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# IONOSPHERIC DATA IN JAPAN

FOR AUGUST 1949

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(Denki-Tushin Kenkyujo)

MINISTRY OF TELECOMMUNICATIONS

TOKYO, JAPAN

THE ELECTRICAL COMMUNICATION LABORATORY

(Denki-Tushin Kenkyujo)

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## FOREWORD

Although we have had long period of experience on the ionospheric observations in Japan since 1931, it was unable to publish the results of the observations as restricted by the military officials of the past.

Japan is not allowed to become a member of the International Telecommunication Conference. However, in accordance with the Recommendation of C.C.I.R., we send our results of the ionospheric observations and on radio propagation to the main organizations concerned with radio propagation hereafter.

Symbols and presentation in this report were used in accordance with the Recommendation No. 6 of C.C.I.R. Stockholm 1948: Standardization of Symbols and presentation of Results of Ionospheric Soundings Annex 1—5.

We will be very much appreciated to receive the similar publications from the organizations concerned with radio propagation in the world.

June, 1949

Goro Yoshida, Dr. Eng.

Director of

The Electrical Communication Laboratory,

Ministry of Telecommunications,

Tokyo, Japan

## SITE OF THE IONOSPHERIC STATIONS

Ionospheric observation is carried out at five stations in Japan.

The stations are situated as follows:

	longitude	latitude	site
Wakkanai	141° 41.1' E	45° 28.6' N	Wakkanai-machi, Soya-gun, Hokkaido
Fukaura	139° 54.1' E	40° 36.6' N	Fukaura-machi, Nishitugaru-gun, Aomori-ken
Shibata	139° 15.8' E	37° 57.0' N	Seiro-mura, Kitakanbara-gun, Niigata-ken
Kokubunji	139° 29.3' E	35° 42.4' N	Koganei-machi, Kitatama-gun, Tokyo-to
Yamagawa	130° 37.7' E	31° 12.5' N	Yamagawa-machi, Ibusuki-gun, Kagoshima-ken

## REMARKS ON SYMBOLS

Except both  $f_{\min} E$  and  $f_{\min} F$ , other symbols are used in accordance with recommendation of C.C.I.R.  $f_{\min} E$  and  $f_{\min} F$  in the table are defined as follows:

- $Z_d$ . Half breadth of the layer, calculated by the method of Booker.
- $f_{\min} E$  Minimum frequency, on which echo reflected from E-layer begins to appear by use of the observation equipment on routine work.
- $f_{\min} F$  Minimum frequency, on which echo reflected from F-layer begins to appear by use of the observation equipment on routine work.

IONOSPHERIC DATA

135° E Mean Time Wakkanai Lat. 45°23.6'N Long. 141°41.1'E

f<sub>o</sub>F<sub>2</sub>

Day	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	
1	FT <sup>z</sup>	7.1 <sup>z</sup>	7.1	7.1	6.9 <sup>F</sup>	7.0 <sup>F</sup>	7.0 <sup>F</sup>	(8.5) <sup>F</sup>	[8.4] <sup>B</sup>	(8.3) <sup>F</sup>	A	A	A	(8.0) <sup>F</sup>	[8.2] <sup>F</sup>	8.3 <sup>F</sup>	T	T	(8.3) <sup>F</sup>	FT	FT	FT	FT	FT	
2	FT	7.0	7.1	7.1	6.6 <sup>F</sup>	FS	FS	(8.8) <sup>S</sup>	ST	AF	FT	FT	FT	F	FT	FT	FT	T	(7.6) <sup>F</sup>	(7.6) <sup>F</sup>	(7.6) <sup>F</sup>	T	T	T	
3	6.7	6.8	6.5	6.4	(6.5) <sup>F</sup>	6.9 <sup>F</sup>	6.7 <sup>F</sup>	(6.7) <sup>F</sup>	(6.6) <sup>F</sup>	6.9	6.8	6.9	6.5	6.3	6.4	6.4	6.7	6.0	6.3	T	6.2	6.3	6.3	6.3	5.4
4	5.6	B	A	A	3.8 <sup>F</sup>	4.9	(5.9) <sup>F</sup>	6.8 <sup>F</sup>	7.2 <sup>F</sup>	7.2 <sup>F</sup>	7.1 <sup>F</sup>	S	T	T	T	T	T	T	6.7	6.5	6.5	6.2	6.1	5.3 <sup>F</sup>	
5	4.6	4.8	4.8	4.5	4.5	5.4	5.4	6.2	7.0 <sup>F</sup>	8.4 <sup>F</sup>	C	FL	I	FT	C	C	C	C	C	C	T	T	T	C	
6	7.7	7.5 <sup>F</sup>	6.2	5.7	5.3	6.3	6.2	5.8	6.0 <sup>F</sup>	A	C	C	7.0	6.9	T	7.5	7.2	7.1	6.7	7.0	C	T	T	A	7.7 <sup>F</sup>
7	7.3 <sup>F</sup>	7.3 <sup>F</sup>	6.8	(5.7) <sup>F</sup>	5.1	5.0	A	C	C	C	C	C	C	C	C	C	A	AF	AF	7.0 <sup>F</sup>	AF	6.4 <sup>F</sup>	6.0 <sup>F</sup>	6.0 <sup>F</sup>	
8	6.0 <sup>F</sup>	6.2 <sup>F</sup>	6.0 <sup>F</sup>	(5.7) <sup>F</sup>	5.4 <sup>F</sup>	6.5	5.6	A	A	T	T	T	8.0	7.5	7.0 <sup>F</sup>	7.0 <sup>F</sup>	7.1	7.9 <sup>F</sup>	T	6.7	6.7	7.3	(6.9) <sup>F</sup>	7.0	
9	5.9	5.4	5.4 <sup>F</sup>	4.6 <sup>F</sup>	B	B	B	B	B	B	5.5	5.4	6.2	6.4	[6.3] <sup>F</sup>	6.2	6.6	6.8	T	6.3	(6.0) <sup>F</sup>	6.2	6.3	6.2	
10	6.0 <sup>F</sup>	F	F	4.7 <sup>F</sup>	5.0 <sup>F</sup>	4.6 <sup>F</sup>	5.7	5.5	(5.3) <sup>F</sup>	A	A	AT	A	AF	(6.4) <sup>F</sup>	6.1	(6.2) <sup>F</sup>	6.2 <sup>F</sup>	6.4	A	A	A	A	6.5 <sup>F</sup>	6.5 <sup>F</sup>
11	FT	(5.7) <sup>F</sup>	(5.3) <sup>F</sup>	A	5.0 <sup>F</sup>	A	A	A	A	6.7	6.8	6.8	6.9	7.2	7.1	6.7	A	6.5	6.7	7.0	7.4	7.1	6.4	6.3	
12	C	C	C	C	5.3	6.6 <sup>F</sup>	T	6.6	T	7.0 <sup>F</sup>	T	T	T	T	T	7.3	6.9	6.9 <sup>F</sup>	T	T	FT	FT	FT	FT	
13	6.8 <sup>F</sup>	5.7	5.5	5.0 <sup>S</sup>	5.3	5.5	5.6	6.8	7.4	FT	6.2	FT	6.8	FT	5.7	6.6	6.6	6.5	[7.0] <sup>S</sup>	7.4	7.3	S	5.8 <sup>F</sup>	6.5	
14	6.1 <sup>M</sup>	5.7	5.6	5.0	4.7	5.7	5.8	6.8	BT	7.0	7.1	6.5	6.6	7.7	6.9	6.9	6.5	6.7	5.8	6.3	6.3	6.5	6.5	5.7	
15	5.4	5.7 <sup>F</sup>	6.2	6.2 <sup>F</sup>	F	4.4 <sup>F</sup>	5.3	5.8	A	A	A	A	A	6.0	6.0	5.8	A	A	A	A	A	5.6 <sup>F</sup>	5.5 <sup>F</sup>	5.2 <sup>F</sup>	
16	5.4 <sup>F</sup>	5.4 <sup>F</sup>	5.3 <sup>F</sup>	4.6	4.5 <sup>F</sup>	4.5	5.5	6.3	6.0	7.0	T	6.6	7.0 <sup>F</sup>	[7.3] <sup>F</sup>	7.5 <sup>F</sup>	6.4	7.2 <sup>F</sup>	6.9	6.5	6.8	6.9	7.2	[6.8] <sup>F</sup>	6.4	
17	6.0	5.6	5.5 <sup>F</sup>	5.1	5.1 <sup>F</sup>	5.6	6.8	FT	T	9.2	C	T	T	T	T	7.6	7.7	7.6	(7.1) <sup>F</sup>	T	T	T	6.9	6.5	
18	6.1	6.3	6.2	5.9	5.6	5.8	6.6	7.8 <sup>S</sup>	8.1 <sup>F</sup>	T	T	T	8.0 <sup>F</sup>	6.8	T	7.4	T	7.5 <sup>F</sup>	7.0 <sup>F</sup>	8.0 <sup>F</sup>	T	6.6	6.1	6.1	
19	4.3	4.7 <sup>F</sup>	C	C	5.3	5.9	A	A	7.2	(7.4) <sup>F</sup>	T	6.8	7.1	S	T	(6.8) <sup>F</sup>	T	T	6.5	FT	6.7 <sup>P</sup>	6.5	7.0	6.0	
20	6.4	6.0	6.0 <sup>F</sup>	5.4	5.5	6.0	6.8	T	T	T	T	6.0	6.0	T	T	T	A	T	T	FT	6.9	6.5	6.7	6.7	
21	6.6 <sup>F</sup>	AF	7.0 <sup>F</sup>	F	5.7 <sup>F</sup>	5.8 <sup>F</sup>	(8.0) <sup>F</sup>	C	C	C	C	C	C	C	C	C	C	C	T	T	T	T	T	7.0	7.0 <sup>M</sup>
22	7.0	6.5 <sup>F</sup>	6.5 <sup>F</sup>	6.5	6.4	T	7.4	6.8	7.0	S	T	T	T	T	T	T	FT	FT	FT	AF	AF	AF	(7.4) <sup>F</sup>	7.2	
23	6.9	6.6	6.2	6.0 <sup>Z</sup>	5.7 <sup>Z</sup>	5.7	7.4	C	C	C	C	C	C	7.9 <sup>F</sup>	7.5 <sup>F</sup>	7.6	8.5 <sup>F</sup>	7.7	7.7	T	T	6.9	T	T	
24	6.9 <sup>M</sup>	C	C	C	C	C	C	T	S	T	T	T	7.0	T	T	T	T	T	T	T	T	7.9	T	T	
25	T	7.2	7.1	6.9	7.2	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	8.3 <sup>F</sup>	7.4	7.0	6.3	
26	7.1	7.0	6.8	6.7	6.6	C	C	C	T	T	T	T	T	T	T	T	9.4 <sup>M</sup>	7.2	7.4 <sup>F</sup>	9.0 <sup>F</sup>	8.3 <sup>F</sup>	7.4	7.0	6.3	
27	7.1	7.3	7.3	7.2	6.7	7.5 <sup>F</sup>	C	A	T	T	T	9.4 <sup>M</sup>	B	B	8.6 <sup>F</sup>	8.5 <sup>F</sup>	8.0 <sup>F</sup>	7.2	7.4 <sup>F</sup>	T	T	(8.0) <sup>F</sup>	T	7.5	
28	7.3 <sup>M</sup>	7.0 <sup>M</sup>	6.8 <sup>M</sup>	[6.8] <sup>C</sup>	6.7 <sup>F</sup>	7.4	[7.4] <sup>F</sup>	7.4	7.4 <sup>F</sup>	7.6	7.7	6.9	7.0	6.6	6.0	6.7	7.2	6.4	6.6	7.0	7.0	6.8 <sup>M</sup>	6.2	5.8	
29	5.7	5.7	5.8	6.1	6.2	7.0	7.3	T	8.3	A	A	T	T	A	C	(8.9) <sup>F</sup>	(7.8) <sup>F</sup>	T	8.2	T	7.8	7.1	6.7	6.5	
30	5.2	5.8	4.6	5.7	5.6	C	C	C	C	9.9	9.5	C	T	T	T	T	T	C	C	T	T	7.7	6.9	7.0	
31	6.7	6.9	6.5	6.3	5.9	6.0	6.3	8.0	8.1	6.8 <sup>F</sup>	6.8	7.2 <sup>F</sup>	7.4	7.8	7.6	T	7.6	7.0	6.8	7.4	6.3	6.1 <sup>P</sup>	6.1 <sup>P</sup>	6.4	
Mean Value	6.3	6.1	6.2	5.9	5.5	5.8	6.3	6.8	7.2	7.3	7.0	6.8	7.0	7.2	7.0	6.9	7.2	6.9	6.7	7.0	6.9	6.9	6.5	6.4	
Count	26	24	26	25	28	23	19	16	15	12	12	11	14	11	14	18	16	16	16	15	16	20	22	24	

