	JA 87	JA 54
3	JA 43	JA 51	JA 40	22	JA 15	22	JA 49	69	61	84	JA 93	JA 42	JA 53	JA 52	41	JA 54	87	81	46	JA 139	JA 67	JA 42	JA 83	59
4	JA 54	JA 33	21	22	EB 14	20	29	JA 40	JA 49	72	118	132	JA 85	72	62	57	34	JA 40	JA 32	JA 23	26	26	JA 22	JA 34
5	28	JA 21	18	JA 17	EB 14	22	29	39	51	44	80	125	JA 68	49	EB 36	G	38	39	49	73	JA 29	30	JA 44	JA 73
6	JA 93	JA 77	JA 64	JA 50	JA 28	G	29	JA 43	38	JA 62	72	83	JA 98	JA 143	JA 93	JA 53	EB 37	115	93	136	JA 55	JA 106	JA 131	JA 55
7	JA 52	JA 53	JA 52	JA 27	JA 24	JA 22	31	JA 44	75	JA 131	JA 130	97	68	74	JA 54	40	39	G 23	JA 36	JA 33	JA 28	62	JA 56	62
8	JA 54	JA 34	JA 54	28	JA 21	20	JA 34	JA 45	JA 55	JA 53	JA 63	103	JA 94	JA 107	39	G	G	G	24	JA 41	24	JA 46	28	JA 44
9	33	JA 58	JA 36	JA 42	JA 84	JA 48	100	JA 115	81	57	JA 43	JA 50	55	G	43	JA 45	JA 46	JA 41	JA 42	JA 26	JA 53	JA 25	JA 26	JA 34
10	JA 53	JA 35	49	JA 41	18	25	JA 40	JA 51	JA 95	JA 95	82	100	100	JA 123	JA 81	JA 41	JA 67	JA 71	JA 104	JA 128	137	JA 90	JA 84	JA 92
11	JA 87	JA 37	JA 29	JA 28	JA 26	JA 27	29	JA 54	90	JA 124	60	102	JA 60	JA 93	JA 93	57	JA 124	JA 113	JA 57	40	31	JA 25	JA 64	JA 33
12	JA 73	JA 72	JA 50	JA 71	JA 56	JA 35	JA 52	34	JA 47	JA 59	88	JA 54	JA 114	84	JA 60	JA 44	JA 46	JA 95	23	16	24	JA 26	JA 20	JA 22
13	JA 27	JA 34	JA 33	JA 20	JA 19	19	JA 36	JA 54	JA 54	JA 47	JA 43	JA 54	58	52	B	55	40	37	32	42	JA 51	59	JA 52	JA 53
14	55	JA 32	JA 29	JA 22	JA 24	JA 23	JA 33	JA 51	JA 74	101	62	JA 48	JA 57	92	60	JA 39	JA 42	JA 43	29	JA 27	18	18	EB 12	EB 13
15	18	JA 23	JA 27	19	JA 28	18	G	32	G	42	JA 52	136	104	JA 119	69	49	JA 42	JA 44	23	JA 17	JA 23	JA 24	JA 24	JA 33
16	JA 45	JA 33	31	JA 26	JA 80	43	JA 34	JA 33	39	JA 128	JA 144	49	125	88	61	61	75	JA 62	JA 95	61	JA 48	34	JA 47	JA 22
17	19	55	JA 43	JA 32	JA 31	JA 33	50	JA 50	JA 43	51	JA 42	42	51	JA 54	47	JA 43	JA 43	G 24	25	JA 64	JA 53	93	JA 65	JA 95
18	JA 63	JA 66	JA 49	JA 34	JA 48	JA 53	61	JA 119	JA 85	54	46	JA 128	JA 54	G 38	G 27	JA 52	61	JA 55	JA 55	54	JA 47	61	JA 85	JA 122
19	JA 86	JA 53	JA 45	JA 55	JA 48	28	JA 53	JA 79	JA 44	JA 64	60	132	92	JA 128	63	JA 55	66	JA 101	JA 145	JA 130	JA 63	JA 89	JA 63	JA 90
20	JA 70	JA 55	JA 52	JA 34	JA 29	JA 21	28	JA 42	103	JA 96	90	JA 91	51	38	53	60	60	JA 49	78	C	C	C	C	C
21	C	C	C	C	JA 48	JA 27	JA 91	JA 54	83	127	JA 42	71	JA 71	G	55	81	83	JA 54	JA 37	JA 36	58	JA 82	JA 52	JA 45
22	JA 54	JA 69	JA 33	JA 29	JA 55	JA 37	32	JA 41	JA 55	JA 93	JA 101	JA 94	JA 45	77	57	45	JA 43	40	JA 50	JA 71	JA 56	JA 35	JA 85	JA 36
23	JA 54	JA 27	JA 34	JA 41	JA 44	JA 22	32	JA 45	JA 62	JA 87	JA 55	JA 79	42	57	JA 126	EB 43	EB 41	46	61	67	EB 13	33	JA 54	JA 51
24	JA 46	JA 52	JA 36	EB 14	JA 21	JA 37	27	JA 40	JA 40	JA 65	87	84	60	JA 130	JA 131	JA 66	40	33	26	JA 36	59	JA 37	JA 62	JA 53
25	25	20	41	JA 29	JA 26	20	JA 45	JA 54	68	JA 95	72	JA 58	JA 67	JA 56	41	53	JA 47	JA 37	34	32	40	26	JA 57	26
26	JA 43	JA 43	JA 34	22	EB 14	22	G	G	JA 47	68	59	JA 54	52	JA 46	JA 54	JA 51	JA 132	JA 132	JA 51	36	EB 16	24	17	EB 13
27	JA 71	JA 51	JA 22	JA 22	EB 13	20	32	JA 43	G	JA 115	JA 77	JA 106	73	89	JA 51	JA 51	JA 54	JA 43	JA 57	44	EB 12	58	JA 53	JA 50
28	JA 54	JA 37	JA 31	33	EB 13	JA 35	32	JA 46	JA 51	JA 74	115	60	JA 63	96	53	EB 42	G	39	40	C	JA 21	29	21	19
29	JA 33	EB 12	JA 32	JA 18	JA 19	19	31	JA 41	35	JA 69	JA 55	49	JA 55	JA 71	JA 67	JA 53	JA 49	JA 75	JA 52	C	C	JA 55	JA 55	JA 50
30	JA 65	JA 47	JA 31	JA 27	27	JA 24	JA 53	56	JA 57	JA 43	JA 51	41	JA 96	48	40	EB 36	EB 32	32	39	JA 34	44	36	45	78
31	74	50	EB 14	EB 20	EB 20	26	JA 34	78	JA 65	JA 61	116	94	JA 72	JA 70	78	JA 76	EB 38	55	61	26	C	C	C	C
	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
CNT	30	30	30	30	31	31	31	31	31	31	31	31	31	31	30	31	31	31	31	28	28	29	29	29
MED	JA 54	JA 45	JA 35	JA 28	JA 26	24	34	JA 45	JA 55	JA 68	JA 63	83	JA 67	71	57	JA 52	46	JA 46	45	JA 40	JA 46	JA 36	JA 53	JA 50
U Q	JA 70	JA 55	JA 49	JA 41	JA 48	JA 35	JA 50	JA 54	74	JA 95	90	102	92	JA 93	JA 67	57	66	JA 75	57	JA 66	JA 56	JA 62	JA 64	JA 60
L Q	43	JA 33	31	22	EB 19	20	29	41	44	54	JA 52	JA 54	54	49	47	43	39	39	32	30	24	JA 26	27	33

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

IONOSPHERIC DATA STATION KOKUBUNJI

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

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

H / D	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
1	18	18	44	41	27	36	48	55	50	52	54	65	77	G 35	56	44	35	38	G 20	19	29	25	22	30
2	25	21	18	28	22	26	32	34	42	41	48	58	40	55	54	50	44	53	29	32	21	18	66	45
3	31	43	30	E B 13	E B 12	20	40	37	45	A A 84	44	40	38	50	40	50	78	79	37	30	42	31	34	30
4	34	28	E B 13	E B 12	E B 14	19	27	37	43	A A 72	A A 118	A A 132	61	59	51	48	33	33	29	21	20	19	20	32
5	22	20	17	13	E B 14	20	28	34	36	40	A A 80	A A 125	41	48	E B 36	G	35	32	39	63	21	24	25	14
6	61	45	46	30	16	G	29	35	37	59	A A 72	A A 83	A A 98	A A 143	50	47	E B 37	A A 115	A A 93	A A 136	34	29	50	23
7	35	22	23	21	18	G 16	30	40	A A 75	36	A A 130	A A 97	A A 68	A. A 74	50	37	37	G 22	26	22	20	45	40	29
8	38	20	33	16	19	19	29	38	34	48	50	A A 103	49	A A 107	38	G	G	G	G 20	20	16	32	20	35
9	17	17	26	23	21	24	A A 100	49	A A 81	50	41	44	51	G	43	41	39	36	25	23	47	20	20	29
10	34	23	E B 11	20	E B 11	19	34	40	A A 95	44	A A 82	A A 100	A A 100	A A 123	A A 81	37	51	43	A A 104	45	47	49	A A 84	A A 92
11	45	30	20	17	18	20	27	48	A A 90	56	56	A A 102	45	A A 93	46	U Y 56	A A 124	A A 113	33	32	20	20	22	22
12	44	45	36	47	29	27	38	33	43	41	A A 88	A A 54	A A 114	A A 84	44	40	41	A A 95	23	16	14	26	15	15
13	18	18	15	18	17	18	33	43	43	43	41	46	A A 58	52	B	52	U Y 40	32	27	U Y 41	33	41	31	E B 14
14	46	14	27	19	21	17	29	47	A A 74	A A 101	A A 62	46	A A 57	A A 92	51	36	33	40	23	23	16	E B 12	E B 12	E B 13
15	E B 12	16	18	E B 12	19	17	G	31	G	40	50	A A 136	A A 104	A A 119	61	40	G 26	29	21	15	20	21	21	25
16	35	22	20	20	22	32	30	31	38	47	A A 144	46	A A 125	A A 88	A A 61	52	A A 75	55	41	44	22	31	20	19
17	E B 13	E B 15	30	E B 14	20	26	35	43	40	45	42	41	41	42	47	37	40	G 21	25	25	28	A A 93	47	A A 95
18	44	19	27	21	35	37	47	51	47	47	44	A A 128	44	G 36	G 26	39	U Y 61	43	45	46	43	50	53	A A 122
19	30	36	32	40	16	22	40	37	37	53	52	A A 132	69	A A 128	55	47	60	A A 101	51	60	41	30	40	A A 90
20	45	42	35	20	20	20	28	34	A A 103	A A 96	A A 90	A A 91	43	U Y 38	51	U Y 60	39	43	A A 78	C	C	C	C	C
21	C	C	C	C	E C 30	24	35	44	45	A A 127	41	A A 71	55	G	A A 55	A A 81	A A 83	41	35	33	44	41	30	34
22	31	40	22	19	15	26	27	34	46	38	A A 101	66	44	A A 77	54	41	38	32	35	45	36	19	32	18
23	23	17	29	27	34	19	30	42	55	53	47	53	41	U Y 56	A A 126	E B 43	E B 41	46	25	63	E B 13	23	42	33
24	30	39	29	E B 14	E B 13	22	26	38	38	58	80	50	47	51	A A 131	47	40	32	26	22	45	33	36	29
25	17	E B 12	18	25	20	20	36	43	62	A A 95	A A 72	51	A A 67	54	37	50	41	34	33	27	40	25	38	25
26	39	27	23	20	E B 14	21	G	G	40	51	48	43	44	43	44	47	A A 132	A A 132	40	34	E B 16	18	U Y 16	E B 13
27	41	34	E B 12	20	E B 13	20	32	35	G	A A 115	43	62	A A 73	59	46	43	45	36	40	40	E B 12	56	45	39
28	30	31	20	27	E B 13	32	29	39	41	63	A A 115	53	58	A A 96	40	E B 42	G	36	36	C	E B 15	22	16	U Y 18
29	28	E B 12	22	16	17	17	28	37	34	63	42	41	52	40	50	35	36	63	25	C	C	35	26	37
30	38	34	20	21	19	22	49	47	56	42	43	40	A A 96	45	39	E B 36	E B 32	30	36	32	40	34	43	A A 78
31	A A 74	45	E B 14	E B 20	E B 20	24	34	78	47	61	A A 116	A A 94	A A 72	A A 70	A A 78	70	E B 38	45	57	U Y 26	C	C	C	C
	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
CNT	30	30	30	30	31	31	31	31	31	31	31	31	31	31	30	31	31	31	31	28	28	29	29	29
MED	32	22	22	20	18	20	30	38	43	52	54	62	57	56	50	43	40	40	33	32	25	29	31	29
U Q	41	36	30	25	21	26	36	44	A A 56	A A 63	A A 88	A A 100	A A 73	A A 92	A A 55	50	51	A A 55	40	44	40	38	42	A A 38
L Q	23	18	18	E B 16	E B 14	19	28	34	38	43	44	46	44	43	43	37	35	32	25	22	18	20	20	18

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

IONOSPHERIC DATA STATION KOKUBUNJI

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

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

D \ H	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
1	13	13	12	13	13	15	15	14	22	23	32	25	33	33	30	22	16	16	13	11	12	13	13	13
2	14	14	13	12	13	13	13	13	20	30	30	31	36	39	23	26	20	15	13	12	14	13	14	15
3	13	16	13	13	12	13	14	19	18	20	31	31	25	31	31	30	19	28	15	15	13	13	13	14
4	13	13	13	12	14	12	15	14	21	30	33	26	30	34	24	22	23	16	13	14	12	13	14	13
5	14	12	13	13	14	13	14	23	20	21	27	22	30	28	36	28	21	14	13	12	10	12	13	11
6	12	13	12	12	12	11	13	14	20	22	32	26	31	23	29	21	37	49	13	13	13	13	14	13
7	14	14	13	13	11	14	13	19	20	25	24	32	30	27	30	21	22	20	12	13	14	13	14	13
8	12	12	13	12	12	13	12	21	16	26	35	30	33	22	26	20	19	15	14	15	12	13	14	13
9	13	13	13	12	13	14	14	17	17	21	30	32	32	26	25	29	20	20	13	13	12	12	13	14
10	13	14	11	13	11	12	12	15	17	24	28	34	33	29	22	20	24	14	12	12	13	13	13	13
11	13	14	13	13	13	12	14	14	17	25	21	27	27	21	25	34	14	13	11	13	12	11	13	14
12	13	12	12	14	12	12	12	15	20	20	25	27	27	28	21	22	18	16	13	13	12	13	11	12
13	13	13	12	14	13	13	12	13	16	22	23	27	33	41	B	30	25	22	14	15	12	13	13	14
14	14	11	14	12	12	12	12	16	16	22	27	30	26	30	28	25	20	14	13	13	13	12	12	13
15	12	13	11	12	14	12	15	15	27	27	32	28	36	27	33	19	17	19	13	10	13	13	14	14
16	12	13	14	14	13	13	13	13	19	22	27	20	31	30	30	25	19	16	14	13	13	13	13	13
17	13	15	14	14	13	13	13	13	22	29	30	29	32	32	30	29	20	14	13	13	14	13	13	15
18	14	13	13	13	14	13	13	13	22	30	33	30	30	25	22	19	19	15	15	14	18	13	13	14
19	13	12	13	13	12	13	12	13	25	25	31	32	24	29	30	23	17	16	13	13	13	13	15	13
20	13	14	11	11	14	13	16	16	25	22	29	21	31	30	25	38	14	18	13	C	C	C	C	C
21	C	C	C	C	E C 30	13	12	16	18	26	30	30	34	22	26	22	19	19	13	13	17	14	14	12
22	14	13	14	11	12	12	14	16	22	27	31	34	35	22	33	32	23	14	12	13	13	13	14	15
23	13	11	13	13	13	11	14	16	24	18	32	31	26	39	42	43	41	34	13	15	13	14	13	14
24	12	13	12	14	13	13	14	17	19	29	24	31	34	35	31	27	15	21	14	14	14	14	14	14
25	13	12	12	12	12	13	13	16	25	20	28	23	29	27	27	28	28	20	20	16	21	13	20	16
26	15	13	13	12	14	13	19	20	29	26	33	32	33	32	32	31	32	14	13	E C 33	16	13	13	13
27	13	13	12	13	13	15	16	19	22	31	26	36	28	30	33	31	23	14	13	13	12	16	14	13
28	13	13	13	14	13	12	13	17	22	31	34	39	35	32	30	42	21	14	13	C	15	13	13	15
29	14	12	14	13	11	12	16	13	23	25	25	34	35	31	32	23	20	17	16	C	C	13	14	13
30	14	15	13	13	13	11	13	15	22	31	23	28	39	33	35	36	32	13	14	21	17	27	20	20
31	14	21	14	20	20	13	22	32	35	31	42	42	45	32	24	25	38	30	20	22	C	C	C	C
	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
CNT	30	30	30	30	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	28	28	29	29	29
MED	13	13	13	13	13	13	13	16	21	25	30	30	32	30	30	26	20	16	13	13	13	13	13	13
U Q	14	14	13	13	14	13	15	17	23	29	32	32	34	32	32	31	24	20	14	15	14	13	14	14
L Q	13	12	12	12	12	12	13	14	18	22	26	27	29	27	25	22	19	14	13	13	12	13	13	13