Sweep 1.0 Mc to 17.0 Mc in 15 min

Manual

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# IONOSPHERIC DATA

Wakkanai

hp F<sub>3</sub>

Lat. 45°23.6'N  
Long. 141°41.1'E

135°E Mean Time

Day	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	
1	FT 390	FT 390	370	350 <sup>F</sup>	340 <sup>F</sup>	340 <sup>F</sup>	340 <sup>F</sup>	F	B	T	A	T	A	A	T	T	T	T	T	T	FT	FT	FT	FT	
2	FT 440	FT 440	330	370 <sup>F</sup>	370 <sup>F</sup>	370 <sup>F</sup>	370 <sup>F</sup>	S	ST	AF	FT	FT	FT	F	F	FT	FT	T	T	(320) <sup>T</sup>	FT	FT	FT	FT	
3	B 440	B 440	400	(390) <sup>T</sup>	380 <sup>F</sup>	410 <sup>F</sup>	410 <sup>F</sup>	410 <sup>F</sup>	(450) <sup>P</sup>	420	430	420	B	S	490	490	380	500	B	T	480	400	T	450	
4	390	B	A	A	430 <sup>F</sup>	400	B	F	F	F	S	T	T	T	T	T	T	T	T	340	370	410	B	T	
5	B	460	370	390	320	310	(320) <sup>B</sup>	330 <sup>F</sup>	300 <sup>F</sup>	300 <sup>F</sup>	A	FT	T	FT	C	C	C	C	C	C	T	T	T	C	
6	420	410 <sup>P</sup>	B	350	400	320	330	290	B	A	C	C	380	T	T	360	380	370	B	C	C	T	T	A	T
7	T	T	400	B	T	410	A	C	C	C	C	C	C	C	C	C	A	AF	AF	AF	C	AF	360 <sup>F</sup>	380 <sup>F</sup>	
8	370 <sup>F</sup>	440 <sup>F</sup>	390 <sup>F</sup>	(410) <sup>F</sup>	370 <sup>F</sup>	320	210	A	A	T	T	T	400	300	B	B	300	B	T	310	360	420	(380) <sup>F</sup>	390	
9	490	410	BF	390 <sup>F</sup>	B	B	B	B	B	B	G	G	B	370	(360) <sup>C</sup>	380	320	300	T	B	F	BF	380	440	
10	410 <sup>F</sup>	F	F	F	410 <sup>F</sup>	500	480	A	A	A	A	AT	A	AF	A	A	A	A	A	A	A	A	A	BF	
11	FT	(490) <sup>A</sup>	(370) <sup>F</sup>	A	A	A	A	A	A	A	A	320	330	300	310	320	350	A	A	A	310	300	280	310	
12	C	C	C	350	210 <sup>F</sup>	T	280	T	280	T	330	B	T	T	T	T	B	B	300	T	FT	FT	FT	FT	
13	330 <sup>F</sup>	370	370	330 <sup>S</sup>	310	320	290	310	300	F	290	FT	G	G	FT	G	300	300	B	410	340	S	B	B	
14	BH	390	350	300	320	340	310	A	T	320	340	380	310	330	320	350	320	(310) <sup>B</sup>	(320) <sup>B</sup>	340	390	360	420	360	
15	400	B	BF	BF	F	A	B	B	A	A	A	A	A	B	360	370	A	A	A	A	A	B	BF	350 <sup>F</sup>	
16	350	340	400	360	400 <sup>F</sup>	400	400	310	310	310	390	T	300	B	B	B	B	280	290	350	350	400	(370) <sup>C</sup>	330	
17	350	340	380 <sup>F</sup>	360	380 <sup>F</sup>	310	320	FT	T	310	C	T	T	T	T	310	300	320	T	T	T	T	T	420	
18	420	480	B	B	360	360	360	320 <sup>S</sup>	B	T	T	T	B	G	T	T	T	B	B	B	B	T	290	350	
19	330	B	C	C	400	390	A	A	360	(350) <sup>T</sup>	T	300	310	S	T	B	T	T	310	FT	340 <sup>P</sup>	330	340	S	
20	380	430	410 <sup>P</sup>	380	410	300	310	T	T	T	T	B	B	T	T	T	A	T	T	T	T	T	B	T	
21	330 <sup>F</sup>	AF	390 <sup>F</sup>	390 <sup>F</sup>	400 <sup>F</sup>	300 <sup>F</sup>	(320) <sup>P</sup>	C	C	C	C	C	C	C	C	C	C	C	C	C	T	(410) <sup>H</sup>	360	380 <sup>H</sup>	
22	370	380 <sup>F</sup>	400 <sup>F</sup>	340	340	T	FT	FT	320	C	TS	TS	TS	T	TS	T	FT	T	FT	FT	A	A	T	B	
23	(390) <sup>B</sup>	340	340	340 <sup>Z</sup>	340 <sup>Z</sup>	330	320	290	G	S	T	T	T	T	T	T	T	T	FT	T	AF	AF	AF	(370) <sup>F</sup>	
24	380 <sup>H</sup>	C	C	C	C	C	C	C	C	C	C	C	C	C	B	B	B	300	300	300	T	T	T	T	
25	T	360	410	380	370	T	T	T	S	T	T	T	300	T	T	T	T	T	T	T	T	300	T	T	
26	340	410	410	400	380	C	C	C	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	
27	440	430	380	420	(400) <sup>B</sup>	B	C	A	T	T	T	410 <sup>H</sup>	B	B	B	B	B	310	B	T	T	(320) <sup>T</sup>	T	350	
28	420 <sup>H</sup>	400 <sup>H</sup>	420 <sup>H</sup>	C	B	250	(240) <sup>F</sup>	230	200 <sup>F</sup>	(300) <sup>B</sup>	(360) <sup>B</sup>	(320) <sup>B</sup>	300	290 <sup>B</sup>	G	320 <sup>B</sup>	320	300	310	260	330	400 <sup>H</sup>	380	370	
29	410	400	390	330	340 <sup>B</sup>	330	320	T	300	A	A	A	T	A	C	(340) <sup>T</sup>	(310) <sup>T</sup>	T	C	T	310	340	400	410	
30	420	(380) <sup>B</sup>	360 <sup>B</sup>	410	440	C	C	C	C	B	340 <sup>B</sup>	C	T	T	T	T	T	T	C	C	T	T	370	340	
31	360 <sup>B</sup>	(420) <sup>B</sup>	440	320	390 <sup>B</sup>	370	340	300	300	310 <sup>F</sup>	310	410 <sup>F</sup>	400	390	360	T	340	320	230	270	340	S	420 <sup>P</sup>	(400) <sup>B</sup>	
Median Value	390	410	390	370	380	330	320	310	320	(320)	(340)	330	(310)	(330)	(370)	350	320	310	(310)	(320)	(320)	340	340	370	370
Count	22	21	22	20	25	21	17	11	10	9	9	10	9	7	8	11	10	12	9	9	13	15	17	17	

Sweep: 1.0 Mc to 17.0 Mc in 1.5 mtr

Manua.

# IONOSPHERIC DATA

Lat. 45°23.6'N  
Long. 141°41.1'E

Wakkanai

h<sub>p</sub>

135°E Mean Time

Day	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	
1	300	300 <sup>A</sup>	320	300	280	300	310	260	400	370	300	A	A	TF	320	310 <sup>C</sup>	290	250	290	240	300	300	300	(340) <sup>A</sup>	
2	(330) <sup>A</sup>	(330) <sup>A</sup>	280 <sup>A</sup>	280 <sup>A</sup>	280	240	240	250	(280) <sup>A</sup>	270 <sup>A</sup>	400 <sup>A</sup>	(300) <sup>A</sup>	300	310	320	350	320	310	270	250	290	240	280	(300) <sup>A</sup>	
3	250	300	290	310	340	390	400	400	450	420	420	420	480	S	490	490	380	500	270	300	320	280	300	380 <sup>A</sup>	
4	260 <sup>A</sup>	A	A	A	360 <sup>F</sup>	360 <sup>A</sup>	410	280	390	380	390	340	390	380	380	350	300	260	280	270	280	290	270	330	
5	350	300	310	280	300	250	250	300	310	300	A	400	300	310	C	C	C	C	C	290	290	290	290	(290) <sup>C</sup>	
6	270	290	280	250	290 <sup>A</sup>	310	310	260	300	A	C	310	380	370	340	320	350	350	370	300	(320) <sup>C</sup>	330	A	220	
7	280	320	340	370	310	400	A	C	C	C	C	C	C	C	C	C	A	AF	AF	AF	250 <sup>F</sup>	AF	300	300 <sup>A</sup>	
8	300 <sup>A</sup>	300 <sup>A</sup>	360	300 <sup>A</sup>	300 <sup>A</sup>	300 <sup>A</sup>	210 <sup>A</sup>	A	A	300 <sup>H</sup>	B	400 <sup>H</sup>	370	300	360	320	270	260	270	270	310 <sup>A</sup>	(360) <sup>A</sup>	(320) <sup>A</sup>	(310) <sup>B</sup>	
9	(310) <sup>A</sup>	270 <sup>A</sup>	340 <sup>A</sup>	330 <sup>A</sup>	(340) <sup>A</sup>	310	300	A	B	B	490	570	380 <sup>B</sup>	370	(380) <sup>C</sup>	380	300	290	280 <sup>A</sup>	270 <sup>A</sup>	280	350 <sup>A</sup>	310 <sup>A</sup>	300	
10	290	290	270	300	300 <sup>F</sup>	310	430	480	A	A	A	AT	A	A	AF	A	440	A	A	A	A	A	A	290	
11	350	(490) <sup>A</sup>	370 <sup>A</sup>	A	AF	A	A	A	A	A	300	320	300	310	320	350	A	(380) <sup>A</sup>	A	300 <sup>A</sup>	260 <sup>A</sup>	280	270 <sup>A</sup>	300	
12	C	C	C	C	290	200 <sup>A</sup>	210	270	300	320	360	360	330	310	310	320	300	300	300	260	A	FT	FT	210	
13	260	270	280	270	240	250	270	300	290	AF	290	390	360	300	300	290	300	300	300	250	300	300	280	270	
14	300 <sup>A</sup>	300	290	260	300 <sup>A</sup>	250	270 <sup>A</sup>	290 <sup>A</sup>	320	320	340	380	310	320	320	320	290	280	290	300 <sup>A</sup>	290 <sup>A</sup>	300	300	300 <sup>A</sup>	
15	320	310	340 <sup>A</sup>	A	310	A	400	480	A	A	A	A	A	A	390	360	380	A	A	A	A	AF	300 <sup>A</sup>	330 <sup>A</sup>	
16	320 <sup>A</sup>	300 <sup>B</sup>	270	260	280	400	400	300	310	360 <sup>A</sup>	300	300	290	300	270	300	210	280	210 <sup>A</sup>	270 <sup>A</sup>	300 <sup>A</sup>	310 <sup>A</sup>	(280) <sup>C</sup>	250 <sup>F</sup>	
17	270	270 <sup>A</sup>	280	300	300	270	290 <sup>A</sup>	270	300	280	(290) <sup>C</sup>	300	290	300	310	300	280	290	250	260	280	270	280	300 <sup>A</sup>	
18	310 <sup>A</sup>	300 <sup>A</sup>	270	220	280	250	210	300	300	300	290	340	310	320	310	300	320	260	250	210	230	220 <sup>A</sup>	230	240	
19	210	200	(290) <sup>A</sup>	(330) <sup>C</sup>	370 <sup>A</sup>	290	A	A	360	350	320	300	300	400	380	300	280	300	290	300	280	290 <sup>A</sup>	280	S	
20	280	330 <sup>A</sup>	300 <sup>A</sup>	300	300 <sup>H</sup>	230	300	300	270	330	310	300	290	340	290	340	A	300	280	220	270	330 <sup>A</sup>	320 <sup>A</sup>	420 <sup>A</sup>	
21	330 <sup>A</sup>	AF	290 <sup>B</sup>	250 <sup>B</sup>	280	270	300	C	C	C	C	C	C	C	(290) <sup>C</sup>	C	C	250	300	300	(380) <sup>A</sup>	300 <sup>H</sup>	260	300 <sup>A</sup>	
22	240	260	290	290	290 <sup>A</sup>	230	230	(260) <sup>T</sup>	(280) <sup>T</sup>	(290) <sup>C</sup>	290	310	290	330	(290) <sup>T</sup>	230	260	300	290	310	A	A	290	290	
23	290	220	270	250	290	270	290	290	280	300	(300) <sup>T</sup>	(300) <sup>T</sup>	(330) <sup>T</sup>	300	350	310	280	260	260	310 <sup>A</sup>	320 <sup>A</sup>	310 <sup>A</sup>	310 <sup>A</sup>	300	
24	300 <sup>A</sup>	C	C	C	C	C	C	C	C	C	C	C	C	C	(290) <sup>B</sup>	300	290	300	300	270	210	250	250	280 <sup>A</sup>	
25	280	290	310	(300) <sup>A</sup>	(300) <sup>A</sup>	280	220	250	250	290	290	290	300	300	300	300	290	250 <sup>B</sup>	250	A	260	250	260	260	
26	250 <sup>A</sup>	280	300	300	C	C	C	C	300	300	300	340	370	370	310	300	300	300	310	270 <sup>A</sup>	250	250	320	270 <sup>A</sup>	
27	300 <sup>A</sup>	300 <sup>A</sup>	290	300	300	290	C	A	300	240	300	300	300	270	260	300	290	260	270	300	300	250	280	290	
28	300 <sup>H</sup>	(300) <sup>A</sup>	300 <sup>H</sup>	C	200 <sup>A</sup>	210	(210) <sup>C</sup>	200	200	290	290	290	300	290	380	310	290	280	280	(300) <sup>A</sup>	300 <sup>A</sup>	300 <sup>A</sup>	270	280	
29	300 <sup>A</sup>	300	280	240 <sup>F</sup>	250	300	290	270	260	A	A	220	260	A	C	280	310	300	290	200 <sup>A</sup>	220	240	240	(310) <sup>B</sup>	
30	(300) <sup>A</sup>	270 <sup>A</sup>	330 <sup>A</sup>	300	300	C	C	C	C	C	260	260	(280) <sup>C</sup>	310	A	300	230	280	C	C	290	310 <sup>A</sup>	290	300	
31	320	(300) <sup>A</sup>	300	270	280 <sup>A</sup>	300	290	280	300	310 <sup>B</sup>	300	400	400	360	300 <sup>B</sup>	300	300	300	210	210	300	(300) <sup>A</sup>	300 <sup>A</sup>	(300) <sup>A</sup>	
Mean Value	300	300	300	300	290	290	280	280	300	300	300	310	310	320	310	320	300	300	280	270	290	300	290	300	300
Count	30	27	28	25	29	26	24	21	22	21	22	25	25	24	25	28	24	26	25	25	27	26	28	30	

Sweep 1.0 Mc to 17.0 Mc in 15 min

Manual

Electrical Communication Laboratory, Japanese Ministry of Telecommunications  
 (Denki-tsushin Kenkyujo) Gotanda, Shinagawa-ku, Tokyo, Japan