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

IONOSPHERIC DATA STATION KOKUBUNJI

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

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

D \ H	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
1	F 295	J F 275	F 280	F 275	F 290	F 305	F 310	290	305	290	280	300	A 270	265	265	260	295	305	310	290	J R 280	275	285	R
2	260	285	F 290	F 295	310	300	305	330	300	330	265	295	290	300	295	285	305	310	295	295	F 285	F 280	F 270	285
3	285	265	F 265	F 285	300	320	270	R 285	300	A	295	250	295	280	280	305	A 285	A 290	275	300	F 285	V 300	265	F 280
4	285	285	280	280	295	300	305	305	315	A	A	A	295	295	295	295	300	315	290	280	285	V 285	285	305
5	285	300	325	280	290	295	330	325	335	340	A	A	U R 305	U R 310	300	285	305	290	290	300	305	290	F 275	290
6	J R 305	F 295	F 300	F 290	F 305	F 315	310	310	V 305	330	A	A	A	A	285	J R 305	310	A	A	A	J R 280	300	F 325	J F 310
7	F 285	F 310	305	F 290	F 280	F 285	330	355	A	315	A	A	A	A	280	280	300	290	295	300	300	305	F 290	F 300
8	J R 280	F 300	F 300	F 295	F 295	F 305	320	310	320	295	305	A	320	A	290	275	280	280	305	295	285	280	295	F 290
9	285	285	F 275	J F 280	F 285	F 275	A	A	A	275	315	300	235	310	290	300	300	295	310	300	300	305	275	F 280
10	F 285	F 300	F 285	270	F 290	F 275	V 270	285	A	290	A	A	A	A	A	300	A	315	A	A 295	305	F 315	A	A
11	F 295	F 275	F 285	F 295	F 310	F 275	295	285	A	A	A	A	A	A	275	J R 305	A	A	315	290	300	290	265	F 270
12	F 285	285	F 305	A	290	R	A	245	V 265	260	A	A	A	A	270	265	305	A	300	315	295	300	270	295
13	295	295	290	275	300	310	315	J R 360	300	310	245	285	A	U R 310	B	R 330	U R 330	320	330	Y	270	F 290	325	F 330
14	A 275	F 280	F 290	F 295	280	275	250	J R 280	A	A	A	245	A	A	R 275	290	295	295	300	310	310	310	295	290
15	290	280	280	300	305	330	275	310	320	325	300	A	A	A	285	300	305	330	325	335	290	285	285	290
16	F 275	F 290	F 305	305	295	300	355	335	320	275	A	300	A	A	A	305	A	315	320	315	310	V 295	280	F 290
17	290	F 315	F 295	F 300	F 320	305	320	340	305	U R 340	290	320	310	R 305	315	305	315	295	295	300	315	A	A 290	A
18	J R 290	F 290	F 300	F 295	F 310	F 330	330	320	330	310	320	A	295	300	295	305	J R 305	300	300	R 310	315	315	300	A
19	F 310	F 305	F 300	F 285	F 280	F 325	295	290	315	295	305	A	320	A	285	310	305	A	U R 315	290	F 280	F 305	F 310	A
20	F 300	295	F 290	280	F 300	F 320	F 330	340	A	A	A	A	285	290	300	J R 305	300	300	A	C	C	C	C	C
21	C	C	C	C	C 275	F 255	275	305	310	A	270	A	U R 250	290	A	A	A	300	305	275	285	305	295	F 275
22	295	280	F 280	F 285	F 290	300	290	325	305	300	A	A 300	310	A	290	305	305	310	300	295	285	F 280	F 290	F 305
23	F 290	F 320	F 310	F 300	F 290	F 300	315	310	330	V 305	J R 315	J R 290	295	Y	A	U R 315	R 305	J R 310	300	310	310	300	275	280
24	F 290	305	290	310	F 315	325	285	300	305	310	A	320	300	305	A	310	300	310	300	295	300	320	290	295
25	J R 290	290	300	F 295	F 275	F 290	315	310	335	A	A	305	A	290	295	Y	305	310	300	J R 305	U R 340	290	R 310	F 295
26	F 300	F 305	325	310	F 300	320	305	310	360	S	J S 305	295	290	305	295	295	A	A	310	R	305	285	290	300
27	F 275	F 290	F 305	F 305	315	325	325	R 325	300	A	290	305	A	290	295	290	295	285	290	300	305	285	305	J R 305
28	275	F 305	F 290	290	310	310	J R 330	310	340	350	A	285	280	A	275	295	305	305	305	C	295	280	290	J R 290
29	F 295	F 310	300	290	290	305	335	340	325	A 305	315	285	290	285	285	280	300	300	300	C	C	275	285	F 280
30	J R 295	J R 295	275	275	315	340	285	315	270	320	345	295	A	295	280	285	300	310	310	U R 320	R	R 305	R	A
31	A	295	295	J R 295	295	295	280	320	325	R	A	A	A	A	A	A 295	R	U R 310	310	Y	C	C	C	C
	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
CNT	29	30	30	29	31	30	29	30	25	21	16	17	18	17	24	29	25	26	28	24	27	28	27	23
MED	290	F 295	F 292	F 290	F 295	305	310	310	315	310	302	295	295	295	288	300	305	305	300	300	300	292	290	F 290
U Q	F 295	F 305	F 300	298	310	320	328	325	328	328	315	302	305	R 305	295	R 305	305	310	310	310	305	305	295	F 300
L Q	285	285	F 285	280	290	F 295	285	300	302	292	285	285	285	290	280	285	300	295	298	295	285	285	275	F 280

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

IONOSPHERIC DATA STATION KOKUBUNJI

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

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

D \ H	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
1								A	A	A	A	A	A	340	A	A 315	350	A	L					
2						L 350	340	370	345	L 365	A	A	350	A	A	A	A 345	A	U L 350					
3						L	A	335	A	A	A 340	340	350	A	345	A	A	A	A					
4							345	L 375	L	A	A	A	A	A	A	A	340	L 345	U L 325					
5						L	L 360	370	H 370	A 350	A	A	385	A	390	355	340	330	A					
6						L	L 355	370	370	A	A	A	A	A	A	A	L 330	A	A	A				
7						U L 330	375	A	A	330	A	A	A	A	A	335	U L 330	L 340	U L 345					
8						L	U L 370	U L 360	375	A	A	A	A	A	375	360	340	345	L					
9						335	A	A	A	A	365	355	375	400	A	A	A 325	A 340						
10						L 325	A	A	A	A	A	A	A	A	A	365	A	A	A	A				
11							345	A	A	A	A	A	A	A	A	A	A	A	A					
12						A	A	H 340	A	A	A	A	A	A	A 285	380	A	A	330	L				
13						L	A 345	A	A	A	400	A	A	A	B	A	A	L						
14						315	345	A	A	A	A	A	A	A	A	380	360	A	L 340					
15							350	360	385	380	A	A	A	A	A	355	385	355	L 375					
16						A		390	400	A	A	A	A	A	A	A	A	A	A					
17							U L 355	A	370	A	390	415	350	R 395	A	380	A 350		U L 335					
18						A	A	A	A	A	425	A	370	395	380	365	A	A	A					
19							A	U L 340	385	A	A	A	A	A	A	A	A	A	A	A				
20						L	U L 350	L 395	A	A	A	A	370	390	A	A	365	A	A	C				
21						300	A	A	A	A	380	A	A	385	A	A	A	A	A					
22						L	345	390	A	400	A	A	A 335	A	A	A 330	360	U L 335						
23							L	A	A	A	A	A	380	A	A	350	L	A	U L 350	A				
24							H 340	A 335	350	A	A	A	A 340	A	A	A	400	L 345	U L 350					
25							L	A	A	A	A	A	A	A	U S 355	A	345	345	A					
26							L	U L 345	L 360	A	A	350	R	375	A 340	A	A	A						
27							L	U L 370	355	A	R 365	A	A	A	A 330	A	A	U L 350	U L 370					
28							L	U L 350	A 365	A	A	A	A	A	360	B	360	A						
29						L	L	U L 360	L	A	380	370	A	370	A	R 370	365	A	L					
30							A	A	A	A	L 360	385	A	A 350	365	350	370	340						
31							L	A	A	A	A	A	A	A	A	A	L 345	A	A					
	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
CNT						6	14	17	12	5	9	6	10	9	10	14	19	11	10					
MED						328	348	360	370	365	380	362	360	385	358	358	350	345	U L 348					
U Q						335	L 355	L 372	380	390	395	385	375	395	375	370	365	L 345	U L 350					
L Q						315	345	342	358	340	362	350	A 350	360	A 340	350	340	340	U L 335					

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

IONOSPHERIC DATA STATION KOKUBUNJI

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

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

D \ H	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
1								A 295	280	360	375	325	A	350	390	395	310	280	260					
2						330	320	280	340	300	460	365	350	340	350	350	310	305	290					
3						280	370	360	320	A	365	485	335	390	360	320	A	A	300					
4							300	285	305	A	A	A	330	A 345	325	340	315	290	310					
5						L 310	265	275	265	290	A	A	360	325	335	360	315	330	280					
6						285	295	265	285	A 290	A	A	A	A	360	310	320	A	A	A				
7						350	270	245	A	310	A	A	A	A	380	370	325	305	290					
8						315	260	290	275	330	340	A	310	A	380	405	360	295	270					
9						395	A	A	A	A 430	325	375	585	355	390	350	360	320						
10						370	365	365	A	410	A	A	A	A	A	345	A	320	A	A				
11							350	A 400	A	A	A	A	A	A	435	A	A	A	280					
12						A 375	A	525	460	485	A	A	A	A	475	480	370	A	335	255				
13						305	305	260	365	325	575	385	A	355	B	E A 340	310	300						
14						430	475	430	A	A	A	595	A	A	465	410	390	360	325					
15							420	315	285	310	340	A	A	A	A 415	325	300	265	270					
16						330	245	270	330	440	A	365	A	A	A	340	A	A 320	275					
17							300	275	345	280	390	315	340	365	330	325	320		325					
18						E A 290	A 280	A 300	285	320	325	A	355	370	360	335	A	330	A 305					
19							A 300	355	290	A 360	320	A	A	A	385	310	A 355	A	E A 310	A				
20						290	270	250	A	A	A	A	395	350	325	320	300	325	A	C				
21						465	405	320	315	A	435	A	550	410	A	A	A	320	300					
22						315	350	300	295	285	A	A	320	A	340	315	305	300						
23							305	310	A 265	320	330	A 365	385	Y	A	320	320	320	285	A				
24							385	330	300	310	A	305	Y	340	A	330	310	305	295					
25							300	300	265	A	A	340	A	365	350	325	305	300	300					
26							280	295	245	300	330	360	385	325	350	335	A	A						
27							280	280	320	A	350	E A 350	A	A	365	335	320	305	310					
28							255	320	265	A 290	A	390	E A 390	A	365	315	285	285						
29						295	250	260	285	A	320	420	385	365	350	345	300	A 295	280					
30							E A 330	265	415	285	275	360	A	345	350	330	290	270						
31							L 330	E A 305	280	R	A	A	A	A	A	A	295	305	E A 305					
	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
CNT						17	28	30	25	21	16	16	15	16	24	28	24	24	22	1				
MED						315	300	296	290	310	340	365	358	352	360	335	312	305	294	255				
U Q						372	350	320	325	360	382	388	390	365	388	350	322	320	310					
L Q						292	275	275	278	290	325	345	335	342	350	322	302	295	280					

IONOSPHERIC DATA STATION KOKUBUNJI

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

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

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	275	325	A 330	315	295	A 250	A 255	A	A	A	A	A	A	220	A	A	A 215	A	255	260	320	295	250	A 340
2	365	310	280	275	280	265	A 250	210	A 280	A 250	A	A	235	A	A	A	A	A	A 250	270	280	310	A	320
3	300	355	A 355	285	265	250	A	A 250	A	A	A	210	245	A	235	A	A	A	A	A 260	A 305	270	315	300
4	A 310	310	290	285	265	250	220	A 255	A	A	A	A	A	A	A	A	240	A 245	A 270	280	260	285	280	270
5	295	285	240	280	280	255	235	215	H 215	H 270	A	A	205	A	H 195	230	245	240	A	A	255	260	295	260
6	A	A 330	A	310	275	260	240	235	220	A	A	A	A	A	A	A	B	A	A	A	310	265	A 280	260
7	A 320	270	265	280	300	255	220	A	A	A 250	A	A	A	A	A	230	A 270	220	H 240	260	260	A 285	A 315	A 305
8	A 350	285	A 300	285	275	260	240	A 255	215	A	A	A	A	A	210	220	230	235	250	265	270	A 305	285	315
9	290	300	370	325	A 350	A	A	A	A	A	A 255	A	E A 270	215	A	A	A	A 290	295	250	E A 315	255	305	A 350
10	A 315	A 305	300	330	315	270	A	A	A	A	A	A	A	A	A	240	A	A	A	A	E A 330	A 310	A	A
11	A	A 335	295	280	275	265	240	A	A	A	A	A	A	A	A	A	A	A	A	A 275	260	240	340	340
12	E A 355	A	A 305	A	330	A	A	H 220	A	A	A	A	A	A	A	A 250	A	A	235	260	260	270	285	270
13	270	290	305	305	280	260	E A 280	A	A	A	A 210	A	A	A	B	A	A	A 235	245	A	A 355	A 335	255	230
14	A	A 270	A 335	300	330	285	A 270	A	A	A	A	A	A	A	A	225	235	A	235	265	235	225	260	290
15	300	310	290	265	280	245	235	215	220	A 245	A	A	A	A	A	A 270	215	230	A 250	250	235	280	280	310
16	A 385	340	290	270	295	A	A	205	230	A	A	A	A	A	A	A	A	A	A	A	255	290	305	290
17	280	270	305	270	280	A 265	E A 260	A	230	A	225	210	255	235	A	225	E A 280	230	235	265	245	A	A	A
18	A	A 300	280	285	A 315	A	A	A	A	A	A 205	A	A 250	200	190	215	A	A	A	A	265	A 290	A	A
19	A 300	320	335	A 360	285	245	A	230	215	A	A	A	A	A	A	A	A	A	A	A	A 300	260	300	A
20	A 325	A 335	A 325	310	295	245	235	225	A	A	A	A	240	205	A	A	A 265	A	A	C	C	C	C	C
21	C	C	C	C	E C 405	260	A	A	A	A	225	A	A	220	A	A	A	A	A	A 290	E A 300	A 280	290	A 330
22	315	E A 365	320	310	300	A	245	225	A	200	A	A	A	A	A	A	A 245	240	260	E A 290	A 295	300	290	255
23	280	260	A 290	330	A 320	250	A 250	A	A	A	A	A	215	A	A	230	B	A	245	A	235	260	A	A 320
24	A 300	A 300	A 295	250	245	235	H 230	A	240	A	A	A	E A 310	A	A	A	210	240	A 260	265	A 300	270	A 310	A 300
25	260	280	275	320	305	255	A	A	A	A	A	A	A	A	210	A	E A 245	A 240	A	250	A 255	300	A 315	350
26	310	280	250	245	255	250	235	225	A	A	A	E A 265	A	A 230	350	A	A	A	A 265	A 255	255	290	280	250
27	A	A 335	265	280	250	245	235	220	215	A	A 240	A	A	A	A	A	A	E A 270	A 250	270	245	A 335	290	A 290
28	320	300	310	300	260	265	230	A 260	A	A	A	A	A	A	235	B	225	A	265	C	240	270	280	280
29	315	245	270	280	285	265	235	A 250	210	A	A 215	210	A	A 210	A	230	235	A	A 250	C	C	A 310	315	315
30	A 315	325	305	315	250	240	A	A	A	A	A	A 250	A	A	H 225	220	215	245	260	260	A 265	305	A 340	A
31	A	A 350	290	300	290	305	A 260	A	A	A	A	A	A	A	A	A	B	A	A	Y	C	C	C	C
	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
CNT	24	29	29	29	31	26	21	16	11	5	7	5	9	8	8	12	15	13	19	19	28	28	24	24
MED	308	302	295	285	282	255	238	225	220	A 250	225	210	240	218	218	230	232	240	250	262	261	285	290	300
U Q	A 320	A 332	315	312	305	265	A 252	A 250	230	260	240	A 258	E A 262	225	235	235	A 245	A 245	A 260	A 270	A 300	A 302	A 312	A 320
L Q	292	282	280	280	275	250	235	218	215	222	210	210	225	208	202	222	215	232	245	260	255	268	280	270

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

IONOSPHERIC DATA STATION KOKUBUNJI

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

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

D \ H	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
1						A 125	115	115	110	115	A 115	A	A 140	A 135	120	115	115	110	E A 145	B				
2						A	A	A	A	A	115	A	B 140	B	110	B 130	115	115	120	B				
3						125	115	115	115	115	A 115		A	A	A	125	115	B	A	B				
4						A 120	115	115	120	120	120	120	120	A	A	A	A	A	A	B				
5						120	A 130	125	115	110	110	115	115	130	B	125	120	115	120	B				
6						130	115	A 130	115	115	A	120	A	A	A	A 140	B	B	A	B				
7						A 140	120	115	115	115	A	A	120	A	A	A	A 140	A 125	A	B				
8						120	115	115	110	120	A	110	A	A	A	115	115	120	E A 140	B				
9						A 115	115	115		A	115	A	A	115	130	125	120	120	A	B				
10						125	110	110	120	115	120	A	A	A	A	A	115	115	115	B				
11						125	120	110	110	115	115	115	120	110	A	A	A	A	A	B				
12						A 115	110	110	110	120	115	115	120	115	120	110	115	A	B					
13						A 110	110	110	115	115	A	A	B	B	A	A	A	A	B					
14						A 115	115	115	115	115	A	110	A	A	A	A	A	A	B					
15						A 120	110	120	115	B 135	120		A	120	A	110	E A 135	A	A 125	E				
16						A	A 110	A	A	A	A	A	A	A	A	A	A	A	A	B				
17						A	A 115	115	A	A	115		A	A	A	A	A	A 125	A	B				
18						A	A	A	A	A	A	A	A	130	A 130	A 120	A 125	115	115	B				
19						A 115	110	115	115		A	A	A	A	A	A	A	A	A	B				
20						A 115	120	110	110		A	A	A	A	A	B	110	115	115	C				
21						A 115	115	115	115	120		A	A	115	115	115	115	115	120	B				
22						120	120	115	115	115	120	120	A	110	A	A	120	115	A	B				
23						A	A 110		120	110	A	A	110	A	B	B	B	B	A	B				
24						A 120	120		115	120	A	A	A	A	A	A	A	A	A	B				
25						A 120	115		115	115	115	A	A	A	115	A	A	A	B	B				
26						150	120	115	A	A	A	A	A	A	A	A	A	A	A					
27						A 120	115		115	A	110	A	A	A	A	120	115	115	A					
28						A 115	115		120	120	A	B	A	A	A	B	120	120	A					
29						A 120	120		A	115	115	130	A	A	A	115	115	125	120					
30						125	115	115	115	A	A	A	B	130	B 140	B	B	110	A					
31						A	A	A	A	A	B	B	B	A	A	A	B	B	B					
	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
CNT						10	25	28	25	22	15	11	8	10	8	13	17	17	10					
MED						125	115	115	115	115	115	115	118	120	118	120	115	115	119					
U Q						130	120	115	115	115	120	120	120	130	130	125	A 120	120	E A 125					
L Q						120	115	110	112	115	115	115	112	115	115	115	115	115	115					

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

IONOSPHERIC DATA STATION KOKUBUNJI

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

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

D \ H	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
1	110	110	110	110	110	115	115	105	110	110	110	110	110	125	120	115	115	110	110	100	120	115	110	110
2	110	105	135	115	105	E G 175	110	110	110	120	110	110	155	130	125	120	130	120	130	125	120	115	110	110
3	110	105	110	115	120	140	125	115	115	110	110	120	110	110	120	125	115	120	115	115	110	110	105	105
4	105	105	105	105	B	140	140	120	115	115	110	110	110	110	110	105	110	105	105	105	110	115	100	115
5	110	110	110	110	B	155	140	130	130	115	115	115	120	120	B	G	140	125	115	110	110	115	105	110
6	110	110	105	105	105	G	135	130	135	115	110	110	105	105	110	135	B	115	115	110	120	110	125	110
7	105	110	100	100	105	105	130	120	115	110	105	110	110	110	110	110	140	110	120	105	105	110	115	115
8	110	105	100	110	105	155	125	120	115	115	115	110	110	105	115	G	G	G	105	120	105	100	105	110
9	110	110	110	110	120	115	120	110	110	110	120	110	110	G	125	120	120	115	110	115	110	110	105	115
10	105	105	110	105	110	150	120	120	120	125	110	110	120	100	110	110	120	120	110	110	120	110	110	110
11	105	105	105	95	95	120	130	115	110	115	115	105	110	110	125	110	95	100	105	105	100	105	120	120
12	110	110	110	110	110	120	120	120	120	115	110	125	120	115	120	125	120	115	120	110	120	110	115	110
13	120	120	120	105	100	120	120	120	110	115	120	115	125	120	B	110	110	115	105	120	115	115	105	105
14	105	105	100	100	100	130	130	115	110	110	105	110	105	105	105	110	110	105	105	120	105	105	B	B
15	100	110	110	115	110	120	G	140	G	120	120	115	110	110	110	110	120	110	135	105	105	100	100	105
16	100	100	100	95	110	110	115	120	160	110	105	110	100	105	100	100	115	115	110	115	120	120	135	95
17	105	115	115	120	115	110	110	110	115	115	120	115	115	120	125	110	105	105	110	125	110	115	110	120
18	110	105	110	105	105	105	105	105	110	110	115	105	110	110	105	135	125	120	115	115	115	115	110	110
19	105	100	100	100	120	100	125	115	125	110	110	105	105	105	100	140	125	115	110	110	110	110	110	110
20	105	105	100	100	110	105	135	115	105	110	110	130	110	110	150	130	125	125	115	C	C	C	C	C
21	C	C	C	C	115	110	125	120	115	110	125	105	135	G	125	120	120	120	115	120	110	115	110	110
22	115	105	110	115	130	125	125	130	115	120	115	110	125	115	115	125	120	120	110	110	120	120	115	110
23	105	110	100	105	105	110	115	120	110	110	110	110	115	130	120	B	B	120	115	110	B	110	110	110
24	110	105	105	B	110	130	150	130	120	115	110	110	110	120	105	110	115	120	110	110	105	110	115	110
25	110	110	120	105	105	150	125	120	115	110	110	110	105	105	120	110	115	115	110	115	110	110	115	115
26	105	100	110	100	B	145	G	G	125	115	110	110	110	110	110	110	100	100	100	120	B	100	100	B
27	110	110	120	110	B	135	135	120	G	115	115	115	100	105	110	120	120	120	110	115	B	110	110	120
28	110	105	115	110	B	120	125	120	120	110	115	110	110	110	110	B	G	125	120	C	120	120	100	105
29	110	B	110	115	115	150	125	120	115	120	130	130	120	120	120	130	130	120	115	C	C	115	115	110
30	110	110	110	110	115	125	115	115	110	115	115	125	115	125	155	B	B	140	120	125	115	115	115	110
31	105	105	B	B	B	120	120	115	110	110	105	110	110	105	105	105	B	120	110	120	C	C	C	C
	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
CNT	30	29	29	28	25	30	29	30	29	31	31	31	31	29	29	26	25	30	31	28	25	29	28	27
MED	110	105	110	108	110	120	125	120	115	115	110	110	110	110	115	112	120	118	110	115	110	110	110	110
U Q	110	110	110	110	115	140	130	120	120	115	115	115	120	120	122	125	125	120	115	120	120	115	115	115
L Q	105	105	102	102	105	110	118	115	110	110	110	110	110	105	110	110	112	110	110	110	108	110	105	110

JUL. 1993 H'ES (KM) COMMUNICATIONS RESEARCH LABORATORY, JAPAN

IONOSPHERIC DATA STATION KOKUBUNJI

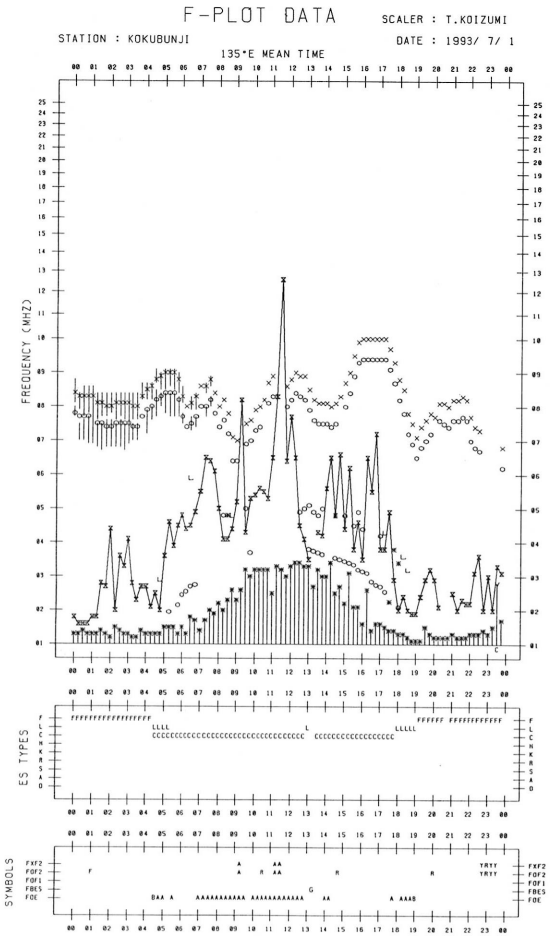
JUL. 1993 TYPES OF ES 135°E MEAN TIME (G.M.T. + 9H)

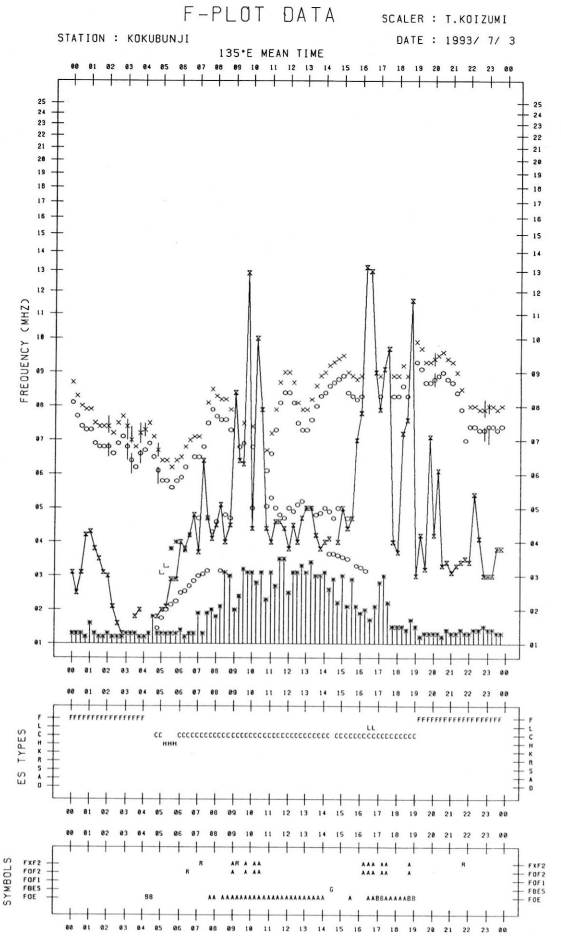
LAT. 35°42.4'N LON. 139°29.3'E SWEEP 1.0MHZ TO 25.0MHZ IN 24.0SEC IN MANUAL SCALING