# IONOSPHERIC DATA

f<sub>o</sub>F<sub>2</sub>

Lat. 45°23.6'N  
 Long. 141°41'E

Wakkanai

135°E Mean Time

Day	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
1						A	A	Q	L	T	5.3 <sup>T</sup>	A	A	A	A	T	(4.1) <sup>T</sup>	A	Q	Q				
2						Q	4.2	A	A	A	A	A	T	A	T	T	T	T	Q	Q				
3						A	A	4.4	4.6	4.6	A	T	5.0	S	4.8	4.7	4.6	4.3	A	A				
4						A	(4.2) <sup>L</sup>	A	4.9	4.7	4.7	L	(4.9) <sup>T</sup>	(4.8) <sup>T</sup>	4.9	(4.8) <sup>T</sup>	A	A	Q	Q				
5						A	A	T	T	A	A	5.9	T	L	C	C	C	C	C	C				
6						A	A	A	4.3	A	C	A	A	A	4.8	5.1	4.8	4.5	4.4	4.1	Q			
7						3.6	A	A	C	C	C	C	C	C	C	C	A	AF	AF	AF				
8						3.6	A	A	A	4.5 <sup>T</sup>	A	5.0	5.0	4.6	4.1	(4.3) <sup>T</sup>	Q	Q	Q	AF				
9						A	A	A	4.5	A	4.6	4.7	B	4.8	[4.8] <sup>C</sup>	4.7	3.8	L	A	A				
10						A	A	4.2	4.2	4.5	A	A	A	AF	A	A	A	A	A	A				
11						A	3.4	A	A	A	4.5	5.0	4.9	4.9	4.6	5.0	A	A	A	A				
12						A	A	5.3	4.4	L	5.1	4.9	B	4.8	A	B	B	A	3.5	A				
13						Q	Q	L	4.4	A	L	5.0	5.1	4.4	4.6	4.7	L	L	L	Q				
14						Q	A	L	4.8	L	5.2	4.1	4.8	4.7	4.5	L	L	A	A	A				
15						A	A	4.0	A	A	A	A	A	4.9	4.7	L	A	A	A	A				
16						3.3	4.2	L	4.5	A	4.8	5.0	4.8	4.7	4.8	5.0	Q	L	Q	Q				
17						A	A	4.5 <sup>J</sup>	A	5.0	[5.2] <sup>C</sup>	5.3	L	4.9	5.1	A	A	A	A	A				
18						Q	A	L	4.7	L	4.7	L	5.4	L	4.5	4.8	4.6	A	A	A				
19						Q	A	A	L	A	L	B	L	L	S	L	Q	L	L	L				
20						Q	L	L	A	A	B	B	B	L	B	4.2 <sup>J</sup>	A	T	Q	T				
21						A	B	C	C	C	C	C	C	C	C	C	C	A	A	A				
22						Q	Q	T	T	T	T	T	T	T	T	F	Q	Q	A	A				
23						2.3	4.0	4.6	5.3	C	T	T	T	T	T	T	T	T	T	T				
24						C	C	C	C	C	C	C	C	C	T	5.0	4.6	4.2 <sup>J</sup>	4.0	A	L			
25						Q	Q	4.0 <sup>J</sup>	4.3 <sup>J</sup>	T	5.1	5.2	T	T	5.0	4.7	L	A	A	A				
26						C	C	C	Q	L	5.0	6.0	L	5.4	L	5.0	4.6	L	3.0	Q				
27						Q	C	A	L	T	L	L	L	L	L	L	L	Q	Q	L				
28						Q	C	B	T	T	T	T	L	L	5.1	5.0	A	A	Q	Q				
29						L	Q	Q	A	A	A	5.5	6.3	A	C	L	Q	A	Q	A				
30						C	C	C	C	A	Q	C	A	A	A	Q	L	C	C	Q				
31						Q	B	4.6 <sup>J</sup>	5.0	4.7 <sup>J</sup>	4.7	L	T	B	B	B	Q	Q	Q	Q				
Mean Value						-	-	4.4	4.5	4.7	5.0	5.0	5.0	4.8	4.8	4.8	4.5	-	-					
Count						4	4	9	11	8	11	13	8	13	15	14	7	3	3					

Sweep 1.0 Mc to 17.0 Mc in 1.5 min

Manual

W 4



IONOSPHERIC DATA

h<sub>p</sub>F<sub>2</sub>

Lat. 45°23.0'N  
 Long. 141°41.1'E

Wakkanai

135°E Mean Time

Day	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
1		A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A
2		Q	Q	210	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A
3		A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A
4		A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A
5		A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A
6		A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A
7		A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A
8		260	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A
9		A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A
10		A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A
11		A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A
12		A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A
13		Q	Q	270	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A
14		Q	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A
15		A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A
16		300	230	270	200	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A
17		A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A
18		Q	A	220 <sup>A</sup>	240	210 <sup>A</sup>	220	180	200	200	210	240	250	A	A	A	A	A	A	A	A	A	A	A
19		Q	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A
20		Q	220	(220) <sup>B</sup>	A	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B
21		A	220	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C
22		Q	Q	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T
23		(270) <sup>B</sup>	220	210	240	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T
24		C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C
25		Q	Q	210	200	T	200	200	T	200	200	T	200	200	T	200	200	T	200	200	T	200	200	T
26		C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C
27		Q	Q	C	C	A	240 <sup>T</sup>	T	T	220	250	200 <sup>S</sup>	220	200	200	200	200	200	200	200	200	200	200	200
28		Q	C	C	B	180	T	T	T	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200
29		240	Q	Q	180	A	A	A	A	200	210	A	C	210	Q	A	Q	A	Q	A	Q	A	Q	A
30		C	C	C	C	A	Q	C	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A
31		Q	260	270	220	200	200	220	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B
Median Value		-	230	220	240	230	220	220	210	200	220	240	230	240	250	250	250	250	250	250	250	250	250	250
Count		4	7	11	13	10	13	17	13	16	19	19	12	8	5	3								

Sweep 1.0 Mc to 1.0 Mc in 1.5 min

Manual

Electrical Communication Laboratory, Japanese Ministry of Telecommunications  
 (Denki-tsushin Kenkyujo) Gotanda, Shinagawa ku, Tokyo Japan

**IONOSPHERIC DATA**

fe

Lat. 45°23.6'N  
 Long. 141°41'E

Wakkanai

135°E Mean Time

Day	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
1						2.1	2.6	3.1	A	B	3.5	3.8	3.9	A	A	A	A	A	B	A				
2						A	B	A	A	A	A	A	A	B	A	A	A	A	A	A	A			
3						A	A	3.0	3.3	A	A	A	A	S	3.6	3.3	A	3.0	A	A	A			
4						A	A	A	A	B	B	A	B	A	A	B	A	A	A	B	A			
5						2.0	(2.4) <sup>A</sup>	A	B	B	A	A	B	A	C	C	C	C	C	C	C			
6						A	A	A	A	A	C	A	3.6	3.4	(3.6) <sup>A</sup>	3.2	2.9 <sup>J</sup>	2.7	A	A	A			
7						A	A	A	A	C	C	C	C	C	C	C	A	AF	AF	AF	AF			
8						2.5	2.8	3.2	A	A	B	4.0	A	A	B	A	3.3 <sup>J</sup>	3.2	2.4	2.4	2.4			
9						A	2.4	3.2	A	R	A	A	T	B	C	A	A	(2.7) <sup>A</sup>	A	A	A			
10						A	A	2.6	A	A	A	A	3.4	3.3 <sup>F</sup>	A	A	3.1	A	A	A	A			
11						A	A	A	A	A	A	A	A	A	A	A	2.0	2.6	A	A	A			
12						A	2.7	2.8	A	A	A	3.6	A	A	B	A	3.5	B	B	2.0	A			
13						A	2.6	2.8	3.1	3.1	A	3.5	A	A	A	3.3	A	A	B	A	A			
14						A	A	2.8	3.1	A	A	B	A	A	A	A	A	2.9	A	A	A			
15						A	2.5	3.0	3.6	3.4	3.4	A	A	A	B	B	A	A	A	A	A			
16						2.3	2.6	2.8	3.3	B	A	A	4.0	B	B	B	B	3.5	2.8	2.2	A			
17						A	2.5	2.4	2.8	3.3	[3.4] <sup>C</sup>	3.5	3.7	3.5	3.6	A	(3.3) <sup>A</sup>	A	A	A	A			
18						A	A	A	A	A	A	A	A	B	A	A	A	2.7	A	A	A			
19						A	A	A	A	B	B	B	B	S	A	B	B	2.7	A	B	A			
20						B	2.5	3.1	B	B	B	B	B	B	A	A	A	T	1.9	A	A			
21						A	2.6	C	C	C	C	C	C	C	C	C	C	C	B	A	A			
22						A	A	T	A	C	A	3.7	A	A	S	A	3.3	2.9	A	A	A			
23						1.5	2.4	3.0	3.4 <sup>J</sup>	T	T	T	T	T	T	3.6 <sup>C</sup>	3.0	2.5 <sup>A</sup>	A	A	A			
24						C	C	C	C	C	C	C	C	C	A	B	3.0 <sup>B</sup>	3.2	A	A	A			
25						1.5	2.1 <sup>J</sup>	B	A	T	T	T	T	T	A	3.5 <sup>E</sup>	T	A	A	A	A			
26						C	C	C	B	T	B	B	S	A	B	3.3	B	2.8	2.0	A	A			
27						A	C	2.8 <sup>J</sup>	A	A	B	B	3.5 <sup>J</sup>	B	3.7	A	B	B	A	A	A			
28						1.9	C	B	A	A	T	T	3.7	B	B	A	A	2.4	A	A	A			
29						A	A	B	A	A	A	A	A	A	C	A	B	A	A	A	A			
30						C	C	C	C	3.6 <sup>B</sup>	3.8	C	A	A	B	A	A	C	C	B	A			
31						1.2	2.3	A	3.3 <sup>J</sup>	B	B	B	B	B	B	B	B	A	A	A	E			
Median Value						2.0	2.5	2.9	3.3	-	-	3.7	3.7	-	3.6	3.4	3.2	2.7	2.0	-				
Count						8	14	14	8	4	4	6	7	3	5	8	10	13	5	1				

Sweep 1.0 Mc to 17.0 Mc in 1.5 min Manual

Electrical Communication Laboratory, Japanese Ministry of Telecommunications  
 (Denki-tsushin Kenkyujo) Gotanda, Shinagawa-ku, Tokyo, Japan

IONOSPHERIC DATA

h'fE

Lat. 45 23.6 N  
 Long. 141 11.6 E

Wakkanai

135°E Mean Time

Day	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
1						100	120	100	A	B	100	110	100	100	A	A	A	A	B	A				
2						A	B	A	A	A	A	A	B	B	A	A	A	A	A	A	A			
3						A	A	100	100	A	A	B	A	100	100	100	A	100	A	A	A			
4						A	A	A	120	110	A	A	110	A	A	110	A	A	A	A	B			
5						100	100	A	(100) <sup>B</sup>	100	A	A	B	A	C	C	C	C	C	C				
6						A	100	A	A	A	A	A	100	100	100	100	100	100	A	A	A			
7						A	A	A	C	C	C	C	C	C	C	C	100	AF	AF	AF				
8						100	100	100	A	A	100	100	A	A	B	A	A	100	100	110	100			
9						A	110	100	100	B	A	A	100	100	110	A	A	100	A	A	A			
10						A	A	100	A	A	A	A	110	100	100	A	120	100	A	A	A			
11						A	A	A	A	A	A	A	A	A	A	A	100	100	100	A	A			
12						A	110	100	A	A	A	100	A	A	A	A	100	100	100	100	A			
13						A	100	100	100	100	A	100	A	A	A	100	A	A	100	A	A			
14						A	A	100	100	A	A	100	A	A	A	A	A	100	100	A	A			
15						A	100	100	100	100	100	A	A	A	A	A	A	A	A	A	A			
16						100	100	100	100	100	A	A	100	100	100	100	100	100	100	100	A			
17						A	110	110	100	100	(100) <sup>C</sup>	100	100	100	100	A	100	A	A	A	A			
18						A	A	A	A	A	A	A	100	A	A	A	A	A	100	A	A			
19						A	A	A	A	110	100	(140) <sup>B</sup>	110	100	A	100	B	110	A	A	B			
20						100	100	100	100	110	A	100	110	100	A	A	A	A	100	110 <sup>A</sup>	A			
21						A	100	C	C	C	C	C	C	C	C	C	C	110	A	A	A			
22						A	A	100	A	C	A	100	A	A	A	100	A	100	100	A	A			
23						100	100	100	100	100	100	(100) <sup>T</sup>	100	100	100	100	100	100	100	A	A			
24						C	C	C	C	C	C	C	C	C	A	100	100	100	A	A	A			
25						100	100	100	A	T	T	T	T	T	A	A	100	T	A	A	A			
26						C	C	C	B	100	100	100	100	A	A	100	100	100	100	100	A			
27						A	C	100	A	A	100	100	100	100	100	A	100	100	100	A	A			
28						100	(100) <sup>C</sup>	(100) <sup>B</sup>	A	A	100	100	100	100	100	A	A	100	A	A	A			
29						A	A	100	100	A	A	A	A	A	A	C	A	100	A	A	A			
30						C	C	C	C	100	130 <sup>B</sup>	C	A	B	A	A	A	A	C	C	B			
31						100	100	A	100	100	100	B	B	B	B	B	100	A	A	A	E			
Mean Value	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
Count	9	16	18	13	12	12	13	14	14	14	14	13	12	12	16	18	18	18	18	18	18	18	18	18