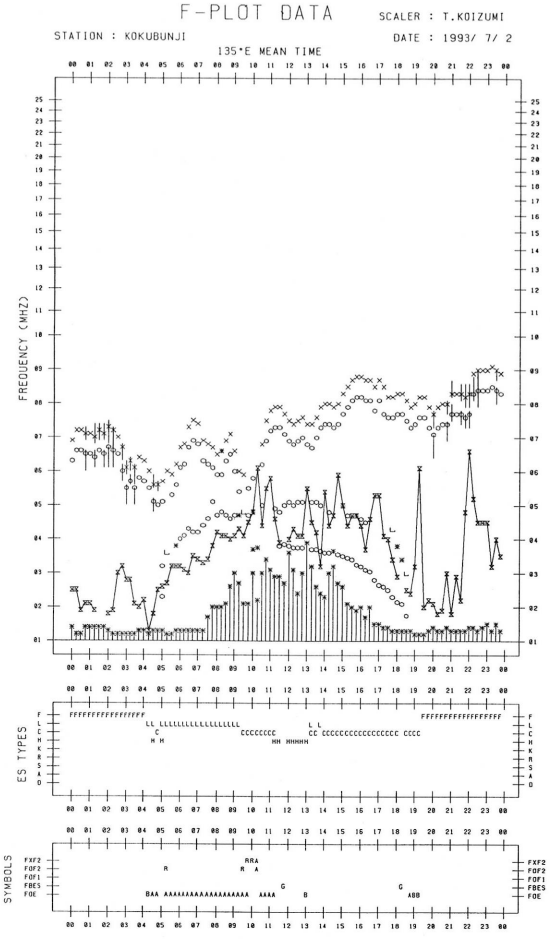
D \ H	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
1	F 2	F 3	F 5	F 4	F 4	CL 21	C 2	C 3	C 2	C 3	C 2	C 2	C 2	L 1	C 2	C 2	C 2	C 2	L 1	L 3	FF 32	F 2	F 3	F 2
2	F 4	F 3	FF 24	FF 23	F 3	HL 12	L 2	L 2	L 2	L 1	C 2	C 2	H 1	H 3	C 1	C 2	C 2	C 3	C 2	C 3	F 3	F 3	F 5	F 4
3	F 4	F 4	F 4	F 2	F 1	C 2	C 3	C 2	C 3	C 3	C 2	C 1	C 2	C 2	C 2	C 2	C 3	C 1	C 2	C 3	F 4	F 3	F 4	F 3
4	F 3	F 3	F 1	F 2		CL 11	H 1	C 2	C 2	C 3	C 3	C 3	C 3	L 2	L 2	L 3	L 2	L 2	L 2	L 2	FF 21	FF 22	F 2	FF 13
5	F 2	F 1	F 1	F 1		H 1	HL 11	C 1	C 1	C 2	C 2	C 2	C 1	C 1			H 1	H 1	C 4	C 3	F 3	F 3	F 4	F 3
6	F 4	F 5	F 4	F 3	F 2		C 1	CL 21	H 1	C 2	C 3	C 2	C 3	L 2	L 2	CL 12		C 3	C 3	C 4	F 2	F 2	FF 13	F 3
7	F 3	F 3	F 4	F 3	F 2	L 1	H 1	C 2	C 3	C 2	L 3	L 3	C 2	C 2	C 3	L 1	HL 11	L 1	CL 11	L 2	F 3	FF 24	F 4	F 5
8	F 5	F 3	F 3	F 2	F 2	H 1	C 2	C 2	C 2	C 2	C 2	C 2	C 2	L 3	L 1				L 1	C 2	F 1	F 3	F 2	F 3
9	F 3	F 2	F 2	F 2	FF 23	C 2	C 4	C 3	C 3	L 2	L 2	L 2	L 2		C 1	C 2	C 2	C 3	C 2	C 2	FF 51	F 2	F 2	F 4
10	F 4	F 3	FF 23	FF 12	F 1	H 1	C 2	C 2	C 3	CC 22	C 2	C 2	CL 23	L 2	L 2	L 2	C 2	C 3	C 4	C 3	FF 23	F 4	F 4	F 4
11	F 3	F 3	F 3	F 2	F 2	C 1	C 1	C 3	C 3	C 3	C 2	C 3	C 2	C 3	CL 12	L 1	L 3	L 3	L 2	L 2	F 2	F 3	FF 32	F 4
12	F 6	F 4	F 4	F 4	F 3	C 3	C 2	C 1	C 2	C 2	C 2	C 2	C 2	C 2	C 2	C 1	C 2	C 3	C 1	L 1	F 2	F 4	FF 12	F 1
13	F 3	F 2	FF 21	F 2	F 1	C 1	C 3	C 3	C 2	C 2	C 1	C 1	C 1	C 1		C 1	C 1	C 1	C 1	C 1	F 5	F 3	F 3	F 2
14	F 4	F 2	F 3	F 2	F 3	C 1	C 2	C 3	C 3	C 2	C 2	C 2	C 2	L 2	L 2	L 2	L 1	L 3	LC 32	C 2	F 1	F 1		
15	F 1	F 2	F 2	F 1	F 2	C 1		H 1		C 1	C 2	C 3	C 2	C 3	C 3	L 3	L 1	L 2	CL 11	L 1	F 3	F 3	F 2	F 3
16	F 4	F 3	F 3	F 2	FF 32	CL 21	C 2	C 1	HL 11	L 2	L 2	L 2	L 3	L 3	L 3	L 2	CL 32	CL 32	CL 32	CL 32	FF 22	FF 12	FF 11	F 2
17	F 1	FF 21	F 2	F 2	F 2	C 2	L 2	C 2	C 2	C 1	C 1	C 1	C 1	CL 11	CL 11	L 2	L 2	L 2	L 2	CL 33	F 4	F 5	F 5	FF 23
18	F 5	F 3	F 5	F 2	F 4	L 3	L 3	L 2	L 2	L 2	C 2	L 2	L 1	L 1	L 1	HL 21	CL 11	C 3	C 4	C 4	F 3	F 4	F 5	F 4
19	F 4	F 3	F 3	FF 22	FF 11	LC 11	C 3	C 2	C 1	C 3	C 2	C 3	L 2	L 3	L 3	HL 23	CL 32	CL 32	C 3	C 4	F 3	F 2	F 4	F 3
20	F 3	F 3	F 3	F 2	FF 11	L 1	C 1	C 2	C 3	C 2	C 2	CL 11	L 2	L 1	HL 11	H 2	C 2	C 2	C 4					
21					F 3	C 2	C 3	C 3	C 2	C 3	C 2	C 2	HC 12		H 2	C 3	C 3	C 3	C 2	C 2	F 2	F 3	F 3	F 3
22	F 3	F 3	F 3	F 3	F 2	C 3	C 1	C 1	C 2	C 1	C 2	C 2	C 1	C 2	C 2	C 1	C 2	C 2	C 3	C 3	F 3	F 1	F 2	F 3
23	F 3	F 3	F 4	F 4	F 5	L 2	L 1	C 2	C 3	C 2	C 2	C 2	L 1	CL 11	C 2			C 1	C 2	C 3		F 2	F 5	FF 31
24	F 3	F 2	F 2		F 1	CL 12	H 1	H 1	C 1	C 2	C 2	C 2	C 2	CL 22	L 2	L 3	L 1	C 1	C 2	C 3	F 3	F 3	F 3	F 2
25	F 2	F 1	FF 12	F 3	F 2	C 1	C 2	C 2	C 2	C 3	C 1	C 2	C 2	L 2	C 1	L 1	C 1	C 2	C 1	C 1	F 1	F 1	F 1	F 1
26	F 3	F 2	FF 11	F 1		H 1			C 1	C 1	C 1	L 1	C 1	C 2	L 2	L 2	L 3	L 4	L 2	F 1		F 1	F 1	
27	F 3	F 2	F 1	F 1		C 1	C 1	C 1		C 2	C 2	C 2	L 3	L 2	L 2	C 1	C 1	C 1	C 2	F 2		F 4	F 3	F 2
28	F 2	F 1	F 2	F 3		C 3	C 1	C 2	C 2	C 2	C 2	C 2	C 2	L 2	L 2			C 1	C 2		F 1	F 1	F 1	F 1
29	F 2		F 3	F 2	F 1	C 1	C 1	C 2	C 1	C 2	C 1	C 1	C 1	C 1	CL 21	C 1	C 1	C 2	C 2			F 3	F 2	F 3
30	F 3	F 3	F 1	F 2	F 2	C 2	C 3	C 3	C 3	C 1	C 1	C 1	C 3	C 1	H 1			H 1	C 1	F 1	F 4	F 1	F 2	F 2
31	F 2	F 2				CL 11	C 1	C 2	C 1	L 2	L 2	L 1	L 2	L 2	L 1	L 2		C 1	C 2	F 1				
	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
CNT																								
MED																								
U Q																								
L Q																								

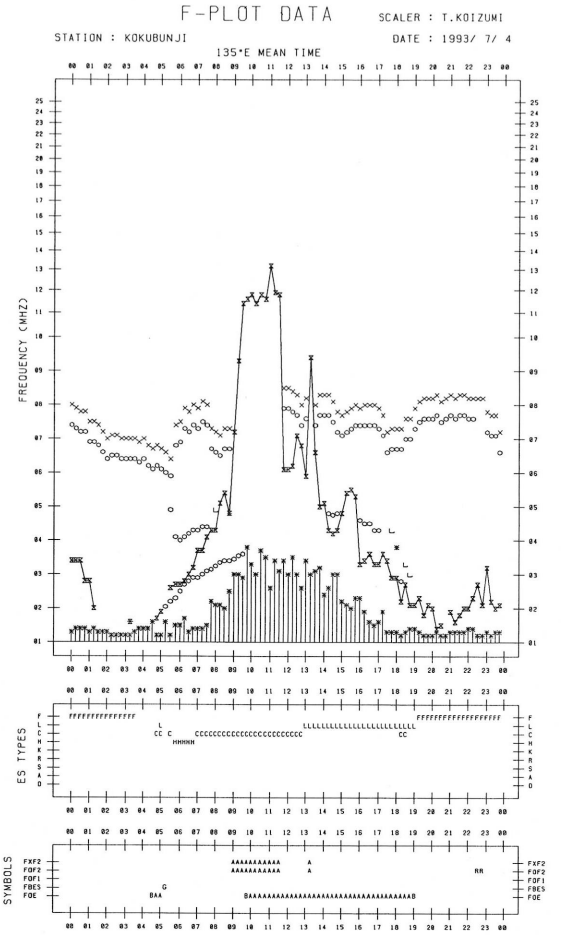
f-PLOTS OF IONOSPHERIC DATA

KEY OF F-PLOT	
I	SPREAD
⬡	FOF2, FOF1, FOE
×	FXF2
✳	DOUBTFUL FOF2, FOF1, FOE
⧖	FBES
⌊	ESTIMATED FOF1
⍑, ⍲	FMIN
∧	GREATER THAN
∨	LESS THAN