Sweep 1.0 Mc to 17.0 Mc in 5 min

Manual

IONOSPHERIC DATA

Wakkanai  
 45°23.6'N  
 141°41.1'E

155°E Meas. Time

Day	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
1	3.4	2.0	6.2	4.4	3.3	3.3	5.2	4.1	5.0 <sup>T</sup>	T	5.7	13.4	10.3	6.3	4.5	8.5	6.3	3.6	4.4	3.6	4.4	2.6	5.7	6.0
2	6.0 <sup>F</sup>	2.4	6.9 <sup>F</sup>	4.3	3.6	2.9	B	5.3	4.2	9.6	7.0	6.3	(4.5) <sup>T</sup>	6.8	(4.3) <sup>T</sup>	(4.4) <sup>T</sup>	4.7 <sup>T</sup>	3.4	2.2 <sup>*</sup>	4.0	4.2	4.2	4.2	5.2
3	4.5	1.2	(2.2) <sup>Y</sup>	2.8	2.4	5.0	4.2	4.8	7.4 <sup>T</sup>	3.7	5.0	4.4	4.4	S	G	3.7	3.7	3.3 <sup>T</sup>	2.7	G	G	G	G	2.7
4	2.4	4.1 <sup>T</sup>	7.4 <sup>T</sup>	7.2 <sup>T</sup>	4.4 <sup>F</sup>	5.7	3.7	3.5	G	G	4.0	B	4.2	3.8	B	4.2	4.3	2.5	G	G	G	2.3	3.8	3.3
5	G	G	(3.8) <sup>Y</sup>	2.3	3.6	3.2	3.8	4.4	(6.8) <sup>Y</sup>	5.7	6.4 <sup>C</sup>	4.3 <sup>T</sup>	4.8 <sup>T</sup>	7.7 <sup>T</sup>	C	C	C	C	C	C	4.4	3.5	4.1	C
6	3.6	4.3	3.7	6.2	2.7	4.0	4.2	6.6 <sup>T</sup>	4.3	7.4 <sup>A</sup>	C	6.6	6.6 <sup>T</sup>	4.8	3.6	5.8 <sup>Y</sup>	3.7	5.8	4.8	2.0	C	(5.0) <sup>T</sup>	7.2	4.2
7	(6.2) <sup>B</sup>	3.7 <sup>T</sup>	2.7	5.1	G	(5.7) <sup>Y</sup>	7.4	5.2 <sup>C</sup>	C	C	C	C	C	C	C	C	12.0	12.3 <sup>F</sup>	11.3 <sup>F</sup>	11.0 <sup>F</sup>	(9.2) <sup>F</sup>	5.0	3.6	3.6
8	3.2	3.6 <sup>F</sup>	(3.0) <sup>B</sup>	4.4	4.7	3.6	5.0	7.0 <sup>T</sup>	7.3 <sup>T</sup>	5.2	4.8	B	6.6	4.0	B	6.2 <sup>Y</sup>	3.2	4.0 <sup>Y</sup>	2.7	3.8	6.0	7.4	6.8	7.4
9	5.8	7.4	6.2	3.3	4.6	6.7	3.6	5.7	4.4 <sup>T</sup>	5.2	5.5	4.2	T	S	C	4.8	5.5	6.0	7.4 <sup>T</sup>	4.4	6.5	6.9	4.5	3.6
10	3.0	3.6	2.6	3.3	2.5 <sup>F</sup>	4.3	7.2	6.2	6.8 <sup>T</sup>	7.3 <sup>T</sup>	7.0 <sup>F</sup>	6.8 <sup>T</sup>	7.0 <sup>F</sup>	6.8 <sup>T</sup>	6.2	7.0 <sup>T</sup>	6.2	7.4 <sup>T</sup>	7.4 <sup>T</sup>	6.9 <sup>T</sup>	7.4 <sup>T</sup>	7.4 <sup>F</sup>	7.4 <sup>T</sup>	3.8
11	6.2	6.6 <sup>T</sup>	(4.4) <sup>Y</sup>	5.6	4.6	7.0 <sup>Y</sup>	10.8	13.6	(9.8) <sup>B</sup>	6.5	5.3	6.8	7.5	4.2	4.6	G	7.8	7.5	7.3	6.8 <sup>Y</sup>	4.5	6.7	3.3	3.4
12	C	C	C	C	3.5 <sup>Y</sup>	4.0 <sup>B</sup>	5.3	4.6	4.7	4.1	5.8	5.2	4.0	7.2 <sup>Y</sup>	5.6	B	G	7.0 <sup>F</sup>	5.0 <sup>F</sup>	4.5	7.2 <sup>T</sup>	7.2 <sup>T</sup>	7.4 <sup>F</sup>	5.8
13	3.2	3.0	2.7	3.2	2.8	2.8	2.8	4.4	4.7	7.2 <sup>T</sup>	6.3 <sup>Y</sup>	5.3	4.1	4.2	G	3.9	4.7	5.1	3.6	2.3	7.3 <sup>T</sup>	4.0	4.0	4.6
14	3.1	3.9	3.6	3.3	3.3	2.2	5.0	6.8	6.0	6.5 <sup>Y</sup>	6.4	G	5.0	5.0	4.5	6.8	6.8	7.1	6.8	5.4	6.5 <sup>F</sup>	5.0	4.5	6.2
15	4.8	4.6	5.2	5.3	3.2	4.7	3.8	4.2	6.6	8.4	7.2	(7.0) <sup>B</sup>	7.0 <sup>Y</sup>	4.6 <sup>Y</sup>	G	6.2 <sup>Y</sup>	7.4	13.0	11.6	7.3	6.1	7.4 <sup>F</sup>	7.2 <sup>F</sup>	6.1
16	5.9	3.6	2.9	2.3	1.8	G	3.7	3.7	4.2	6.0	6.8 <sup>Y</sup>	4.8	G	(5.8) <sup>Y</sup>	G	G	4.0	3.6	3.6	3.4	6.2	7.4	C	6.7
17	4.8	4.4	3.7	4.1 <sup>F</sup>	3.2 <sup>F</sup>	3.0	4.8	5.4	5.8	3.9	C	4.8	4.9	6.0	7.3	7.3	7.3	5.2	5.4	4.0	4.5	5.0	4.0	3.6
18	3.6	(4.6) <sup>B</sup>	2.5	2.2	2.7	2.3	3.7	3.9	4.9	5.0	4.1	5.3	G	4.0	4.0	4.1	4.0	5.8	11.4	3.6	7.3	3.4	2.4	4.0
19	1.6	2.0	3.1	C	3.8	2.5 <sup>B</sup>	7.4	6.4	6.2	B	B	G	S	4.0	B	B	G	3.1	2.5	G	6.0	3.6	G	3.6 <sup>S</sup>
20	G	2.5	2.0	G	G	G	3.5	3.5	5.6 <sup>Y</sup>	B	4.0 <sup>B</sup>	B	B	B	3.8 <sup>B</sup>	3.6 <sup>B</sup>	7.5	T	3.7	1.8	3.3	5.6	4.1	4.1
21	7.2 <sup>F</sup>	7.4 <sup>F</sup>	6.0	4.6	4.0	4.2	4.0 <sup>B</sup>	C	C	C	C	C	C	C	C	C	C	5.9	7.5	5.2	7.4 <sup>T</sup>	5.2	2.3	3.5
22	3.0	2.5	2.7	3.6	3.2	3.2	3.0	T	3.6 <sup>T</sup>	C	4.1	3.9	4.0 <sup>Y</sup>	3.8	S	3.6 <sup>Y</sup>	4.2 <sup>T</sup>	5.8	4.8	4.1	8.4	7.2	3.3	2.3
23	3.2	(6.4) <sup>Y</sup>	2.4	1.1	1.1	B	2.4	G	G	T	T	T	T	T	T	T	3.5 <sup>T</sup>	2.8	3.3	10.6 <sup>F</sup>	9.2	7.4 <sup>T</sup>	4.9	5.7
24	5.5	C	C	C	C	C	C	C	C	C	C	C	C	4.4 <sup>T</sup>	B	G	G	3.4	4.4	3.6	2.0	1.8	3.7	5.0
25	4.5	4.0	3.4	2.7	3.5	2.6	G	G	3.5	T	T	T	T	4.1	G	G	T	6.2	5.2	7.0 <sup>T</sup>	G	2.6	3.0	2.8
26	2.6	G	G	G	G	C	C	C	G	T	4.2	4.3	S	4.0	B	3.6	B	G	(2.2) <sup>Y</sup>	3.0	2.0	7.2	5.2	(4.4) <sup>T</sup>
27	(2.2) <sup>Y</sup>	2.6 <sup>B</sup>	2.6	G	G	2.6	C	(7.6) <sup>B</sup>	3.6 <sup>T</sup>	T	4.1 <sup>T</sup>	B	5.2 <sup>Y</sup>	B	G	4.5	G	G	3.0	2.8	5.2	3.5	3.5	2.7
28	3.5	3.5	1.3	C	1.5	G	C	(4.2) <sup>Y</sup>	4.0 <sup>T</sup>	T	T	T	G	G	G	3.6	4.6	6.2	2.7	2.8	8.0 <sup>Y</sup>	2.7	3.4	3.4
29	2.0	(4.2) <sup>Y</sup>	1.2	1.4 <sup>F</sup>	4.8	1.7	2.8	B	6.6	9.0	8.6	6.6	4.3	7.6	C	4.6	B	(6.7) <sup>B</sup>	2.0	2.3	3.5	3.2	2.2	2.3
30	3.0	2.6	3.0	3.2	1.8	C	C	C	C	6.7	4.4	C	5.8	7.7	6.0	3.8	3.6	C	C	2.6	3.8	4.4	2.7	3.7
31	3.6	3.6 <sup>B</sup>	1.5	G	2.6	2.0	2.5	3.6	G	B	B	B	B	B	B	B	T	3.3	2.1	G	2.8	3.9	3.5	3.5
Mean Value	3.5	3.6	3.0	3.3	3.2	3.2	3.8	4.6	4.9	6.0	5.5	5.0	4.9	4.0	4.0	4.1	4.2	5.8	3.7	3.6	5.6	5.0	4.0	3.8
Count	30	29	29	27	30	27	25	25	27	19	21	20	20	21	20	23	25	28	29	30	30	31	30	30

Electrical Communication Laboratory, Japanese Ministry of Telecommunications  
(Denki-teshinh Kenkyujo) Gotanda, Shinagawaku, Tokyo, Japan

IONOSPHERIC DATA

F.-M3000

Wakkanai  
Lat. 45°23.6'N  
Long. 141°41.1'E

135°E Mean Time

Day	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
1	FT	2.6	2.7	2.9	2.9 <sup>F</sup>	2.8 <sup>F</sup>	JF	B	JT	JT	A	A	A	JT	T	J	T	T	T	JT	FT	FT	FT	FT	FT	FT
2	FT	3.0	2.9	F	FS	FS	J	ST	AF	FT	FT	FT	FT	FT	FT	FT	FT	FT	FT	(2.9) <sup>T</sup>	FT	FT	FT	FT	FT	FT
3	2.7	2.5	2.7 <sup>F</sup>	2.7	(2.8) <sup>T</sup>	2.7 <sup>F</sup>	(2.5) <sup>F</sup>	(2.5) <sup>F</sup>	(2.5) <sup>F</sup>	2.6	2.5	2.6	2.4	S	2.5	2.5	2.8	2.3	B	T	2.3	2.5	T	T	2.5	T
4	2.6	B	A	A	2.5	2.6	J	JF	F	F	S	S	T	T	T	T	C	C	C	C	2.7	2.7	T	T	T	T
5	2.5	2.4	2.7	2.7	2.6 <sup>T</sup>	2.9	B	2.9	3.0 <sup>F</sup>	A	FT	FT	FT	FT	C	C	C	C	C	C	T	T	T	T	T	C
6	2.5	2.6 <sup>P</sup>	2.6	2.8	2.6	3.0	(2.9) <sup>B</sup>	J	A	C	2.9	2.7	T	T	2.8	2.9	2.6	2.7	J	J	C	T	A	JT	JT	JT
7	JT	JT	B	J	2.6 <sup>T</sup>	2.5	A	C	C	C	C	C	C	C	C	C	A	AF	AF	AE	3.0 <sup>F</sup>	AF	2.8 <sup>F</sup>	2.7 <sup>F</sup>	2.7 <sup>F</sup>	2.7 <sup>F</sup>
8	2.7 <sup>F</sup>	2.4 <sup>F</sup>	2.8 <sup>F</sup>	(2.6) <sup>S</sup>	2.7 <sup>F</sup>	2.9	B	A	A	T	T	T	2.8	3.2	J	J	3.1	J	T	2.9	2.7	2.5	FT	2.7	2.7	
9	2.5	2.5	2.7 <sup>F</sup>	2.6 <sup>F</sup>	B	B	B	B	B	2.5	2.4	2.9	2.9	(2.8) <sup>C</sup>	2.8	3.0	3.2	T	B	F	F	BF	2.7	2.4	2.4	
10	2.5	F	F	2.7 <sup>F</sup>	2.5 <sup>F</sup>	2.3	2.5	A	A	A	A	T	A	AF	A	2.6	A	A	A	A	A	A	A	2.3 <sup>F</sup>	BF	BF
11	FT	(2.4) <sup>F</sup>	(2.8) <sup>F</sup>	A	A	A	A	A	A	3.1 <sup>F</sup>	2.9	3.1	3.1	3.1	3.0	2.9	A	A	A	A	A	A	A	2.3 <sup>F</sup>	BF	BF
12	C	C	C	C	2.8	3.1 <sup>F</sup>	T	3.3	T	3.0 <sup>F</sup>	B	T	T	T	T	B	B	3.1 <sup>F</sup>	T	T	FT	FT	FT	FT	FT	FT
13	2.9 <sup>F</sup>	2.8	2.7	3.0 <sup>S</sup>	3.0	3.2	3.2	3.1	F	3.1	FT	2.9	FT	3.1	3.3	3.2	3.2	3.2	B	2.5	2.9	S	J	J	B	B
14	2.5 <sup>H</sup>	2.6	2.8	3.2	3.0	2.9	A	T	3.1	3.0	2.8	3.1	2.8	3.0	3.0	2.9	3.0	3.0	3.0	2.8	2.7	2.7	2.5	2.8	2.8	2.8
15	2.7	J	BF	J	F	A	2.5	B	A	A	A	A	A	3.0	3.0	2.9	A	A	A	A	A	A	J	3.0 <sup>F</sup>	2.8 <sup>F</sup>	2.8 <sup>F</sup>
16	2.8 <sup>F</sup>	2.8 <sup>F</sup>	2.7 <sup>F</sup>	2.7	2.5 <sup>F</sup>	2.6	2.7	3.1	3.1	2.6	T	3.0	J	B	J	3.3	J	3.4	3.2	2.8	2.8	2.7	2.7	[2.6] <sup>C</sup>	2.9	2.9
17	2.8	2.8	2.7 <sup>F</sup>	2.7	2.7 <sup>F</sup>	3.1 <sup>C</sup>	3.0	T	T	3.1	C	T	T	T	T	3.0	3.1	3.0	T	T	T	T	T	2.6	[2.6] <sup>S</sup>	2.9
18	2.6	2.5	(2.7) <sup>S</sup>	2.6	2.7	2.8	2.8	2.9 <sup>S</sup>	J	T	T	T	J	3.1	T	T	J	J	J	J	T	T	T	2.6	[2.6] <sup>S</sup>	2.9
19	2.8	J	E	C	2.6	2.7	A	A	2.8	2.9 <sup>T</sup>	T	3.3	3.1	S	T	J	T	T	3.0	FT	2.8 <sup>F</sup>	2.9	2.8	2.8	2.8	2.8
20	2.6	2.6	2.5 <sup>F</sup>	2.7	2.7	3.1	3.0	T	T	J	T	B	B	T	T	T	A	T	T	T	2.9	3.0	2.8	2.4	2.4	2.4
21	2.8 <sup>P</sup>	AF	2.6 <sup>F</sup>	F	2.6 <sup>F</sup>	3.1 <sup>F</sup>	(3.0) <sup>F</sup>	C	C	C	C	C	C	C	C	C	C	C	C	T	T	T	(2.5) <sup>M</sup>	2.7	2.7 <sup>H</sup>	2.7 <sup>H</sup>
22	2.7	2.6 <sup>F</sup>	2.6 <sup>F</sup>	2.9	2.9	T	T	TF	3.2	C	TS	TS	TS	T	TS	T	TF	T	TF	TF	A	A	T	2.7	2.7	
23	2.7	(3.0) <sup>B</sup>	2.9	2.8 <sup>S</sup>	3.0	3.0	3.1	3.3	3.4	T	T	T	T	T	T	T	T	TF	T	TF	AF	AF	(2.7) <sup>F</sup>	2.7	2.7	
24	2.8 <sup>H</sup>	C	C	C	C	C	C	C	C	C	C	C	C	C	J	J	B	J	3.2	3.1	T	T	2.9	2.7	2.7	
25	T	2.7	2.6	2.7	2.7	T	T	T	S	T	T	T	3.2	T	T	T	T	T	T	T	T	T	T	T	T	
26	2.9	2.7	2.6	2.7	2.8	J	C	A	T	T	T	T	T	T	T	T	T	T	T	T	T	3.2	T	T	T	
27	2.5	2.5	2.7	2.6	2.7	J	C	C	T	T	2.5 <sup>H</sup>	B	B	B	J	J	J	J	J	J	J	J	3.1	2.8	2.9	
28	2.5 <sup>H</sup>	2.6 <sup>H</sup>	2.5 <sup>H</sup>	C	J	3.4	[3.5] <sup>C</sup>	3.6	3.7 <sup>F</sup>	3.0	B	2.9	3.0 <sup>B</sup>	3.1 <sup>B</sup>	3.0	3.0	3.2	3.2	3.0	3.0	T	T	(3.4) <sup>T</sup>	T	2.7	2.7
29	2.6	2.7	2.7	2.9	2.8	2.9	3.0	T	3.0	A	A	T	T	A	C	(3.2) <sup>T</sup>	(3.1) <sup>T</sup>	T	2.9	2.8	2.8	2.5 <sup>H</sup>	2.7	2.8	2.8	
30	2.5	2.7	2.8	2.6	2.5	C	C	C	C	(2.7) <sup>B</sup>	2.8 <sup>B</sup>	C	T	T	T	T	T	C	C	T	T	2.9	2.8	2.6	2.6	
31	B	B	2.5	3.1	2.7	2.6	2.9	3.1	3.1	3.0 <sup>F</sup>	3.2	2.7 <sup>F</sup>	2.8	2.7	2.8	T	2.8	3.0	3.6	3.2	2.8	J	2.5 <sup>F</sup>	2.5	2.5	