F-PLOT DATA
SCALER : T.KOIZUMI
STATION : KOKUBUNJI
DATE : 1993/ 7/ 1
135°E MEAN TIME
FREQUENCY (MHZ)
ES TYPES
SYMBOLS


F-PLOT DATA
SCALER : T.KOIZUMI
STATION : KOKUBUNJI
DATE : 1993/ 7/ 3
135°E MEAN TIME
FREQUENCY (MHZ)
ES TYPES
SYMBOLS


F-PLOT DATA
SCALER : T.KOIZUMI
STATION : KOKUBUNJI
DATE : 1993/ 7/ 2
135°E MEAN TIME
FREQUENCY (MHZ)
ES TYPES
SYMBOLS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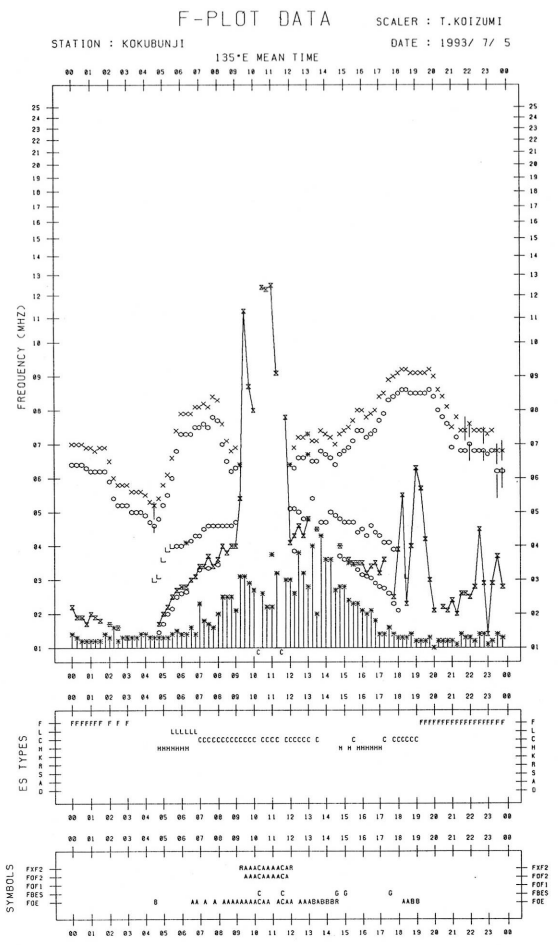
SCALER : T.KOIZUMI
STATION : KOKUBUNJI
DATE : 1993/ 7/ 4
135°E MEAN TIME
FREQUENCY (MHZ)
ES TYPES
SYMBOLS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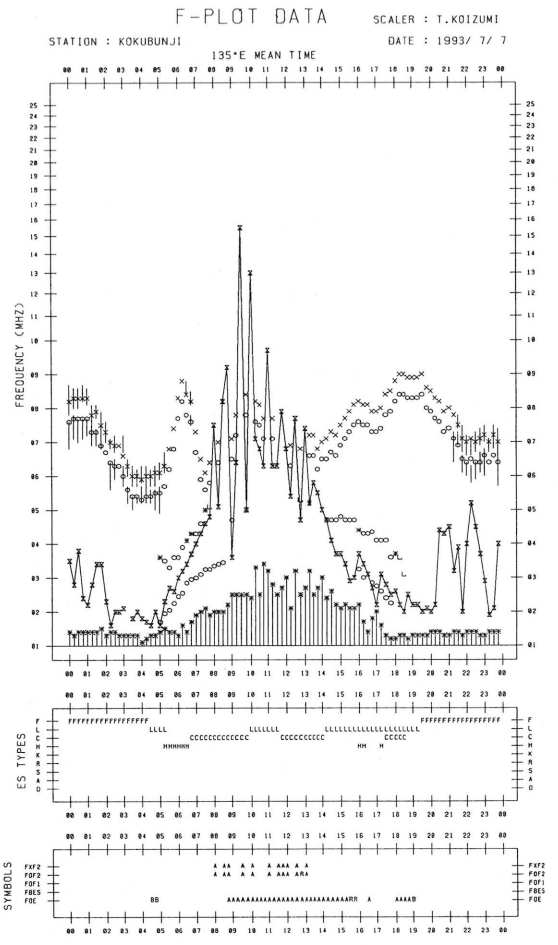
STATION : KOKUBUNJI
DATE : 1993/ 7/ 5
135°E MEAN TIME
FREQUENCY (MHZ)
ES TYPES
SYMBOLS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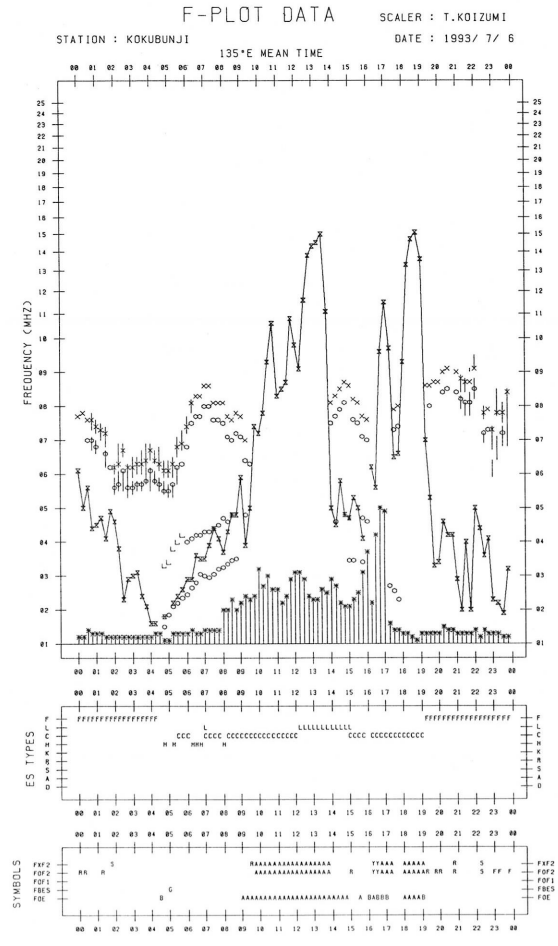
STATION : KOKUBUNJI
DATE : 1993/ 7/ 7
135°E MEAN TIME
FREQUENCY (MHZ)
ES TYPES
SYMBOLS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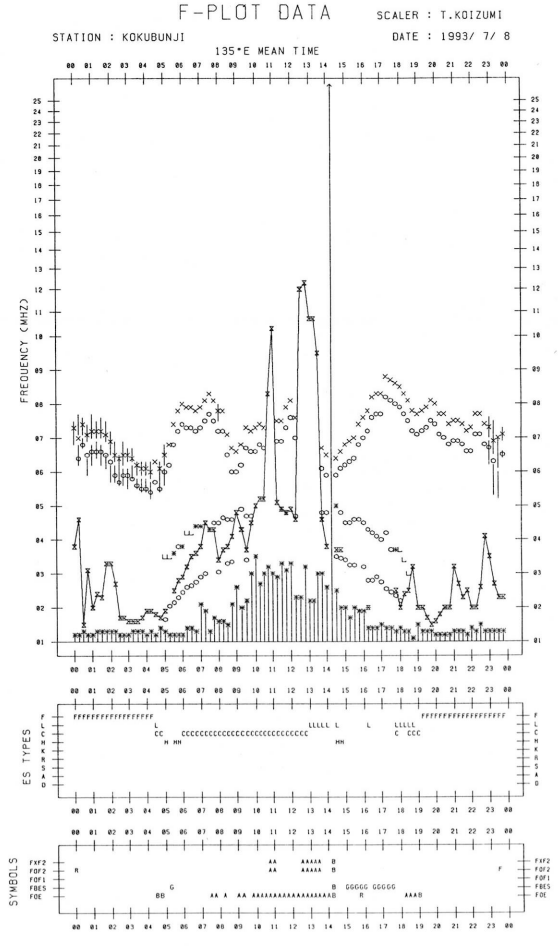
STATION : KOKUBUNJI
DATE : 1993/ 7/ 6
135°E MEAN TIME
FREQUENCY (MHZ)
ES TYPES
SYMBOLS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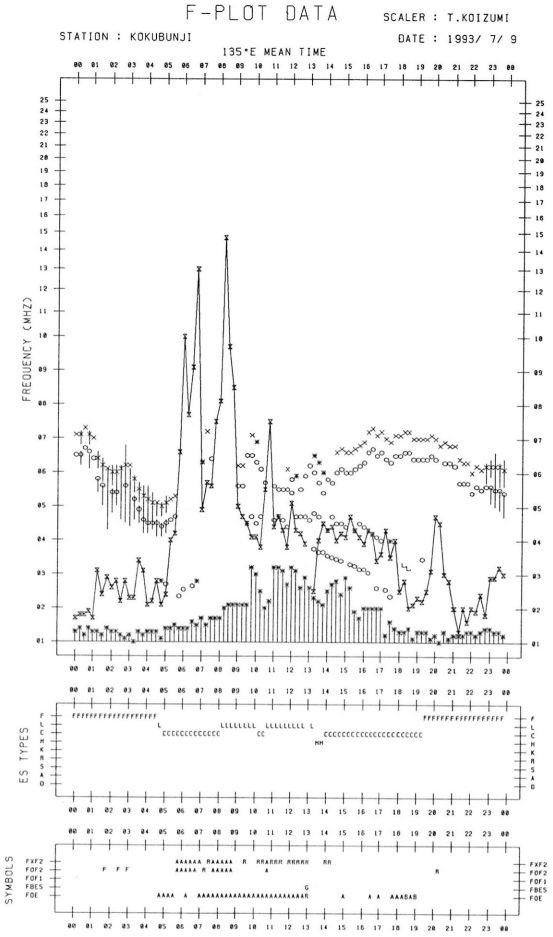
STATION : KOKUBUNJI
DATE : 1993/ 7/ 8
135°E MEAN TIME
FREQUENCY (MHZ)
ES TYPES
SYMBOLS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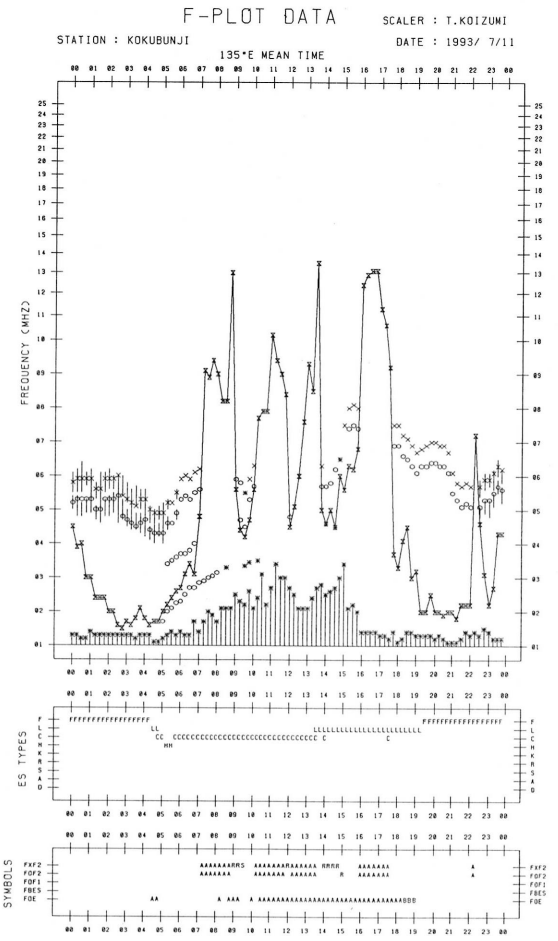
SCALER : T.KOIZUMI
STATION : KOKUBUNJI
DATE : 1993/ 7/ 9
135°E MEAN TIME
FREQUENCY (MHZ)
ES TYPES
SYMBOLS
FXF2
FOF2
FOF1
FBES
FOE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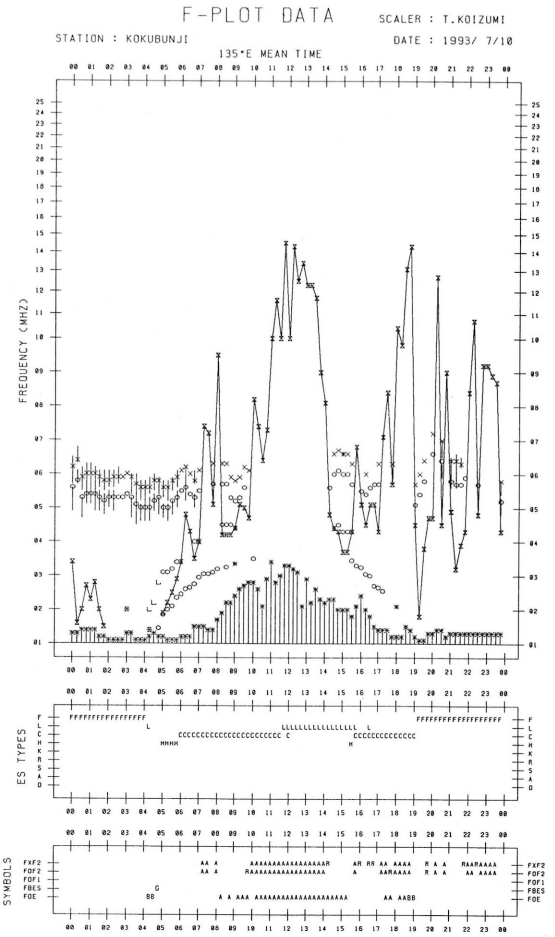
STATION : KOKUBUNJI
DATE : 1993/ 7/11
135°E MEAN TIME
FREQUENCY (MHZ)
ES TYPES
SYMBOLS
FXF2
FOF2
FOF1
FBES
FOE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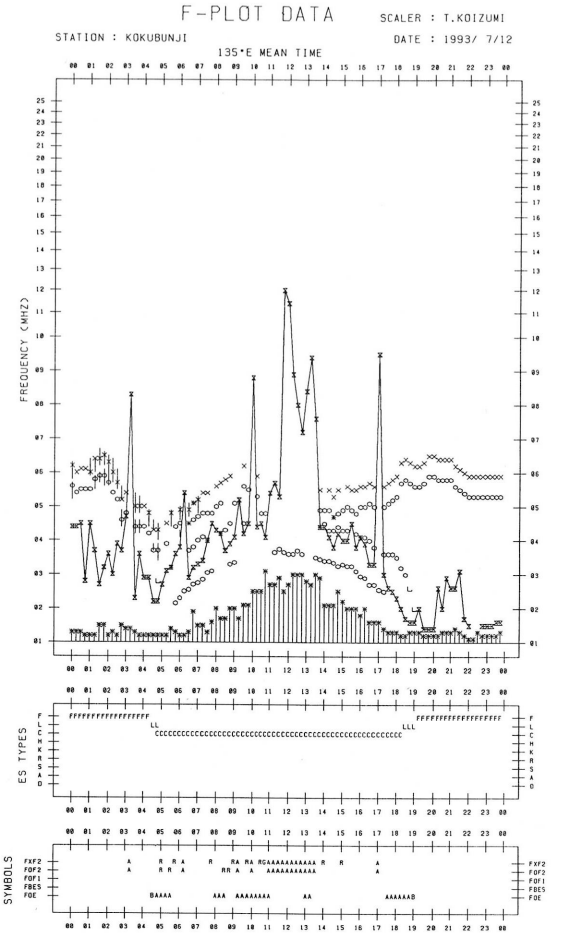
SCALER : T.KOIZUMI
STATION : KOKUBUNJI
DATE : 1993/ 7/10
135°E MEAN TIME
FREQUENCY (MHZ)
ES TYPES
SYMBOLS
FXF2
FOF2
FOF1
FBES
FOE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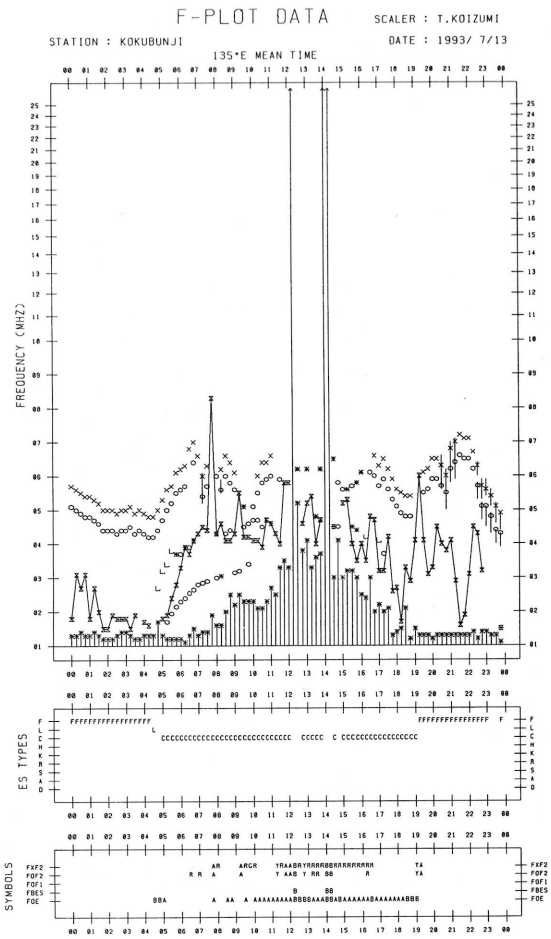
STATION : KOKUBUNJI
DATE : 1993/ 7/12
135°E MEAN TIME
FREQUENCY (MHZ)
ES TYPES
SYMBOLS
FXF2
FOF2
FOF1
FBES
FOE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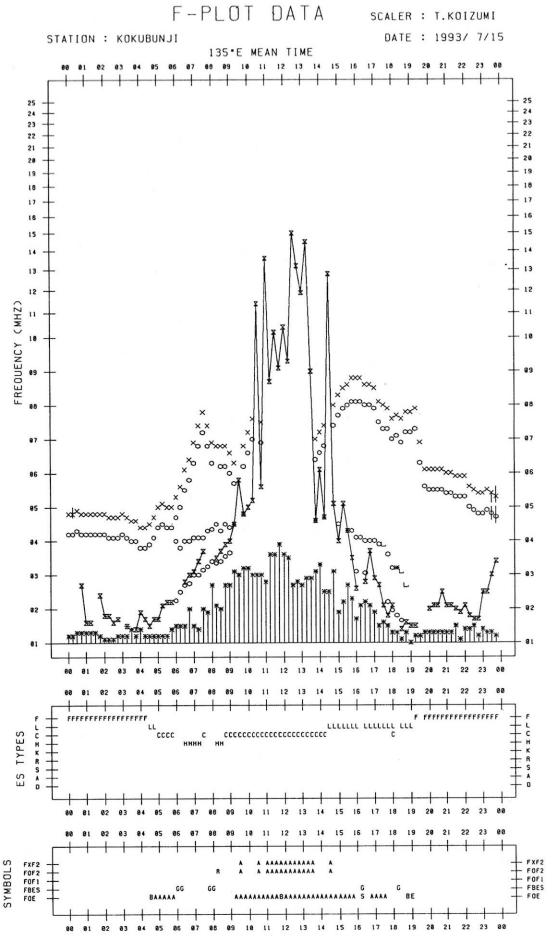
SCALER : T.KOIZUMI
STATION : KOKUBUNJI
DATE : 1993/ 7/13
135°E MEAN TIME
FREQUENCY (MHZ)
ES TYPES
SYMBOLS
FXF2
FOF2
FOF1
FBES
FOE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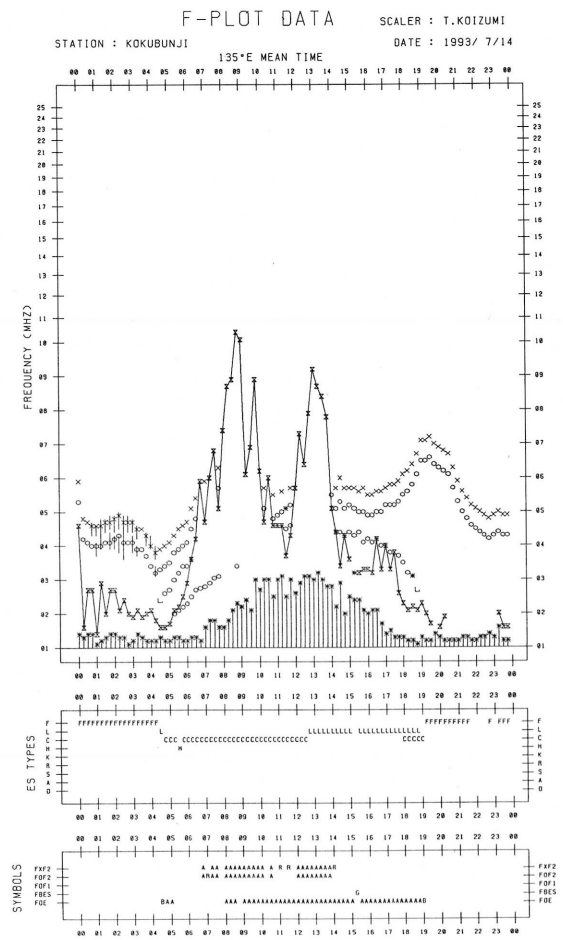
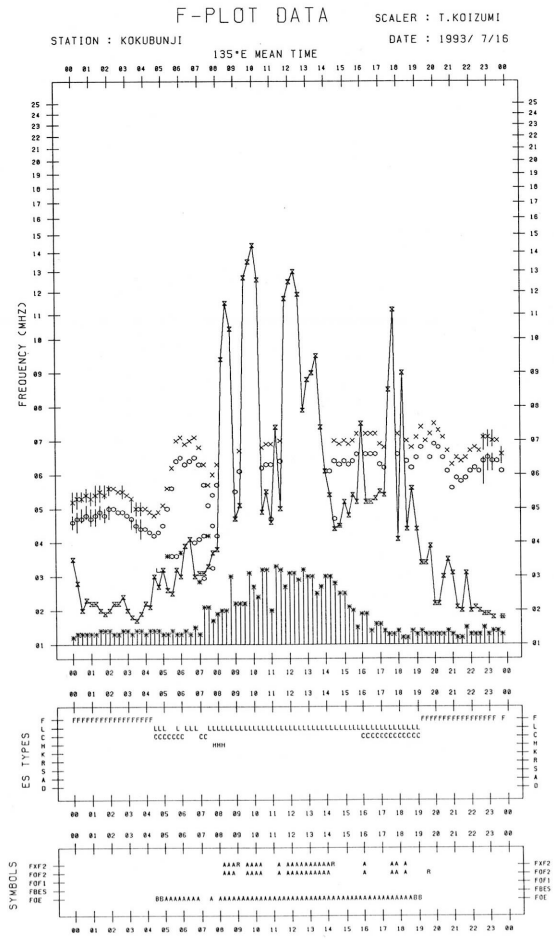
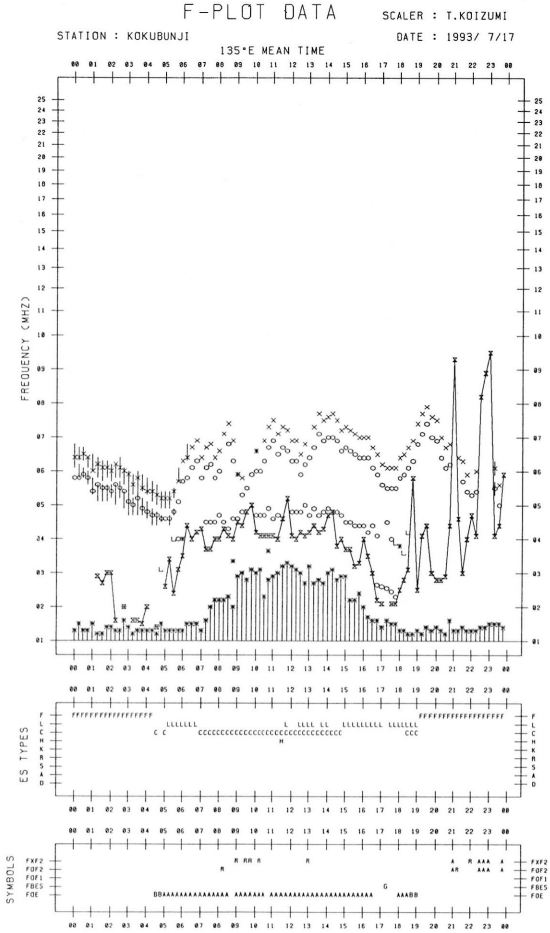
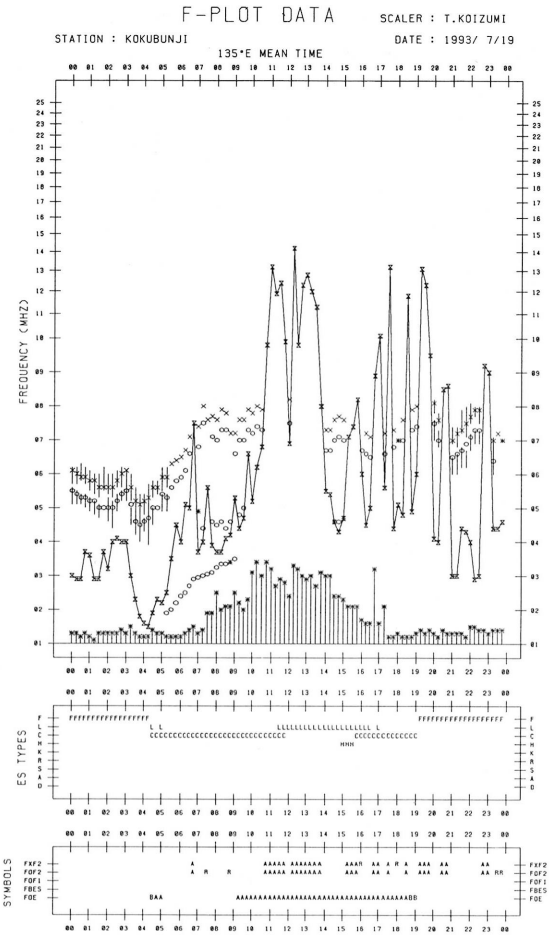
SCALER : T.KOIZUMI
STATION : KOKUBUNJI
DATE : 1993/ 7/15
135°E MEAN TIME
FREQUENCY (MHZ)
ES TYPES
SYMBOLS
FXF2
FOF2
FOF1
FBES
FOE


F-PLOT DATA
SCALER : T.KOIZUMI
STATION : KOKUBUNJI
DATE : 1993/ 7/14
135°E MEAN TIME
FREQUENCY (MHZ)
ES TYPES
SYMBOLS
FXF2
FOF2
FOF1
FBES
FOE


F-PLOT DATA
SCALER : T.KOIZUMI
STATION : KOKUBUNJI
DATE : 1993/ 7/16
135°E MEAN TIME
FREQUENCY (MHZ)
ES TYPES
SYMBOLS
FXF2
FOF2
FOF1
FBES
FOE


F-PLOT DATA
SCALER : T.KOIZUMI
STATION : KOKUBUNJI
DATE : 1993/ 7/17
135°E MEAN TIME
FREQUENCY (MHZ)
ES TYPES
SYMBOLS
FXF2
FQF2
FQF1
FBES
FOE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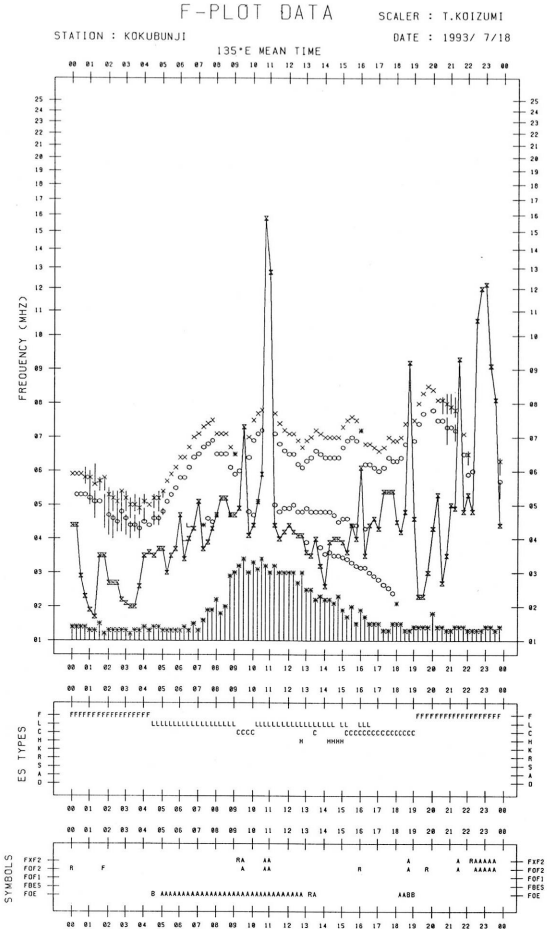
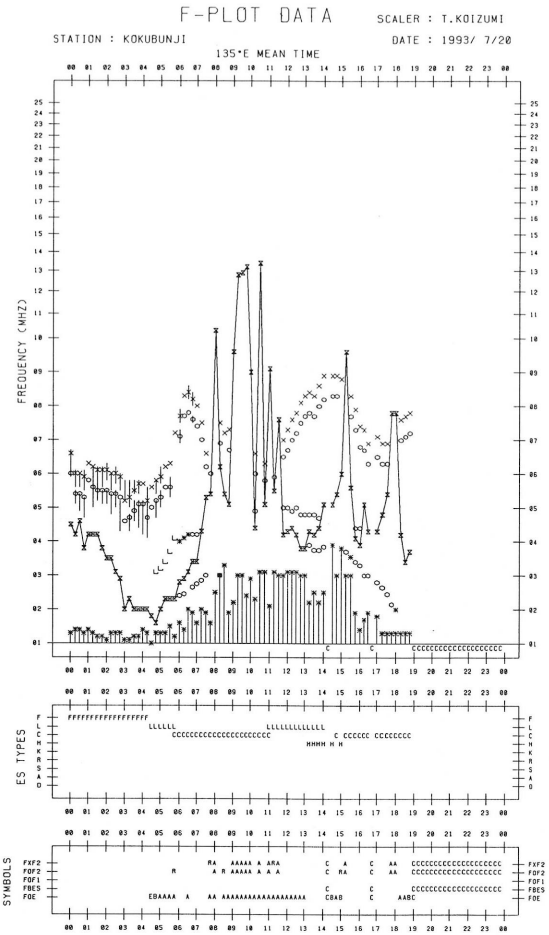
SCALER : T.KOIZUMI
STATION : KOKUBUNJI
DATE : 1993/ 7/19
135°E MEAN TIME
FREQUENCY (MHZ)
ES TYPES
SYMBOLS
FXF2
FQF2
FQF1
FBES
FOE


F-PLOT DATA
SCALER : T.KOIZUMI
STATION : KOKUBUNJI
DATE : 1993/ 7/18
135°E MEAN TIME
FREQUENCY (MHZ)
ES TYPES
SYMBOLS
FXF2
FQF2
FQF1
FBES
FOE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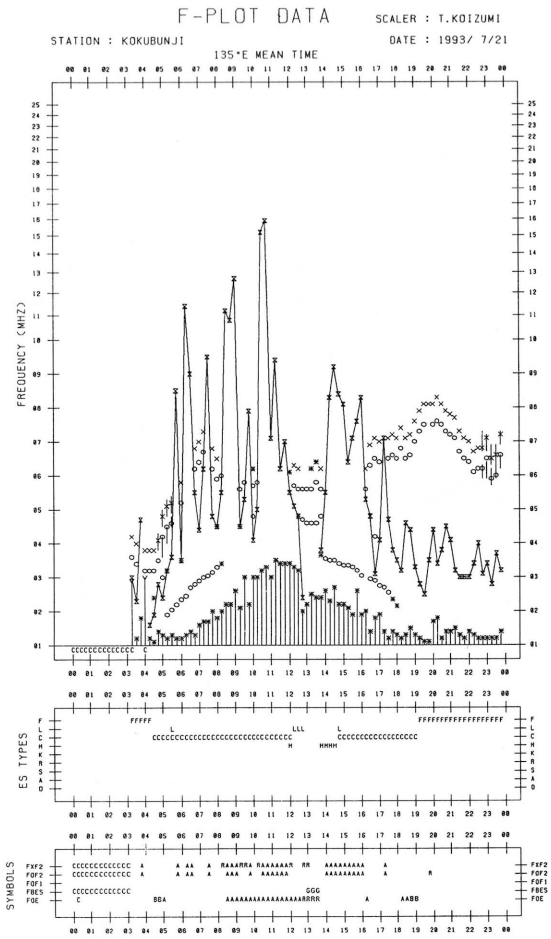
SCALER : T.KOIZUMI
STATION : KOKUBUNJI
DATE : 1993/ 7/20
135°E MEAN TIME
FREQUENCY (MHZ)
ES TYPES
SYMBOLS
FXF2
FQF2
FQF1
FBES
FOE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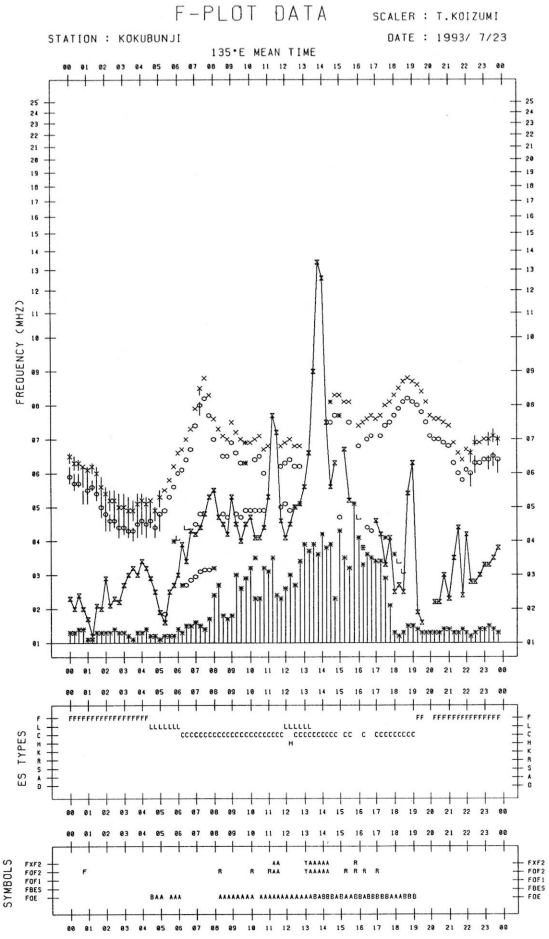
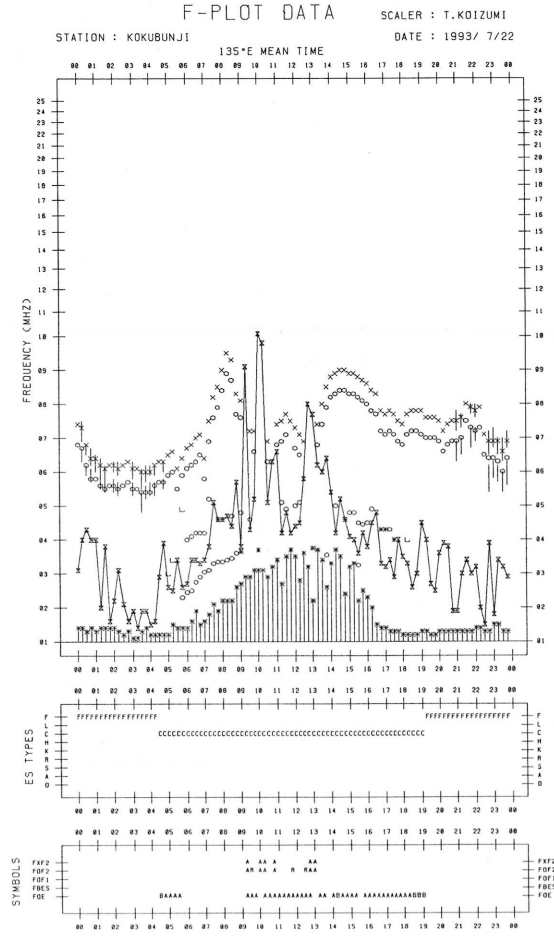
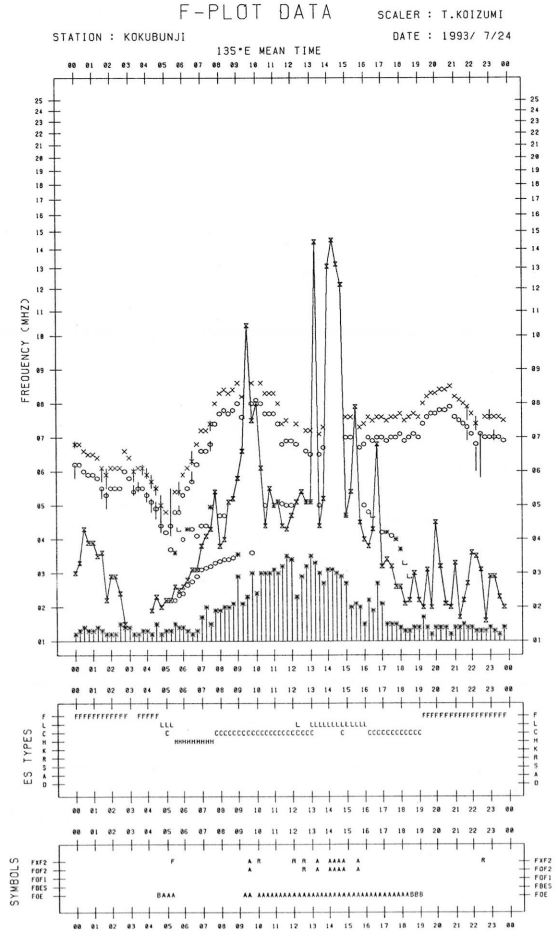
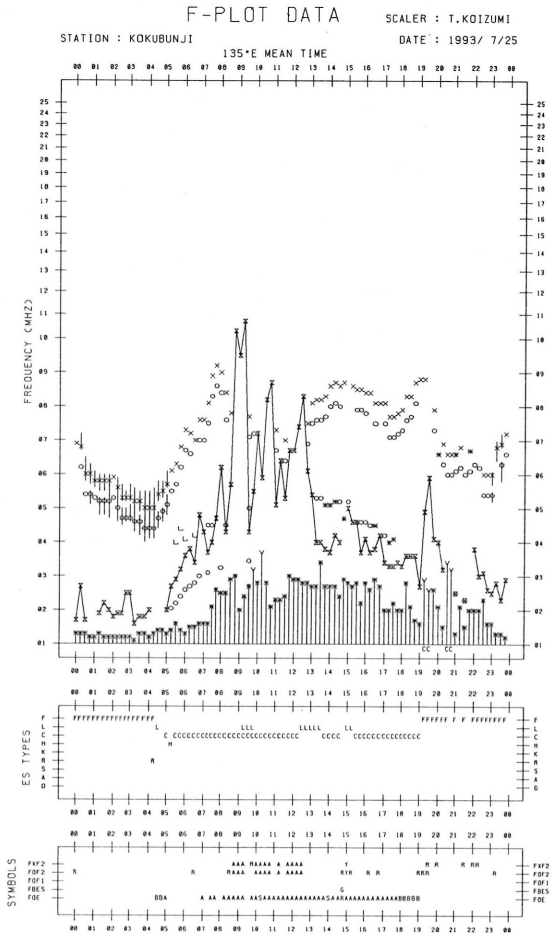
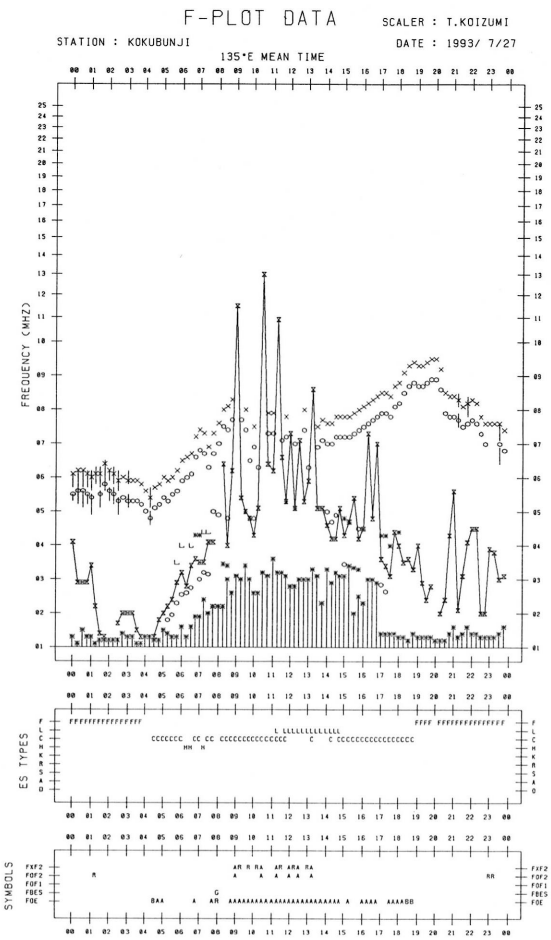
STATION : KOKUBUNJI
DATE : 1993/ 7/21
135°E MEAN TIME
FREQUENCY (MHZ)
ES TYPES
SYMBOLS
FXF2
FOF2
FOF1
FBES
FOE