Mean Values  
Count

Sweep 1.0 Mc in 1.5 min

Manual

W 9

Electrical Communication Laboratory, Japanese Ministry of Telecommunications  
(Denki-teushin Kenkyujo) Gotanda, Shinagawa-ku, Tokyo, Japan

# IONOSPHERIC DATA

Lat. 45°23.6'N  
Long. 141°41.6'E

Wakkanai

155°E Mean Time

Day	00	01	02	05	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
1	1.2	1.4 <sup>F</sup>	E	2.2	2.1	2.1	A	3.6	5.4 <sup>T</sup>	T	A	A	A	A	4.2	4.2	A	2.9	2.4	2.0	A	A	A	A
2	1.1 <sup>F</sup>	1.1 <sup>F</sup>	A	2.0	2.3	B	3.7	4.2	4.2	A	A	T	T	A	T	T	T	AT	2.7	2.0	A	2.5	A	A
3	A	1.2	E	2.1	2.0	2.8	A	A	4.2	3.9	A	5.1 <sup>T</sup>	4.4	S	3.9	3.5	3.3	3.7 <sup>T</sup>	3.7 <sup>T</sup>	2.2	1.5	1.4	1.3	2.3
4	1.6	A	A	E	1.7 <sup>A</sup>	A	3.1	3.6	3.9	4.0	4.2	2.2	2.2	3.9	3.9	4.3 <sup>B</sup>	A	A	2.5	1.5	1.5	T	2.2 <sup>A</sup>	1.5
5	E	E	T	1.4	1.8	2.1	2.4 <sup>A</sup>	A	A	A	A	6.2	A	C	C	C	C	C	C	C	2.2	1.2	E	C
6	E	E	E	E	2.4	A	A	4.0	4.0	A	A	A	A	4.1	3.7	4.1	4.0	3.2	3.0	2.2	C	A	A	A
7	A	A	2.7	A	1.2	3.4 <sup>A</sup>	A	A	C	C	C	C	C	C	C	C	A	AF	AF	1.9 <sup>F</sup>	AF	A	A	A
8	A	A	4.0 <sup>T</sup>	A	1.9	2.4	A	A	A	A	A	A	A	A	3.8	4.0	4.0	3.2	2.5	AF	A	A	A	A
9	A	1.8	A	A	A	2.4	3.3	A	A	A	A	4.1	4.1 <sup>T</sup>	4.0 <sup>T</sup>	[3.9 <sup>F</sup> ]	3.8 <sup>A</sup>	3.6	2.7	A	A	A	A	A	2.2
10	1.5	2.2	E	E	E	2.4	A	3.7	3.8 <sup>A</sup>	4.0 <sup>A</sup>	A	A	A	A	A	A	A	A	A	A	A	A	A	A
11	A	A	A	A	A	A	A	3.0	A	A	4.3	4.4 <sup>A</sup>	4.4 <sup>A</sup>	4.2	4.2	3.8	A	A	A	A	A	A	A	A
12	C	C	C	C	A	A	2.7	3.0	A	4.0	4.6 <sup>A</sup>	4.4 <sup>A</sup>	4.6	4.5	5.0	(4.1) <sup>B</sup>	(4.1) <sup>B</sup>	A	A	A	AF	AF	A	1.2
13	A	A	1.7	1.7	2.1	2.5	2.8	3.0	4.0	A	3.8	3.9	3.9	3.7	3.9	4.3	A	3.8 <sup>A</sup>	3.4	1.5	A	2.1	2.2	1.5
14	A	1.4	2.0	2.0	A	1.7	A	A	4.0	4.2 <sup>A</sup>	A	3.9	4.2	3.8	4.1	3.9	3.6	A	3.0	2.3	A	AF	A	AF
15	1.5	1.2	A	A	1.2	A	A	A	A	A	A	A	4.2	4.0	4.2 <sup>A</sup>	4.2 <sup>A</sup>	A	A	A	A	A	A	A	A
16	A	A	1.5	E	E	2.3	2.6	3.2	3.3	A	4.2	4.1	4.2	4.2	4.4	4.4	4.2	3.0	A	AF	A	A	C	1.4 <sup>F</sup>
17	2.0	A	1.7	A	2.0	1.9	A	3.5	A	4.0	[4.2] <sup>C</sup>	4.3	4.0	3.8	3.8	A	3.8	A	3.5 <sup>A</sup>	1.6	2.8 <sup>A</sup>	A	1.6	A
18	A	A	1.8	E	1.4	2.2	2.0	3.6 <sup>A</sup>	3.8	4.1 <sup>A</sup>	4.4	4.1	4.0	4.1	4.1	4.1	4.0	A	2.8	2.4	A	A	3.0	A
19	1.6	2.4	A	C	A	2.3	A	A	A	5.5	5.3	4.0	4.0	S	3.9	4.8	3.3	3.1	2.3	1.2	A	A	E	A
20	E	A	A	E	E	2.0	3.0	(3.5) <sup>B</sup>	(4.0) <sup>B</sup>	5.6	5.2	4.5	4.5	4.7	4.3	4.3	A	(4.7) <sup>T</sup>	2.8	1.8	A	A	A	A
21	A	A	AF	AF	A	2.7	C	C	C	C	C	C	C	C	C	C	C	3.7	2.2	A	A	A	A	1.3
22	2.0	1.4	1.2	A	A	2.4	3.0	T	4.8 <sup>T</sup>	[4.5] <sup>F</sup>	4.2	4.1	T	T	3.9 <sup>T</sup>	4.6 <sup>T</sup>	4.2 <sup>T</sup>	3.9	A	A	A	A	A	1.6
23	1.3	E	E	E	E	1.7	2.8	3.2	4.2	T	T	T	T	T	T	T	T	T	1.7	AF	A	A	A	A
24	A	C	C	C	C	C	C	C	C	C	C	C	C	T	4.5	3.0	3.4	3.5	A	2.1	1.2	1.4	2.0	A
25	1.8	1.2	E	A	A	1.8	2.8	3.3	4.0	T	4.1 <sup>T</sup>	4.2 <sup>T</sup>	T	T	4.0	3.7	3.6 <sup>T</sup>	A	2.9	A	1.1	1.1	A	A
26	A	E	E	E	E	C	C	C	4.0 <sup>T</sup>	4.0 <sup>T</sup>	4.2	4.3	4.3 <sup>S</sup>	4.0	3.8	3.8	3.7 <sup>T</sup>	3.0	2.4	3.1	2.0	2.1	A	A
27	A	A	E	E	E	3.2	C	C	4.4 <sup>T</sup>	T	4.0	4.0	4.1	3.9	4.0	4.0	3.2	3.2	1.6	2.0	A	A	A	A
28	2.1	A	1.3	C	A	1.9	C	3.9	3.7	T	T	T	T	3.9	3.9	3.8	A	A	2.2	2.1	A	A	1.6	1.5
29	A	E	E	1.3 <sup>F</sup>	1.6	1.4	1.8	2.8	2.8	A	A	4.3	5.0	4.1	4.1	4.1	4.1	2.4	1.5	A	A	1.6	1.3	A
30	A	1.7 <sup>A</sup>	A	2.0	E	C	C	C	C	4.0	4.5	C	A	A	A	3.8	3.6	C	C	2.3	2.5	A	2.2	2.3
31	A	A	1.4	E	A	1.8	2.5	3.8	4.0	4.0	4.1	4.3	5.4	5.6	4.8	5.4	4.0 <sup>T</sup>	4.0	2.0	E	3.3	A	A	A
Median Value	1.6	1.2	1.2	E	1.3	2.2	2.8	3.5	4.0	4.0	4.2	4.2	4.2	4.1	3.9	4.1	3.8	3.4	2.6	2.1	2.0	(1.6)	1.6	1.5
Count	13	15	19	16	20	23	14	16	19	13	14	18	17	16	21	24	19	16	20	17	11	9	11	10

Scale: 1.0 Mc to 17.0 Mc in 1.5 min

Manual

Electrical Communication Laboratory, Japanese Ministry of Telecommunications  
(Denki-tsushin Kenkyujo) Gotanda, Shinagawa-ku, Tokyo, Japan

IONOSPHERIC DATA

Day	135° E Mean Time																															Wakkanai		45°23.6'N	
	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	Lat.	Long.									
1	E	E	E	E	E	1.5	1.5	2.2	2.3	B	2.1	2.1	2.2	2.3	3.5	2.2	1.7	2.1	2.2	1.4	1.7	1.6	1.4	1.2											
2	E	E	E	E	1.5	E	B	1.5	2.4	2.3	2.8	2.8	3.7	4.1	2.4	2.3	2.0	1.8	1.5	1.4	1.3	1.3	1.2	1.1											
3	E	E	E	E	E	1.2	1.4	1.6	2.2	2.2	2.3	4.0	2.4	2.5	3.0	1.2	1.3	1.5	1.5	1.6	G	G	G	E											
4	E	E	E	E	E	E	E	E	1.6	2.0	2.2	2.1	2.2	2.2	2.3	2.1	1.7	1.5	1.6	G	G	T	1.5	1.5											
5	G	G	T	1.8	1.4	1.4	2.2	(2.3) <sup>B</sup>	2.4	2.8	2.2	3.8	3.8	2.3	C	C	C	C	C	C	1.2	1.2	E	C											
6	E	E	E	E	E	1.5	1.4	1.2	2.2	(2.3) <sup>C</sup>	2.3	2.3	2.3	2.4	2.4	2.4	2.2	2.2	2.0	1.6	C	E	1.6	E											
7	E	E	E	E	E	1.2	1.4	1.8	C	C	C	C	C	C	C	C	1.7	1.3	1.2	1.2 <sup>F</sup>	1.2 <sup>F</sup>	1.5 <sup>F</sup>	E	E											
8	E	E	E	E	E	1.2	1.4	1.8	1.8	2.3	2.7	2.5	2.2	2.3	B	2.4	2.2	2.0	2.1	1.7	1.4	1.4	1.4	E											
9	E	E	E	E	E	1.2	E	E	1.4	3.6	2.3	2.2	2.2	2.3	2.0	2.2	2.0	1.5	1.2	1.2	1.1	1.2	1.2	1.2	E										
10	E	E	E	E	E	E	E	E	1.2	E	1.2	1.2	2.1	1.5	1.4	1.6	2.1	1.6	1.4	1.3	1.3	1.2	1.2	1.2	E										
11	1.2	E	E	E	E	E	E	E	E	1.3	1.6	1.6	1.2	1.2	E	1.2	E	E	E	E	E	E	E	E	E										
12	C	C	C	C	E	E	1.3	1.3	1.2	1.3	1.4	2.2	2.3	2.2	2.2	2.1	1.4	1.4	E	1.4	1.5	1.2	1.2	E											
13	E	E	E	E	E	E	E	E	1.2	1.4	1.2	1.2	1.2	E	2.2	2.0	1.2	1.2	1.3	1.5	1.1	2.2	1.2	1.5	E										
14	1.1	E	E	E	E	1.2	1.2	2.0	1.6	1.6	1.8	2.2	2.2	2.2	2.0	2.2	2.2	1.4	1.3	1.1	1.1	1.1	E	E											
15	E	E	E	E	E	E	1.4	1.5	1.5	1.6	1.6	1.6	1.4	1.5	1.6	1.6	1.5	E	E	E	1.3	1.2 <sup>F</sup>	E	E											
16	E	E	E	E	E	E	E	E	1.2	E	1.4	1.4	1.9	2.2	2.2	2.2	1.6	1.4	1.2	1.4	1.4	1.4	C	E											
17	E	E	E	E	E	E	E	E	1.2	(1.4) <sup>C</sup>	1.6	1.6	1.6	1.8	1.4	1.1	1.2	1.2	1.2	1.6	1.4	1.2	1.2	1.1	E										
18	E	E	E	E	E	1.5	1.2	1.5	1.3	1.3	1.5	2.1	1.5	1.5	2.1	1.5	1.5	E	E	E	E	1.4	E	E											
19	1.1	E	E	E	E	1.3	1.3	1.4	1.5	2.3	2.3	3.1	2.3	3.3	3.5	3.3	G	2.2	1.3	G	E	E	E	E											
20	G	E	E	E	E	E	1.2	1.5	1.8	2.0	2.3	2.2	2.3	2.2	2.2	2.1	1.5	1.5	1.3	E	E	E	E	E											
21	E	E	E	E	E	E	E	C	C	C	C	C	C	C	C	C	C	2.2	1.6	1.4	1.1	1.5	E	E											
22	E	E	E	E	1.2	1.5	1.4	1.4	1.5	C	3.3	3.2	2.4	3.2	2.4	2.2	2.1	2.0	1.5	1.3	1.3	1.3	1.2	E											
23	E	E	E	E	E	E	1.2	E	1.4	1.5	1.6	2.7	3.1	2.3	1.6	1.5	1.5	1.2	E	E	E	E	E	E											
24	E	C	C	C	C	C	C	C	C	C	C	C	C	2.0	2.3	2.3	E	1.5	1.5	1.4	1.2	1.2	E	E											
25	1.4	E	E	E	E	E	E	E	E	1.1	T <sup>a</sup>	T	B	B	2.2	2.2	B	1.3	1.2	E	G	2.4	E	E											
26	E	G	G	G	C	C	C	C	G	2.5	2.4	2.2	2.2	2.3	1.5	1.6	E	E	E	E	E	E	E	E											
27	E	E	E	E	E	E	C	1.4	1.5	2.1	2.1	2.2	2.2	2.3	2.0	2.1	2.0	1.8	1.5	E	E	E	E	E											
28	E	E	E	E	E	E	C	E	E	(1.5) <sup>B</sup>	1.9	2.1	2.2	2.3	2.2	2.2	1.7	1.3	E	E	E	E	E	E											
29	E	E	E	E	E	E	E	1.2	1.4	2.0	2.3	3.1	2.1	3.8	C	2.1	1.3	2.0	1.3	E	E	E	E	E											
30	E	E	E	E	E	E	C	C	C	2.0	3.7	[3.4] <sup>C</sup>	3.1	3.8	3.4	2.2	1.8	C	C	1.6	1.3	1.4	1.3	1.2	E										
31	1.2	E	E	E	E	E	E	E	E	E	2.4	B	B	B	B	2.2	1.3	E	G	E	E	E	E	E											
Mean Value	E	E	E	E	E	E	E	1.2	1.4	1.8	2.2	2.2	2.2	2.3	2.2	2.1	1.7	1.5	1.3	1.2	1.1	1.2	E	E											
Count	30	24	28	27	30	28	25	27	26	27	26	26	26	27	25	27	28	29	29	30	30	30	30	30	30										