F-PLOT DATA
SCALER : T.KOIZUMI
STATION : KOKUBUNJI
DATE : 1993/ 7/23
135°E MEAN TIME
FREQUENCY (MHZ)
ES TYPES
SYMBOLS
FXF2
FOF2
FOF1
FBES
FOE


F-PLOT DATA
SCALER : T.KOIZUMI
STATION : KOKUBUNJI
DATE : 1993/ 7/22
135°E MEAN TIME
FREQUENCY (MHZ)
ES TYPES
SYMBOLS
FXF2
FOF2
FOF1
FBES
FOE


F-PLOT DATA
SCALER : T.KOIZUMI
STATION : KOKUBUNJI
DATE : 1993/ 7/24
135°E MEAN TIME
FREQUENCY (MHZ)
ES TYPES
SYMBOLS
FXF2
FOF2
FOF1
FBES
FOE


F-PLOT DATA
SCALER : T.KOIZUMI
STATION : KOKUBUNJI
DATE : 1993/ 7/25
135°E MEAN TIME
FREQUENCY (MHZ)
ES TYPES
SYMBOLS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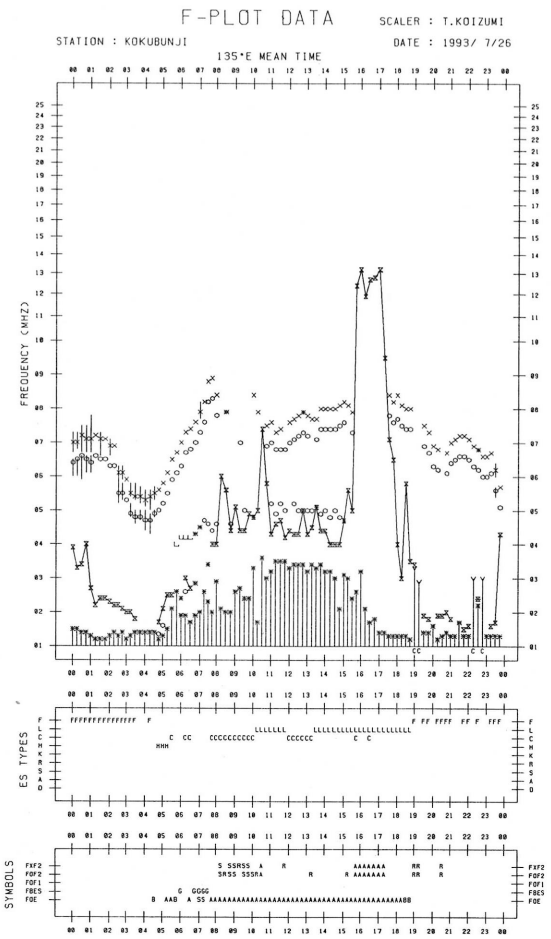
SCALER : T.KOIZUMI
STATION : KOKUBUNJI
DATE : 1993/ 7/27
135°E MEAN TIME
FREQUENCY (MHZ)
ES TYPES
SYMBOLS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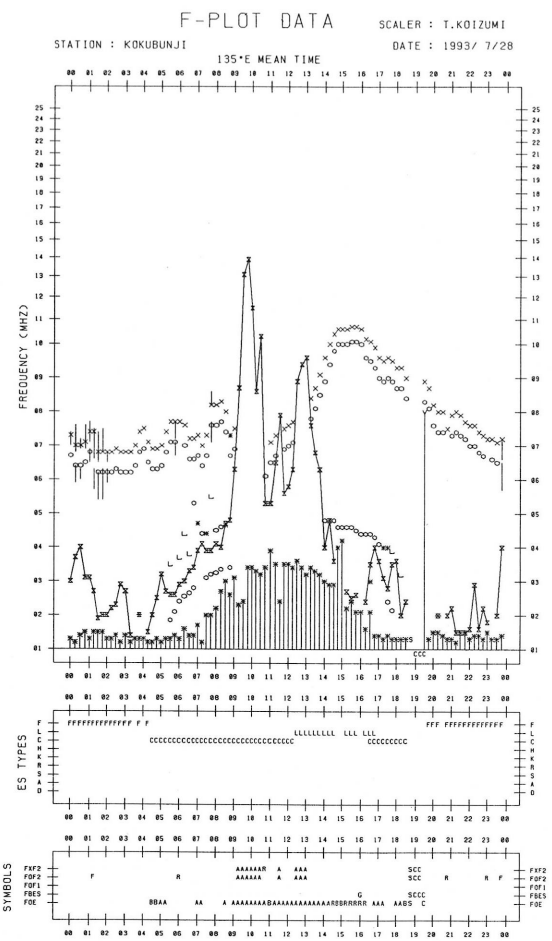
SCALER : T.KOIZUMI
STATION : KOKUBUNJI
DATE : 1993/ 7/26
135°E MEAN TIME
FREQUENCY (MHZ)
ES TYPES
SYMBOLS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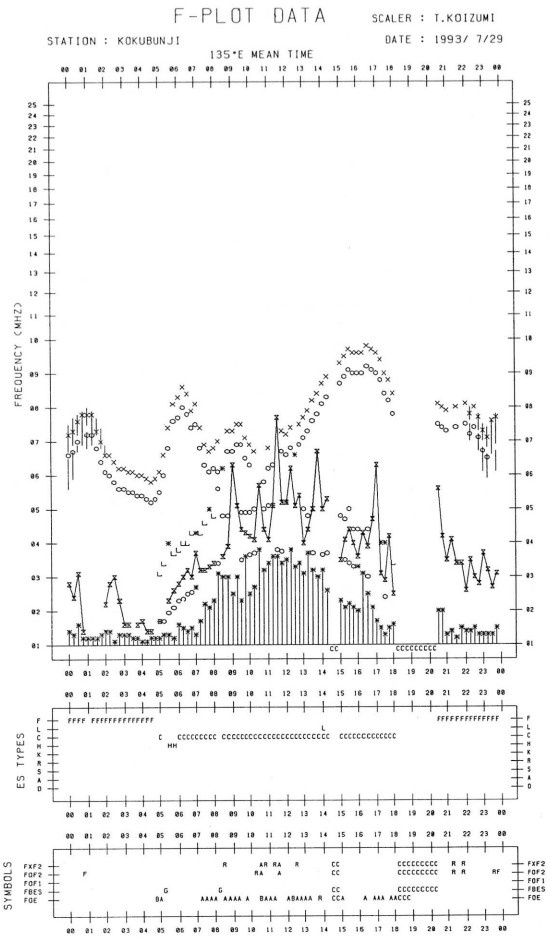
STATION : KOKUBUNJI
DATE : 1993/ 7/28
135°E MEAN TIME
FREQUENCY (MHZ)
ES TYPES
SYMBOLS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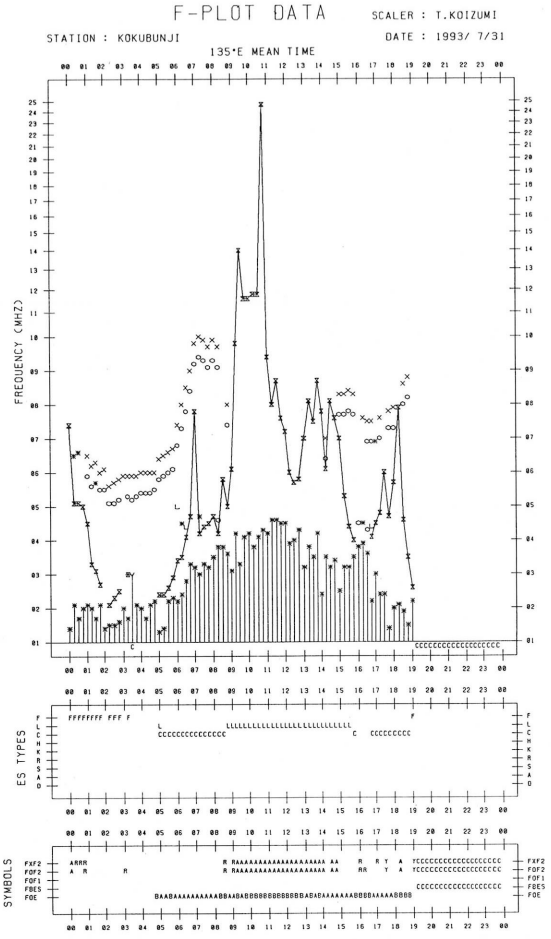
SCALER : T.KOIZUMI
STATION : KOKUBUNJI
DATE : 1993/ 7/29
135°E MEAN TIME
FREQUENCY (MHZ)
ES TYPES
SYMBOLS
FXF2
FOF2
FOF1
FBES
FOE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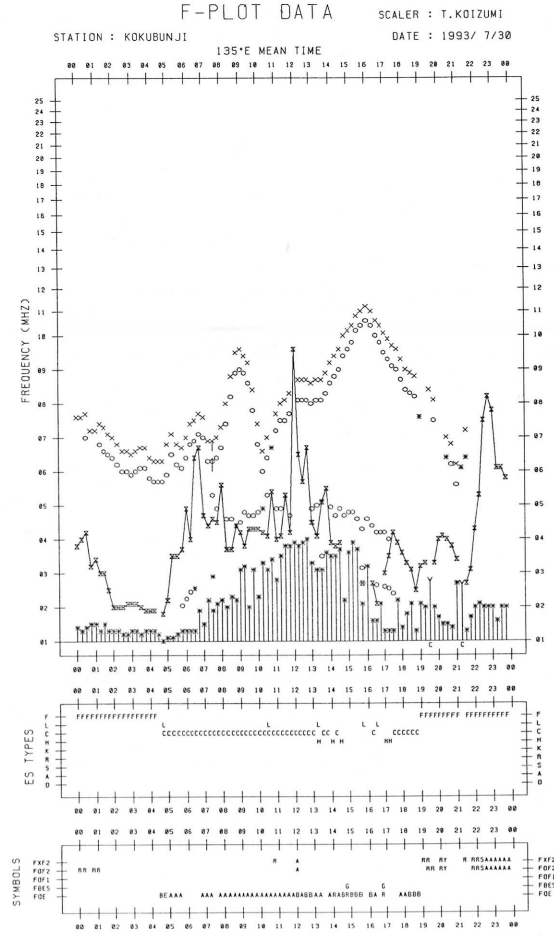
SCALER : T.KOIZUMI
STATION : KOKUBUNJI
DATE : 1993/ 7/31
135°E MEAN TIME
FREQUENCY (MHZ)
ES TYPES
SYMBOLS
FXF2
FOF2
FOF1
FBES
FOE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SCALER : T.KOIZUMI
STATION : KOKUBUNJI
DATE : 1993/ 7/30
135°E MEAN TIME
FREQUENCY (MHZ)
ES TYPES
SYMBOLS
FXF2
FOF2
FOF1
FBES
FOE

B. Solar Radio Emission

B1. Daily Data at Hiraiso

200,500 MHz

No observations due to system replacement.

B. Solar Radio Emission

B2. Outstanding Occurrences at Hiraiso

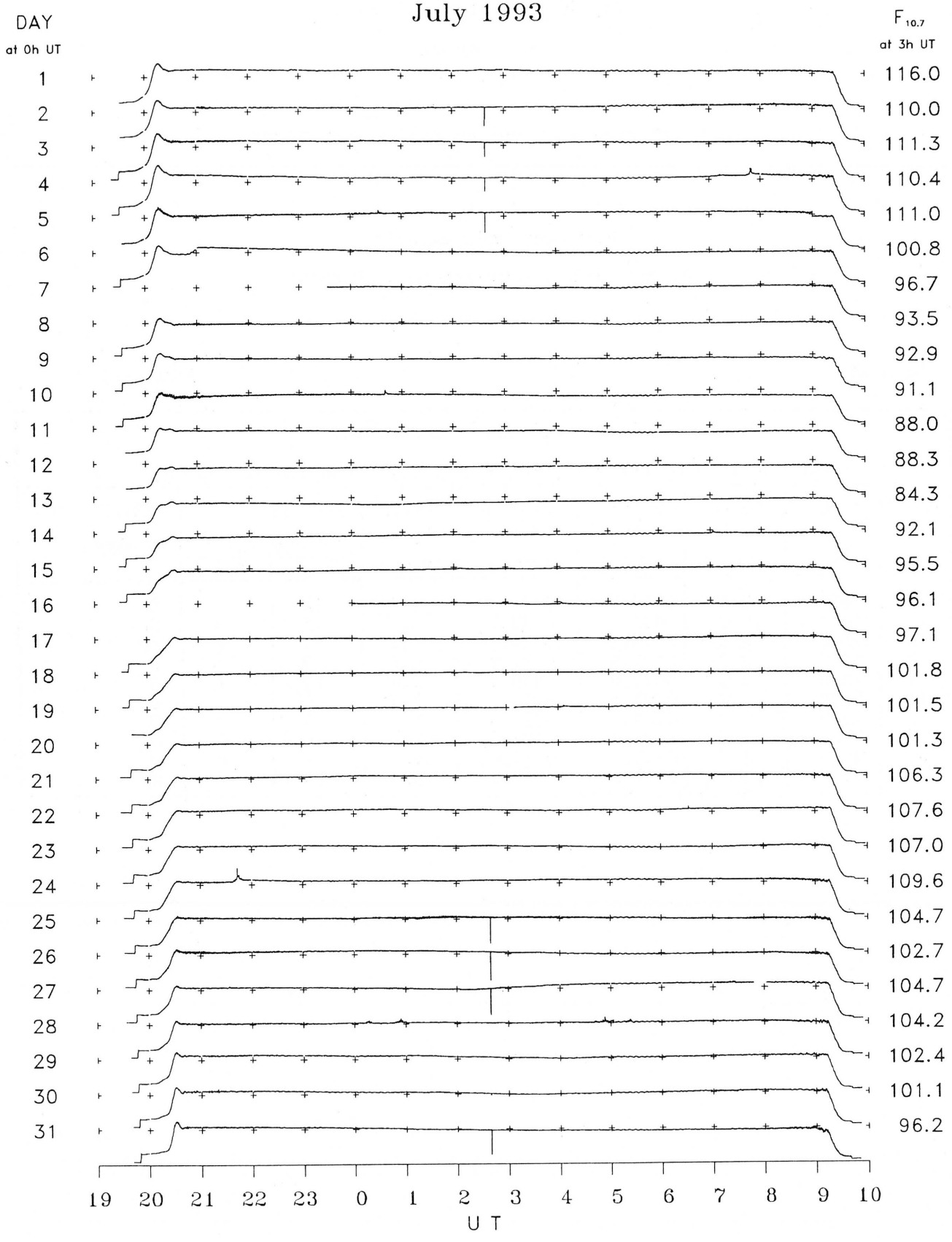
Hiraiso July 1993

Single-frequency observations

Normal observing period: 1940 - 0955 U.T. (sunrise to sunset)

JUL. 1993	FREQ. (MHz)	TYPE	START TIME (U.T.)	TIME OF MAXIMUM (U.T.)	DUR. (MIN.)	FLUX DENSITY (10^{-22}Wm^{-2}Hz^{-1}) PEAK	FLUX DENSITY (10^{-22}Wm^{-2}Hz^{-1}) MEAN	POLARIZATION REMARKS
4	2800	45 C	0744.0	0749.0	6.0	22	7	0
5	2800	46 C	0033.2	0033.2	1.5	15	8	0
6	2800	4 S/F	0723.5	0724.0	1.3	17	4	SR
7	2800	8 S	0131.5	0131.9	0.5	9	7	0
10	2800	3 S	0040.0	0040.4	3.0	10	4	0
14	2800	1 S	0701.5	0703.3	3.0	5	3	0
15	2800	1 S	0724.3	0724.8	1.5	6	2	0
16	2800	1 S	0403.4	0404.5	3.0	6	2	0
22	2800	8 S	0632.6	0632.9	0.5	6	4	0
23	2800	46 C	2142.0	2142.5	6.0	23	14	WR

B 3. Summary Plots of $F_{10.7}$ at Hiraiso



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

C. RADIO PROPAGATION

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

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

MEASURED AT HIRAISO

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

C. RADIO PROPAGATION

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

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

MEASURED AT HIRAISO

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

C. Radio Propagation

C2. Radio Propagation Quality Figures at Hiraiso

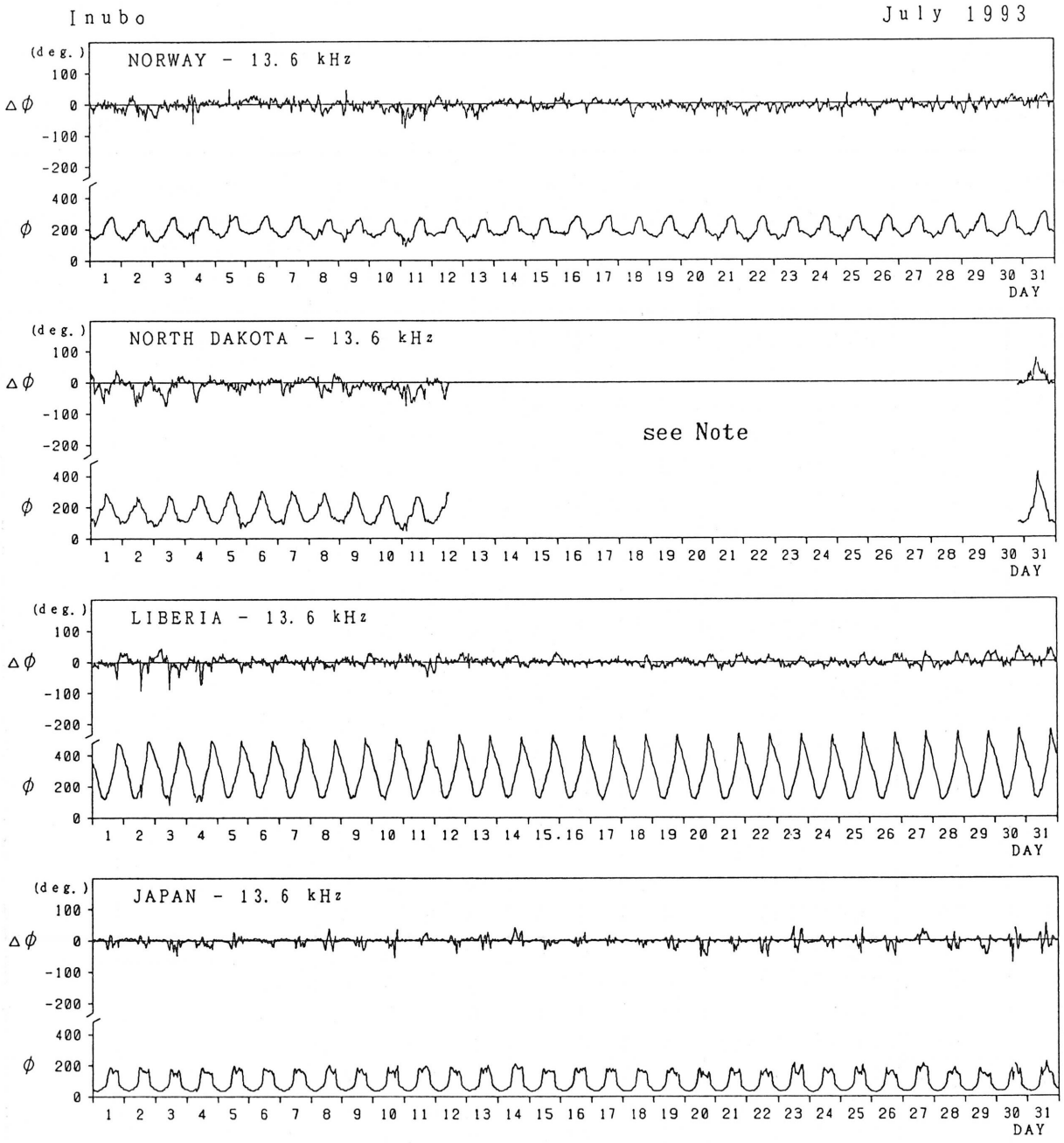
Hiraiso

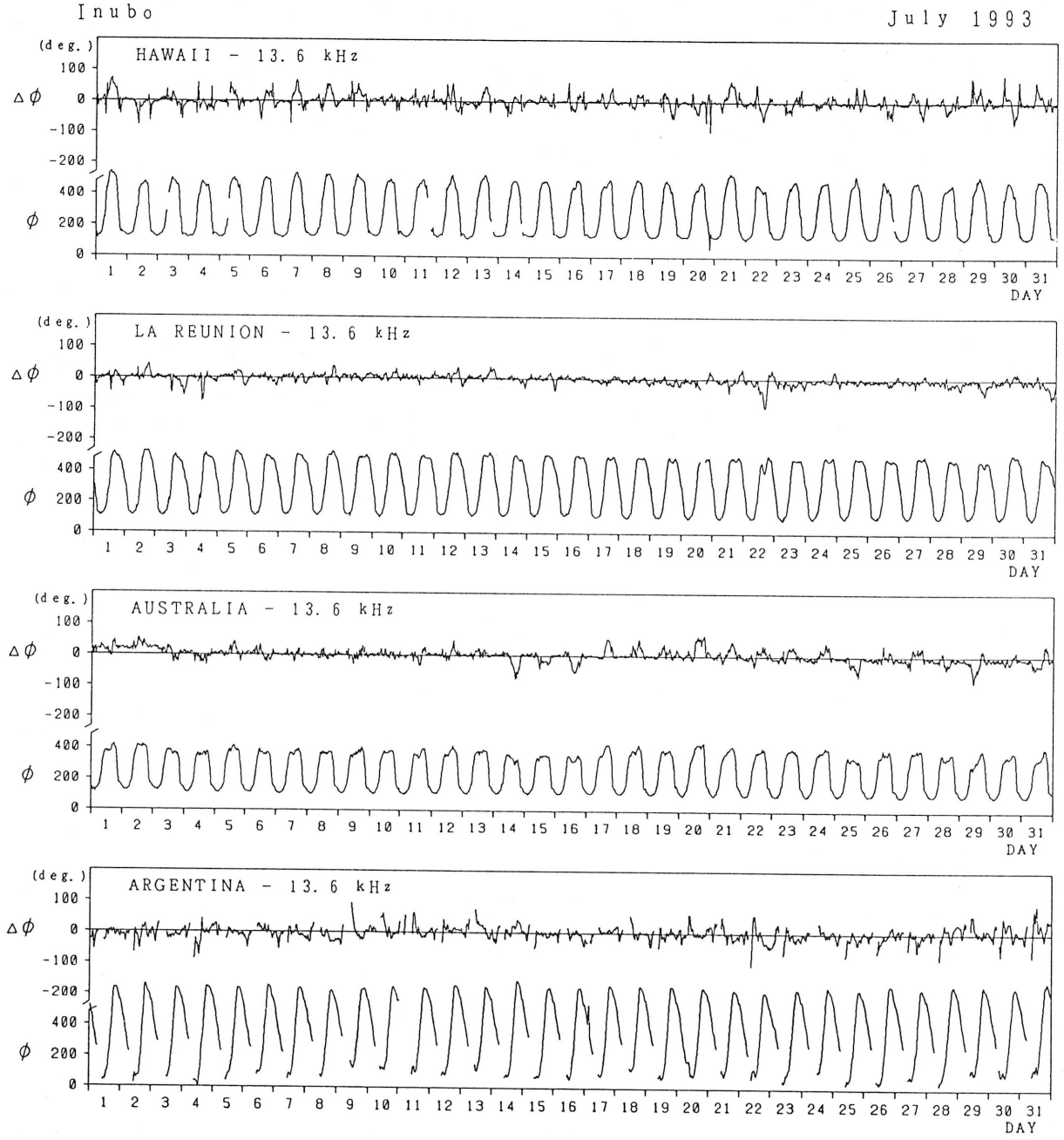
Time in U.T.

July 1993	Whole Day Figure	W W V 00 06 12 18 / 06 12 18 24	W W V H 00 06 12 18 / 06 12 18 24	Condition 00 06 12 18 / 06 12 18 24	Principal Geomagnetic Storms Start h m	End h	Range nT
1	3+	(2)(3)(4)(5)	4 4 3 3	n n n n	None		
2	3+	(1)(3)(4)(4)	4 4 4 4	n n n n			
3	4-	(4)(3)(2)(4)	4 4 4 4	n n n n			
4	4o	(3)(5)(3)(5)	4 4 3 4	n n n n			
5	4+	(4)(5) 5 -	4 4 4 4	n n n n			
6	4o	(3) 5 (4)(3)	4 4 5 4	n n n n			
7	4+	(4)(5) 4 (5)	4 4 4 4	n n n n			
8	4o	(4)(4)(3)(5)	4 4 4 4	n n n n			
9	3o	(3)(4)(3) -	4 4 3 (1)	n n n n			
10	3-	(2)(2)(2) -	3 3 3 3	n n n n			
11	3o	(2)(3)(2) -	4 4 4 3	n n n n			
12	3o	(3)(4)(3) -	3 3 (2) 3	n n n n			
13	3o	(3)(3)(2) -	4 4 3 2	n n n n			
14	3o	(3)(3)(2)(5)	3 3 (2) 4	n n n n			
15	4o	(4)(5)(3)(5)	4 4 2 4	n n n n			
16	4-	(4)(4) C C	4 3 C C	n n n n			
17	4-	(4)(5)(3)(3)	C 4 3 4	n n n n			
18	4o	(3)(5)(5)(4)	4 4 4 4	n n n n			
19	4o	(4)(4)(4) -	4 4 4 4	n n n n			
20	4o	(3)(4)(4)(4)	4 4 5 5	n n n n			
21	3+	(3)(4)(2) -	3 4 3 4	n n n n			
22	4o	(4)(4)(3) -	4 4 4 4	n n n n			
23	4o	(4)(4) 4 (5)	4 4 3 4	n n n n			
24	4+	(4)(5) 4 (5)	4 4 4 4	n n n n			
25	4o	(4)(4) 5 (3)	5 4 4 4	n n n n			
26	4o	(4)(5) 4 -	4 4 4 4	n n n n			
27	4o	(4)(4) 5 (5)	4 4 4 3	n n n n			
28	4+	(4)(4) 5 (4)	4 4 5 4	n n n n			
29	4+	(5)(5) 4 (5)	4 4 5 4	n n n n			
30	4+	(5)(5)(4) -	5 4 4 4	n n n n			
31	4o	(4)(5) 4 (4)	4 4 4 4	n n n n			

C. Radio Propagation

C3. Phase Variation in OMEGA Radio Waves at Inubo





Note: As for NORTH DAKOTA-13.6kHz, no record during 12 July 1230 UT - 30 July 1930 UT, due to the maintenance of transmitter.

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

NONE

C. Radio Propagation

C4. Sudden Ionospheric Disturbance

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

Hiraiso

Time in U.T.

July 1993	S W F						Correspondence	
	Drop-out Intensities(dB)				Start	Dur.	Type	Imp.	Solar * Flare	Solar Burst
	CO	HA	AUS	MOS BBC						
2				15	1316	15	1 s	1	x	C
4				22	0746	29	2 sl	1+	x	C

Note CO:Colorado(WWV) HA:Hawaii(WWVH) AUS:Australia Mos:Moscow BBC:London
* Optical and X-ray Flares

(b) Sudden Phase Anomaly (SPA) at Inubo

Inubo

Jul. 1993	S P A								
	Phase Advance (degrees)						Time (U.T.)		
Date	Ω/N	Ω/L	Ω/LR	Ω/AU	Ω/H	Ω/ND	Start	End	Maximum
1	14		19	22*	21	28	0048	0127	0052
1	13		11	14	9*	32	0253	0333	0303
2		119					1314	1506	1338
3		106*	70*				1042	1215	1119
4	77	–	147	32			0746	0914	0758
4		91*	62*				1116	1328	1213
5				10	12		2326	2354	2332
9				6	7		0207	0227	0209
17		48	57				0826	0942	0841
17					13		2158	2218	2205
20			9	15	9	–	0247	0336	0301
27				5	6	–	0207	0227	0216
27			5			–	0440	0456	0447

IONOSPHERIC DATA IN JAPAN FOR JULY 1993
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