Sweep 1.0 Mc to 17.0 Mc in 1.5 min

Manual

W II

Electrical Communication Laboratory, Japanese Ministry of Telecommunications  
(Denki-tsushin Kenkyujo) Gotanda, Shinagawa-ku, Tokyo, Japan

IONOSPHERIC DATA

$f_oF_2$

Lat. 40°26.6'N  
Long. 139°34.1'E

Fukaura

135°E Mean Time

Day	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
1	7.2 P	7.1	7.5	6.5	6.2	6.8	7.6	9.0	8.2	9.1 R	8.6	9.4	9.9	9.4	9.2	(8.8) A	8.3	8.4	8.7	8.8	7.6	7.8	7.9	7.7
2	7.8	7.4	8.3	(7.9) C	7.4	7.1	8.1	8.4	7.6	8.4	8.8	9.4	9.5	9.3	9.3	9.0	8.3	8.5	8.0	7.8	7.9	(5.2) S	7.9	7.5
3	6.9 J	7.2	7.1	6.6	7.0	6.5 H	7.1	7.6 H	7.6	8.0	7.9	8.0	7.5	6.7	6.7 V	7.3	7.6	5.8	7.3	6.1	6.3	(6.1) S	(5.2) S	(5.9) S
4	5.9	6.3	6.5	A	5.4	5.6	7.6	T	C	8.4	6.4	7.8	7.8	9.0	9.1	9.1	9.1	8.3	7.5	7.4	6.6	6.4	5.7	6.2
5	5.7	5.3	5.4	5.6	4.8	5.3	6.0	C	C	C	C	C	C	C	C	C	C	C	8.7	8.4	8.6	8.4	9.5	8.0
6	6.0	6.7	6.8	6.8	5.8	6.3	6.2	A	6.4 V	7.3	A	(7.3) A	(7.8) B	8.3	8.7	8.4	8.6	7.6	7.6	7.0	6.9	7.0	6.5	6.4
7	6.3	6.3	6.3	6.0	5.7	5.4	6.0	6.7	(6.7) A	6.7	7.1	7.6 J	A	A	8.2	(8.5) A	8.7	9.1	A	A	8.2 F	7.6 P	A	F
8	F	6.1	(6.3) J	(7.0) J	F	(6.7) F	(9.1) K	8.4	9.7	7.2	7.1	8.3	9.3	10.9	11.2	11.5	11.8	10.7	8.2	7.1	6.8	7.0	6.4	6.4
9	7.0	F	F	A	A	A	5.9	5.8	A	6.6	(6.5) B	6.9 J	6.7	6.5	6.5	6.5	7.9	7.4	6.6	6.7	A	(6.3) A	(7.0) A	6.1
10	5.8 F	5.8	5.8	5.7 F	5.5 F	(5.9) F	6.2 F	7.3 F	5.6	5.7	5.7	6.8	6.7	6.5	(6.9) A	7.3	7.4	7.4	7.2	7.4	6.3	6.0	5.9	F
11	F	F	F	F	F	B	B	B	9.6 J	7.8	7.4	7.3	7.7 J	7.2	7.5	7.5	6.9	7.6	7.1 V	8.2	7.4	7.3	6.5	6.4
12	6.0	5.5	5.6	5.7	5.7	(7.4) C	8.5	7.3	7.3	7.1 J	7.1	8.1	8.6	8.3	8.5	8.0	8.2	7.6	8.0	(7.4) A	6.8	(7.3) A	6.7	F
13	F	F	F	F	F	F	7.2 F	7.4	8.2	7.1	6.8	6.8 J	(7.1) C	7.3	7.6	7.3	7.3	7.1	6.9	7.5	8.0	7.6	7.0	6.8
14	(5.8) R	6.0	6.0 V	5.4 F	5.0	5.9	6.2	7.2 J	7.2	7.0	7.6	7.8	7.8	8.4	8.3	8.4	9.0	7.8	6.4	6.9	6.8	7.1	7.4	7.1
15	6.4	6.2	6.4	6.3 F	(3.7) F	4.6 F	(5.9) A	7.2	7.6	(7.5) C	7.4	(7.3) A	7.1	7.0	6.0	6.9 J	6.5	7.3	6.9	6.0	5.6	6.1	5.5	5.6 F
16	5.6	5.4 F	5.2	4.6	4.7	4.3	5.4	6.0	6.5	C	C	C	C	7.4	7.1	7.3	7.6	7.1	6.9	7.4	7.0	7.0	6.7	6.8
17	6.0	5.7	5.6	5.6	5.3	5.7	7.4	5.2	8.3	8.3	8.0	8.4	8.4	8.4	7.8	8.0	8.1	8.0	7.8	7.7	7.4	7.2 Y	7.8	7.4
18	6.6	6.5	6.6	6.2	7.1	6.2	7.6	8.6	9.2	9.8	9.9	(9.8) C	9.6	9.0	9.6	9.4	8.4	8.2	8.6	9.4	8.2	8.2	7.8	7.5
19	7.0	6.8	7.1	6.5	5.6	6.1	C	C	C	C	C	C	C	C	C	C	C	C	C	8.2	7.4	7.2	(6.8) C	6.6
20	5.8	5.4	6.4	6.2	5.9	6.3	6.3	7.8	8.0	7.6	8.4	8.0	8.2	8.5	8.8	8.6	8.2	8.7	9.3	9.3	7.4	7.7 P	7.3	7.3
21	7.2	6.2 F	6.2	(6.5) F	6.2 F	5.7 F	6.2	7.6	8.0	8.7	9.0	9.0	8.8	(9.1) A	9.4	9.0	9.2	8.8	8.8	8.2	7.3 P	7.6 K	8.2 R	7.7
22	7.7 R	7.2 P	F	7.3	7.0	7.1	8.5	10.2	9.9	8.8	8.9	9.2	8.8	9.3	9.5	8.8	9.4	9.4	8.3	8.4	7.8	8.2	8.3	7.8
23	7.5	7.4	7.0	6.6 H	6.2	6.2	7.2	7.4	7.2	7.7	B	8.3	8.5	8.5	8.3	8.3	8.0	8.4	8.3	8.2	8.1	8.0	7.8	7.4
24	7.2	7.1	7.1	6.7	6.3	6.4	8.1	9.3	9.0	9.0	9.0	9.6	(9.6) B	9.6	9.3	9.3	9.7	9.7	9.4	9.1	7.9	8.2	7.8	7.5
25	7.1	7.1	7.1	7.0	7.0	7.8	8.6	8.6	9.6	8.6	8.5	8.6	9.4	9.4	9.2	8.8	8.5	9.4 P	8.5	8.6	9.1	9.1	8.4	7.5
26	7.2	7.0	6.8	6.6	6.6	6.9	8.6	11.3	11.0	C	C	C	C	C	C	C	C	C	C	9.0	8.3 S	7.2 S	7.5	7.2
27	7.2	7.3	7.3	6.8	6.6 R	7.0	9.7 P	10.3	10.3	10.6	10.3	10.3	10.0	10.9	10.3	9.6	9.6	9.0	8.9	8.9	8.6	8.1	7.9	7.4
28	7.2	7.0	6.8	6.7 P	(6.6)	7.3	6.6	6.8	7.2	7.2	7.3 K	(7.2) A	7.0 K	7.0 K	6.5 K	5.8 K	6.4 K	6.8	6.7	6.8	5.8	6.2	6.6	6.5
29	6.2	5.9	5.8	6.2	6.1	6.0	(7.7) C	9.4	10.1	9.8	9.8	10.8	10.4	9.8	8.5	8.3	8.4	(8.3) C	8.1	8.5	7.2	7.1	6.8	6.6
30	6.6	6.4	5.7	5.6	5.7	5.8	7.5	10.4	10.1 P	10.9	10.3	10.4	10.1	9.5	9.6	9.3	8.8	8.4	8.4	8.4	7.4 P	7.1 P	6.7	6.7
31	6.6	6.7	6.8	7.3	7.8	7.9	8.1	8.3	8.1	7.0	7.3	7.6	8.1	7.6	8.0	7.8	8.2	8.4	8.5	7.6	5.1	6.2	6.4	6.3
Mean Value	6.9	6.5	6.5	6.5	6.2	6.2	6.2	6.2	8.1	7.9	7.9	8.0	8.4	8.5	8.5	8.4	8.3	8.3	8.1	8.0	7.4	7.2	7.0	7.0
Count	28	28	27	27	26	28	29	27	27	26	25	27	27	27	28	28	28	28	28	28	30	31	30	28

Sweep 1.0 Mc to 1.00 Mc in 1.5 min

Manual

F 1



Electrical Communication Laboratory, Japanese Ministry of Telecommunications  
(Denki-tsushin Kenkyujo) Gotanda, Shinagawa-ku, Tokyo, Japan

IONOSPHERIC DATA

Day	155° E Mean Time																				Fukaura	Lot 40°36'6"N Long 139°54'1"E		
	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19			20	21
1	400	370	370	330	340	370	340	400	400	320	360	340	350	370	360	340	350	330	300	300	350	370	360	380
2	390	390	400	370	340	310	320	340	320	330	370	340	390	360	370	340	320	300	330	330	380	340	370	340
3	360	370	410	370	410	350	400	400	400	390	380	400	420	440	430	350	330	360	380	420	440	440	370	370
4	330	330	330	A	A	350	290	T	330	330	330	C	C	C	C	350	310	300	370	300	410	430	390	
5	410	420	410	380	360	310	350	C	C	C	C	C	C	C	C	C	C	C	310	300	380	380	360	
6	360	370	390	340	350	370	300	A	310	360	410	460	360	320	320	310	310	340	300	340	370	330	330	
7	360	370	360	370	360	370	340	A	370	350	340	A	A	A	A	A	A	300	A	390	310	A	F	
8	F	370	410	460	F	310	340	280	310	380	350	390	390	390	360	320	300	270	300	390	350	370	420	
9	340	F	F	A	A	A	A	A	A	B	B	B	400	360	340	300	280	310	290	A	A	A	330	
10	340	370	400	420	F	370	360	F	A	G	310	350	340	380	350	320	320	310	300	450	350	390	F	
11	F	F	F	F	F	B	B	B	B	280	330	360	B	330	310	270	300	300	340	300	200	320	310	
12	310	340	340	320	310	260	250	250	B	310	350	320	330	320	320	340	300	310	310	340	340	330	F	
13	F	F	F	F	F	F	300	290	A	B	C	C	C	C	C	310	290	290	320	300	270	310	330	
14	330	330	320	320	310	290	300	B	370	400	330	370	360	320	300	310	340	320	330	360	290	320	410	
15	400	410	340	310	370	370	360	300	300	340	390	370	430	D	D	370	320	320	290	370	350	340	380	
16	360	390	340	340	360	360	410	A	330	C	C	C	360	310	310	320	280	320	310	300	310	340	330	
17	390	330	340	350	320	330	300	290	310	320	330	320	330	310	350	340	290	320	310	320	400	370	330	
18	370	380	350	340	360	350	340	310	210	330	320	340	350	330	320	290	310	290	300	320	320	400	330	
19	370	380	310	310	360	340	C	C	C	C	C	C	C	C	C	C	C	C	300	350	420	440	370	
20	390	420	400	380	410	370	310	300	300	340	350	360	360	350	350	340	360	330	300	350	350	350	370	
21	340	380	340	410	370	280	310	340	340	380	370	360	360	360	350	350	330	310	300	350	440	460	370	
22	BR	B	F	360	340	320	300	340	310	400	350	310	350	330	340	340	320	300	330	360	330	370	330	
23	380	330	380	400	370	300	300	290	310	350	B	340	360	370	310	330	310	350	310	360	400	360	330	
24	350	410	340	350	330	320	290	290	290	300	380	370	B	390	340	370	330	330	310	320	370	360	350	
25	340	400	360	370	360	330	270	280	280	290	320	390	370	330	330	330	310	310	320	350	340	370	340	
26	350	370	370	350	360	330	320	290	290	C	C	C	C	C	C	C	C	C	310	300	350	370	380	
27	380	400	370	360	360	380	B	310	340	320	320	320	360	370	340	340	300	300	320	340	320	320	360	
28	360	370	370	380	R	390	290	320	350	370	330	A	G	420	380	380	340	310	330	360	410	400	370	
29	380	400	360	390	370	360	340	320	310	340	350	370	330	320	320	310	310	300	310	320	340	360	370	
30	400	380	400	390	440	400	350	320	350	360	340	340	340	340	370	350	320	340	330	370	400	410	420	
31	410	410	380	400	370	320	310	300	300	310	320	330	320	330	330	310	340	300	290	350	410	390	380	
Median Value	360	380	370	370	360	340	320	310	330	340	350	340	360	350	340	340	330	310	310	330	370	370	380	380
Count	27	27	27	27	25	27	24	26	24	25	24	27	26	26	26	27	28	28	30	29	30	29	28	28

Sweep 1.0 - Mc to 17.0 Mc in 1.5 min

Manual

Electrical Communication Laboratory, Japanese Ministry of Telecommunications  
(Denki-tsushin Kenkyujo) Gotanda, Shinagawa-ku, Tokyo, Japan

# IONOSPHERIC DATA

h'F<sub>2</sub>

Fukaura

Lat. 40°46.6'N  
Long. 139°34.1'E

135°E Mean Time

Day	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	25
1	310	280	270	290 <sup>A</sup>	310	300	260	300	380	370	310	380	340	320	320	330	310	300	240	250	250	280	300	300	300 <sup>A</sup>
2	300	290	300	(290) <sup>G</sup>	270	250	260	240	340	300	330	340	320	380	350	310	350	310	300	270	280	280	280	290	280
3	330	290 <sup>A</sup>	320	300	310	280 <sup>H</sup>	(340) <sup>A</sup>	400	390	400	380	380	400	420	480	400	350	280	300	300	300	320	340	330	330
4	270	290	300	A	A	300 <sup>A</sup>	280	300	(300) <sup>I</sup>	320	(330) <sup>I</sup>	330	400	360	350	360	300	300	240	280	250	270	330	330	330
5	320	340	310	280	260	290	270	C	C	C	C	C	C	C	C	C	C	C	280	270	340	330	330	260	260
6	270	310	300	280	300	300	(310) <sup>J</sup>	310	350	A	A	(350) <sup>B</sup>	350	320	320	320	210	270	260	230	270	270	270	310	310
7	280	290	290	290	270	240	310 <sup>L</sup>	340	(370) <sup>A</sup>	350	320	A	A	A	A	A	A	300	A	A	280	290	(280) <sup>A</sup>	270	270
8	(280) <sup>I</sup>	290	350	320	260	260	260	270	220	300	350	320	350	330	330	300	240	260	230	240	290	250	300	A	300
9	(300) <sup>I</sup>	290	270	A	A	A	A	A	A	A	B	(360) <sup>B</sup>	350	310	300	300	300	280	(280) <sup>A</sup>	270	A	A	A	A	A
10	300	300	(300) <sup>I</sup>	280	320	340	300	330	290	A	410	310	320	340	380	(340) <sup>J</sup>	300	300	240	260	350	250	260	310	310
11	310	340	310	(290) <sup>I</sup>	300	270	310	240	A	280	330	350	330	330	320	310	270	240	300	300	270	250	280	280	280
12	260	270	270	270	270	220	(240) <sup>I</sup>	250	230	320	290	350	310	310	310	290	A	240	280	(370) <sup>A</sup>	250	250	270	290	290
13	A	A	290	260	260	260	260	290	(280) <sup>A</sup>	290	A	C	300	300	300	300	250	270	280	270	250	230	250	(300) <sup>A</sup>	(300) <sup>A</sup>
14	280	280	280	250	260	280	260	280	350	A	340	350	360	360	300	300	300	300	320	270	250	300	300	(320) <sup>A</sup>	(320) <sup>A</sup>
15	330	(320) <sup>A</sup>	310 <sup>A</sup>	280	350	310	(340) <sup>A</sup>	360	290	(320) <sup>A</sup>	310	(340) <sup>A</sup>	330	B	B	A	A	370	240	230	240	A	320	320	300
16	320	280	310	280	300	290	A	A	330	C	C	C	C	C	C	C	C	C	C	240	230	240	320	300	300
17	A	A	300	290	(290) <sup>A</sup>	280	290	270	220	270	300	300	310	310	320	320	300	270	280	260	230	270	290	270	270
18	290	300	260	240	300	300	240	240	230	290	270	(300) <sup>I</sup>	320	320	300	300	250	240	250	250	260	320	280	280	270
19	290	300	260	240	300	240	C	C	C	C	C	C	C	C	C	C	C	C	C	260	260	A	C	C	300
20	300	320	320	290	300	270	240	240	250	280	330	320	380	350	360	330	320	280	280	270	280	320	330	330	300
21	300	280	290	290	290	280	280	300	330	320	310	360	330	A	A	330 <sup>A</sup>	320	300	280	250	280	320	330	330	300
22	300 <sup>A</sup>	300 <sup>A</sup>	A	280	280	280	260	260	300	380	270	300	280	310	320	280	300	290	290	270	280	300	290	290	300
23	300	280	270	270 <sup>H</sup>	270	290	280	250	270	350 <sup>I</sup>	370	340	350	340 <sup>B</sup>	300	320	300	290	260	250	250	260	280	280	300
24	300	300	290	270	270	250	240	260	270	370	340	310	320	340	330	330	240	280	280	240	240	260	270	280	280
25	280	(290) <sup>A</sup>	300	300	290	250	230	250	260	260	290	320	330	330	310	300	300	290	290	280	A	A	A	250	260
26	270	290	300	290	300	290	240	250	230	C	C	C	C	C	C	C	C	C	C	270	240	270	280	300	300
27	300 <sup>A</sup>	300	280	270	250	320	240	250	250	280	290	310	310	310	360 <sup>K</sup>	300 <sup>K</sup>	300	260	270	260	270	260	280	290	290
28	290	290	290	300	350	280	270	280	340 <sup>K</sup>	370 <sup>K</sup>	380 <sup>K</sup>	A <sup>K</sup>	G <sup>K</sup>	420	380 <sup>K</sup>	380	330 <sup>K</sup>	280	280	270	290	280	280	310	300
29	300	310	300	290	260	250	(250) <sup>I</sup>	240	260	A	A	A	A	280	300	310	300	(280) <sup>I</sup>	250	260	290	280	300	(300) <sup>A</sup>	(300) <sup>A</sup>
30	300	280	310	310	320	310	260	270	290	290	330	320	320	290	300	310	310	300	260	280	250	290	300	330	330
31	320	300	300	320	300	260	260	240	290 <sup>L</sup>	300	300	300	350	290	310	300	240	270	260	250	240	280	300	300	300
Median Value	300	290	300	290	300	290	260	270	290	300	330	330	330	330	320	310	300	290	280	270	270	280	290	290	300
Count	29	29	30	29	30	28	28	26	27	23	24	23	25	25	25	26	25	28	28	30	28	27	29	29	29

Sweep 1.0 Mc to 17.0 Mc in 1.5 min

Manual

IONOSPHERIC DATA

1F1

Fukaura  
Lat. 40°36.6'N  
Long. 139°54.1'E

135°E Mean Time

Day	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	
1						(35)	L	L	L	(5.4) <sup>B</sup>	L	L	L	L	L	5.4	A	L	L	L	Q				
2						Q	Q	Q	L	4.7	A	Q	B	B	B	5.0	4.2 <sup>J</sup>	L	L	L	Q				
3						Q	A	A	4.6	5.2	(5.3) <sup>B</sup>	(5.4) <sup>B</sup>	5.1	5.2	5.1	5.2	B	L	L	L	L				
4						Q	L	B	B	L	B	B	5.3	(5.2) <sup>B</sup>	5.4	5.4	B	L	L	L	Q				
5						L	L	C	C	C	C	C	C	C	C	C	C	C	C	C	A				
6						Q	L	A	4.5	A	A	A	B	B	A	5.0	L	Q	Q	Q	A				
7						Q	L	4.6	B	A	A	B	A	A	A	A	L	A	A	A	A				
8						A	Q	Q	L	5.0	B	B	L	4.9	5.3 <sup>B</sup>	4.3	4.5	B	Q	L	L				
9						A	A	A	A	A	B	B	B	B	4.7	B	B	L	A	A	A				
10						B	L	B	4.5	B	5.0	B	B	B	A	A	4.4	L	L	L	Q				
11						L	L	A	A	A	(5.0) <sup>J</sup>	(4.7) <sup>J</sup>	(4.8) <sup>J</sup>	(4.7) <sup>J</sup>	A	A	L	A	A	A	A				
12						Q	C	L	4.6	5.1	4.9 <sup>J</sup>	F	B	B	B	B	A	A	A	A	A				
13						Q	L	L	4.5	A	A	C	A	A	A	A	Q	Q	Q	A	A				
14						L	A	A	(5.0) <sup>S</sup>	A	B	(5.1) <sup>J</sup>	(5.3) <sup>J</sup>	(5.1) <sup>J</sup>	A	A	A	A	A	A	A				
15						A	A	A	Q	C	A	A	A	B	B	A	A	A	A	Q	A				
16						Q	A	A	A	C	C	C	A	5.2	(5.0) <sup>B</sup>	4.8	4.6	A	L	L	Q				
17						A	L	L	Q	A	B	B	(5.1) <sup>J</sup>	(5.2) <sup>J</sup>	5.1	(4.7) <sup>J</sup>	4.8	Q	Q	Q	L				
18						Q	C	C	C	C	C	C	C	C	C	C	C	C	C	C	B				
19						Q	Q	Q	L	A	B	B	5.9	5.5	(5.7) <sup>A</sup>	5.5	5.1	A	A	A	A				
20						Q	Q	Q	L	A	A	B	B	5.9	5.5	(5.7) <sup>A</sup>	5.5	A	A	A	A				
21						L	L	A	A	5.2	L	A	A	L	A	A	L	A	Q	Q	Q				
22						Q	A	L	L	5.3	L	5.5	5.3 <sup>J</sup>	B	B	A	A	A	A	A	Q				
23						Q	L	Q	Q	T	T	T	5.8	L	A	B	L	L	L	Q	Q				
24						Q	Q	L	L	A	L	L	B	B	6.0	L	B	L	L	L	Q				
25						Q	Q	L	L	L	L	B	L	5.8	(5.0) <sup>A</sup>	4.3	L	L	L	L	Q				
26						Q	Q	Q	Q	C	C	C	C	C	C	C	C	C	C	C	Q				
27						L	Q	L	L	A	L	L	(5.5) <sup>J</sup>	(5.4) <sup>J</sup>	A	L	L	L	L	L	Q				
28						L	Q	Q	5.0	5.0	5.1	A	B	B	5.2	L	4.7	L	L	A	Q				
29						Q	C	Q	L	A	A	A	A	A	A	L	L	L	L	L	Q				
30						Q	C	Q	L	A	L	B	L	B	A	L	A	L	L	A	Q				
31						A	Q	Q	L	L	L	B	L	B	B	B	Q	Q	Q	Q	Q				
Mediana Value						-			4.6	5.2	-	5.2	(5.4)	5.3	5.1	5.0	4.6								
Count						1		1	7	8	4	5	9	12	13	11	7								

Sweep 1.0 Mc to 17.0 Mc in 1.5 min Manual

Electrical Communication Laboratory, Japanese Ministry of Telecommunications  
 (Denki Tsushin Kenkyujo) Gotanda, Shinagawa-ku, Tokyo, Japan

# IONOSPHERIC DATA

h<sub>p</sub>F<sub>o</sub>

Fukaura  
 Lot 40°36'6"N  
 Long 139°34'1"E

135°E Mean Time

Day	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
1						250	230	220	A	A	A	A	A	290 <sup>B</sup>	B	A	A	250	250	Q				
2						Q	Q	Q	A	A	A	Q	B	B	B	B	A	250	250	Q				
3						Q	A	(210)	A	B	B	B	B	B	B	B	250	250	300 <sup>A</sup>					
4						Q	A	210	B	B	B	B	B	B	B	B	B	250	250	Q				
5						250	230	C	C	C	C	C	C	C	C	C	C	C	C	B	A			
6						Q	260	A	240	A	A	A	B	A	A	210	210	Q	Q	Q				
7						Q	230	220	B	A	A	B	A	A	A	A	A	A	A	A	A			
8						A	Q	Q	T	210	B	B	A	A	250	B	230	240	240	Q	220			
9						A	A	A	A	A	B	B	B	B	270	B	B	250	A	A	A			
10						240	230	220	A	B	210	Q	B	B	A	A	A	270	250	Q				
11						210	220	A	A	A	A	A	A	A	A	230	A	B	A	A	A			
12						Q	C	210	230	200	200	210	B	B	B	B	A	A	A	A	A			
13						Q	230	270	230	A	A	A	C	A	A	A	Q	Q	A	A	A			
14						250	A	A	230	A	T	220	A	A	B	A	A	A	A	A	A			
15						A	A	A	Q	C	A	A	A	A	B	B	A	A	A	A	A			
16						Q	A	A	A	C	C	C	A	A	A	220	220	(220)	220	Q	Q			
17						A	260	230	Q	A	B	B	B	240	220	210	250	Q	Q	Q				
18						A	Q	A	Q	A	A	C	A	240	(230)	220	240	240	240	A				
19						Q	C	C	C	C	C	C	C	C	C	C	C	C	C	C	B			
20						Q	Q	Q	230	A	B	A	250	A	A	A	280	A	A	A				
21						240	240	A	A	210	A	A	A	A	A	A	A	A	Q	Q				
22						Q	A	230	(240)	240	200	B	B	B	B	A	A	A	A	A	Q			
23						Q	230	Q	Q	240	B	B	B	A	A	B	230	250	Q	Q				
24						Q	Q	220	A	A	A	B	B	B	A	B	B	B	250	Q	Q			
25						Q	Q	220	220	220	B	B	270	240 <sup>B</sup>	210	200	240	250	250	Q				
26						Q	Q	Q	Q	C	C	C	C	C	C	C	C	C	C	C	Q			
27						260	Q	230	240	(250)	250	(240)	220 <sup>A</sup>	200 <sup>A</sup>	(210)	(250)	250	230	250	Q				
28						270	Q	Q	270	210	200	A	B	230	230	260	250	A	Q	Q				
29						Q	C	Q	220	A	A	A	A	A	220	220	250	C	Q	Q				
30						Q	Q	240	250	A	A	B	270	B	A	240	A	270	A	Q				
31						A	Q	Q	250	A	A	B	B	B	B	240	Q	Q	Q	Q				
Median Value						250	230	230	230	220	200	-	270	240	230	220	250	250	260					
Count						20	10	12	14	8	5	3	5	7	10	12	12	15	10					2

Sweep 1.0 Mc to 11.0 Mc in 1.5 min Manual

IONOSPHERIC DATA

ft

Lat 40°36.6'N  
Long 139°41'E  
Fukaura

135°E Mean Time

Day	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
1						A	2.2 (2.9)		(3.6)	A	A	A	A	B	B	B	3.4	2.9	A	A				
2						B	2.3	3.4	A	A	A	B	B	B	B	B	(3.4)	(3.0)	2.7	B				
3						B	3.2		A	A	A	B	B	B	B	B	3.5	2.9	2.3	A				
4						B	B	3.0	3.4	B	B	B	A	B	B	B	B	B	A	1.8				
5						A	A	C	C	C	C	C	C	C	C	C	C	C	B	A				
6						A	2.6	2.8	3.2	A	A	A	B	B	B	B	3.3	A	A	A	B			
7						E	A	A	B	B	B	B	A	A	A	A	A	A	A	B				
8						A	2.6 <sup>A</sup>	A	A	A	B	B	B	(3.7)	B	B	A	A	B	B				
9						B	1.9	A	A	B	B	B	B	B	B	B	B	B	2.7	A	A			
10						(2.0) <sup>A</sup>	(2.1) <sup>A</sup>	A	A	A	B	B	B	B	B	B	B	B	B	2.5	B			
11						A	A	B	A	A	A	A	A	A	A	A	B	3.0 <sup>A</sup>	A	A				
12						B	C	3.0	(3.2)	(3.4) <sup>A</sup>	B	A	A	B	B	B	A	A	(2.7) <sup>A</sup>	1.9	A			
13						A	A	2.9	3.2	B	A	A	C	A	B	B	(3.1) <sup>A</sup>	A	A	A				
14						A	A	A	(3.0) <sup>A</sup>	B	A	B	A	A	A	A	A	A	B	A	A			
15						B	A	A	A	C	A	A	B	B	B	B	3.2	A	A	A				
16						E	A	A	A	C	C	C	C	A	A	A	A	A	2.2	E				
17						B	A	A	A	A	B	B	B	A	A	A	A	A	(2.2) <sup>B</sup>	B				
18						A	A	A	A	A	A	A	A	A	B	A	A	B	A	A				
19						2.0	C	C	C	C	C	C	C	C	C	C	C	C	C	C				
20						(1.7) <sup>A</sup>	2.5	3.0	3.5	B	B	B	B	B	B	B	A	A	2.7	A				
21						A	A	A	A	A	A	A	A	A	A	A	A	A	(2.0) <sup>A</sup>	A				
22						A	A	A	A	A	A	A	A	B	B	B	A	A	2.9	2.0	A			
23						E	A	A	A	A	A	B	A	A	A	A	B	B	A	A	E			
24						B	B	3.0	3.0 <sup>B</sup>	A	A	B	B	B	B	B	B	B	A	A	E			
25						B	2.5	3.0	B	A	B	B	B	B	B	B	B	B	A	A	E			
26						B	2.5	3.0	B	C	C	C	C	C	C	C	C	C	C	C	E			
27						E	2.4	(2.9) <sup>A</sup>	A	B	B	B	A	A	A	A	A	A	A	A	E			
28						E	(2.1) <sup>A</sup>	2.9	3.3	B	B	B	B	B	B	B	(3.3) <sup>B</sup>	(3.1) <sup>A</sup>	2.8	A	B			
29						E	C	2.7	A	A	A	A	B	B	B	B	B	B	C	B	E			
30						E	B	A	A	A	A	B	B	B	B	B	A	A	A	A	A			
31						A	A	A	A	A	A	A	B	B	B	B	A	A	2.5	1.9 <sup>J</sup>	E			
Median Value						E	2.4	3.0	3.2									3.3	2.9	2.2				
Count						10	11	14	10				1				3	8	10	9				

Sweep 1.0 Mc to 17.0 Mc in 1.5 min Manual

Electrical Communication Laboratory, Japanese Ministry of Telecommunications  
 (Denki-tsushin Kenkyujo) Gotanda, Shinagawa-ku, Tokyo, Japan

IONOSPHERIC DATA

h<sub>p</sub>F<sub>2</sub>

Fukaura  
 Lat. 40° 26.6' N  
 Long. 139° 54.1' E

135° E Mean Time

Day	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	
1						A 100 (110) <sup>A</sup>	A 110	A A	A B	B B	B B	B B	B B	B B	B B	B B	B B	100	A A	A A					
2						B 110 120	A A	A B	A B	B B	B B	B B	B B	B B	B B	B B	(110) <sup>B</sup>	120	110	120	A A				
3						B A 120	A A	A A	A A	B B	B B	B B	B B	B B	B B	B B	B B	B B	B A	A A	B B				
4						B B 110	110 (110) <sup>B</sup>	110 110	A A	B B	B B	B B	B B	B B	B B	B B	B B	B B	B A	A A	B B				
5						A A	C C	C C	C C	C C	C C	C C	C C	C C	C C	C C	C C	C C	C C	B A	A A				
6						A 110 110	A A	A A	A A	B B	B B	B B	B B	B B	B B	B B	A 110	110	A A	A A	B B				
7						E A	A A	A A	B B	B B	B B	B B	B B	B B	B B	B B	A A	A A	A A	A A	A A				
8						A 110	A A	A A	B B	B B	B B	B B	(110) <sup>B</sup>	110	B B	A A	A A	A A	A A	A A	B B				
9						B B	A A	A A	A A	A A	B B	B B	B B	B B	B B	B B	110	110	110	A A	A A				
10						120 100	A A	A A	A A	B B	B B	B B	B B	B B	B B	B B	110	120	110	120	B B				
11						A A	A A	A A	A A	A A	A A	A A	A A	A A	A A	A A	A A	110	120	A A	A A				
12						B C	110 (110) <sup>A</sup>	110	A A	A A	B B	B B	(120)	B B	B B	B B	120	A A	A A	A A	A A				
13						A A	A 120	110	B A	A A	C C	A A	C C	A A	B B	A A	B B	110	A A	A A	A A				
14						A A	A A	A 120	B A	A A	120	A A	A A	A A	A A	A A	A A	A A	B A	A A	A A				
15						A A	A A	A A	A A	C C	A A	A A	B B	B B	B B	B B	A A	110	A A	A A	A A				
16						E A	A A	A A	A A	C C	C C	C C	A A	A A	A A	A A	A A	A A	A 100	E E	A A				
17						B A	A A	A 110 (110) <sup>A</sup>	110	(110) <sup>B</sup>	110	A A	A A	A A	A A	A A	A A	A A	A A	B B	B B				
18						A A	A A	A A	A A	C C	C C	C C	C C	C C	C C	C C	(110) <sup>A</sup>	110	A A	A A	A A				
19						110	C C	C C	C C	C C	C C	C C	C C	C C	C C	C C	C C	C C	C C	C C	B B				
20						A 120	120	110	110 (110) <sup>B</sup>	110	B A	A A	A A	A A	A A	A A	A A	A A	110	A A	A A				
21						A A	A A	A A	A A	A A	A A	A A	B B	B B	B B	A A	A A	A A	A 110	A A	A A				
22						A A	A A	A A	A A	A A	A A	A A	A A	A A	A A	A A	A A	A A	120	120	A A				
23						B A	A A	A 110	A A	A A	110	A A	A A	A A	A A	A A	100	A A	A A	A A	B B				
24						B 110	110	110	A A	A A	110	B B	B B	B B	B B	B B	B B	B A	A A	A A	B B				
25						B 100	100	B A	A A	B B	B B	B B	B B	B B	B B	B B	110	B A	A A	A A	E E				
26						B 120	110	B C	C C	C C	C C	C C	C C	C C	C C	C C	C C	C C	C C	C C	E E				
27						E 130	110	A B	B B	B B	A A	A A	A A	A A	A A	A A	A A	A A	A A	A A	E E				
28						B 130	120	110	B B	B B	100	100	110	110	110	110	110	110	120	A B	B B				
29						E C	120	A A	A A	A A	B B	B B	B B	B B	B B	B B	110	B C	B B	A A	B B				
30						E B	A A	A A	A A	A A	B B	B B	B B	B B	B B	B B	A A	A A	A A	A A	A A				
31						A A	A A	A A	A A	A A	B B	B B	110	B B	B B	B B	110	(120) <sup>A</sup>	120	120	E E				
Mean Value Count						110	110	110	110	110	110	110	110	110	110	110	110	110	110	110	110	110	110	110	110
						11	14	13	6	3	7	4	2	6	13	15	15	11	9						

Sweep 1.0 Mc to 17.0 Mc in 1.5 min Manual

IONOSPHERIC DATA

fes

Lat. 40°36.6'N  
Long. 139°34.1'E

Fukaura

135°E Mean Time

Day	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
1	G	3.2	G	5.6	4.6	4.3	3.4	3.8	3.9	5.0 <sup>B</sup>	5.0	6.2	7.2	B	4.4 <sup>B</sup>	9.8	6.2	5.7	2.9	3.1	3.5	4.2	4.9	3.5
2	3.0	3.5	2.8	C	3.5	3.0	3.4	3.8	6.5	7.2	9.2	4.6 <sup>B</sup>	B	B	6.2	B	5.4	4.2	3.7	3.0	3.4	3.4	3.2	3.5
3	3.4	4.8	2.8	G	G	5.4	5.0	5.0	10.5	5.8	4.2 <sup>B</sup>	(4.4)	B	B	B	4.0 <sup>B</sup>	3.8	3.4	3.4	2.4	G	2.3	G	G
4	G	5.0	5.0	10.0	10.2	5.8	4.0	B	B	B	B	B	4.0 <sup>B</sup>	B	B	B	B	B	4.8	2.4	2.0	2.2	G	(4.6) <sup>B</sup>
5	G	3.0	2.2	1.8	2.0	2.3	3.4	C	C	C	C	C	C	C	C	C	C	C	4.8	5.4	(7.6) <sup>B</sup>	6.4	9.4	3.0
6	2.3	5.0	4.7	3.6	2.8	5.5	3.7	(9.0) <sup>B</sup>	4.6	7.3	10.9	9.8	4.3	C	5.4	5.0 <sup>Y</sup>	6.7	7.0	3.2	G	G	G	G	4.5 <sup>B</sup>
7	6.6	6.2	4.4	G	2.5	1.8	2.8	(9.4) <sup>B</sup>	7.0	6.8	7.1	8.5	(12.8) <sup>B</sup>	(12.0) <sup>B</sup>	(9.6) <sup>B</sup>	12.4	(9.8) <sup>B</sup>	(11.4) <sup>B</sup>	11.7	11.0	8.0	5.0	9.0	6.4
8	5.0	7.1	4.6	3.4	5.0	4.9	3.4	3.4	3.4	B	B	B	4.8	B	4.9	3.5	G	G	G	G	G	4.0	7.1	5.8
9	7.0	5.0	5.5	7.0	8.4	5.0	6.4	6.2	6.2	6.7	4.6 <sup>B</sup>	B	B	B	B	B	4.2	5.0	6.8	5.4	8.0	7.2	7.2	6.6
10	3.4	4.4	4.6	2.2	2.4	2.5	2.8	6.4	6.0	5.8	B	B	B	(4.1) <sup>B</sup>	6.1	8.4	6.7	G	G	2.1	G	G	G	3.4
11	3.1	5.5	6.0	3.7	3.2	5.8	4.5	8.0	10.0	5.4	7.2	5.6	7.1	3.4	4.4	4.4	B	7.0	5.8	8.4	8.4	6.8	5.8	5.4
12	3.4	2.8	2.2	3.2	T	G	G	4.7	4.5	4.7	4.1	4.4	B	B	5.1	4.4	9.4	6.4	7.8	7.6	3.6	7.6	5.0	6.8
13	7.0	3.4	6.0	5.5	3.0	3.0	3.4	3.1	4.7	6.2	5.6	6.2	C	(5.0) <sup>B</sup>	(5.2) <sup>B</sup>	(5.0) <sup>B</sup>	3.4	6.0	5.6	4.2	3.6	7.3	6.6	6.2
14	2.5	3.2	3.0	2.0	2.7	1.8	4.2	5.0	3.4	7.2	(5.8) <sup>Y</sup>	6.8	5.4	4.4	8.2	6.8	10.0	6.6	6.8	7.0	6.2	3.2	4.8	5.0
15	6.3	6.8	5.4	4.0	3.1	3.4	7.0	5.2	C	C	5.6	11.4	4.8	5.4	5.4	6.0	6.0	6.0	3.0	3.0	5.0	5.0	3.2	5.0
16	3.4	2.2	3.7	2.3	3.1	G	5.4	6.6	7.3	C	C	C	7.0	6.7	4.7	5.1	4.2	6.2	3.0	2.2	6.3	7.2	7.0	3.4
17	5.0	5.0	4.0	G	4.8	4.4	5.2	3.2	G	4.8	B	B	B	B	4.3	5.3	4.6	5.8	5.0	4.0	6.6	2.7	4.8	G
18	2.6	3.9	(7.2)	3.6	4.6	4.1	5.0	4.4	4.2	5.2	5.6	C	6.8	4.9	4.8	4.7	4.8	5.0	4.0	6.0	7.0	4.2	3.8	3.4
19	3.4	3.2	2.5	2.3	2.2	2.5	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C
20	3.1	G	G	2.2	G	3.0	G	G	G	6.4	B	5.7	4.2	5.0	7.2	7.0	4.8	4.6	5.4	5.6	4.6	5.5	6.4	2.6
21	2.9	3.0	3.4	3.0	3.0	3.2	6.3	5.6	7.6	6.1	6.0	6.4	6.7	(11.6) <sup>B</sup>	10.2	7.0	7.0	6.2	4.6	4.2	3.4	3.4	6.0	4.6
22	4.9	4.4	3.4	3.0	3.3	3.0	5.0	7.0	6.0	4.9	3.8	4.4	4.8	5.4	5.3	5.0	4.6	4.8	5.6	3.6	6.5	5.3	5.8	4.9
23	2.6	3.0	3.3	1.9	6.1	G	2.5	4.0	(4.2) <sup>B</sup>	5.0	4.7	B	5.6	5.2	5.4	B	B	B	3.3	3.2	G	2.4	2.0	7.1
24	3.7	3.5	2.8	2.4		B	3.4	4.0	4.4	5.0	4.4	B	B	B	B	B	B	B	3.0	2.6	G	G	G	G
25	G	5.8	2.9	2.6	3.5	B	3.4	G	4.0	4.2	(4.2) <sup>B</sup>	B	B	B	B	B	B	4.0	3.4	3.5	4.4	4.4	2.2	3.0
26	2.6	G	G	G	G	G	3.2	3.6	4.0	C	C	C	C	C	C	C	C	C	C	C	C	C	3.0	3.4
27	3.0	2.0	1.8	(2.0) <sup>S</sup>	1.9	G	G	G	3.8	5.8	5.4	3.4	4.8	5.0	6.0	B	B	4.0	5.4	3.4	3.4	4.4	4.7	4.0
28	2.4	2.2	2.2	2.4	2.4	G	2.9	4.6	4.3	4.0 <sup>B</sup>	B	B	B	B	B	B	4.5	4.2	4.4	6.0	3.2	2.2	4.2	3.3
29	2.2	3.1	2.8	2.2	2.0	G	C	3.8	4.4	3.4	6.8	4.2	4.2	3.0	B	B	B	C	4.2	5.0	5.4	4.2	4.8	1.2
30	G	2.4	2.2	G	G	G	B	3.4	5.5	6.3	8.1	B	B	B	5.5	4.2	5.0	4.4	5.8	5.0	3.1	5.6	2.3	(3.0) <sup>Y</sup>
31	1.9	2.2	2.4	G	3.0	3.2	2.8	3.6	3.4	4.8	4.6	B	B	B	B	B	3.6	G	G	2.6	G	G	G	2.4
Mean Value	3.1	3.2	3.0	2.4	2.9	3.0	3.4	4.2	4.5	5.8	5.6	5.7	5.1	5.2	5.4	5.0	5.0	4.8	4.2	3.5	3.6	4.2	4.8	3.5
Count	31	31	31	30	30	29	27	28	28	24	21	15	16	15	19	18	21	25	29	30	30	31	30	31

Sweep 1.0 Mc to 17.0 Mc in 1.5 min

Manual

Electrical Communication Laboratory, Japanese Ministry of Telecommunications  
(Denki Tsushin Kenkyujo) Gotanda, Shinagawa-ku, Tokyo, Japan

# IONOSPHERIC DATA

F<sub>2</sub>-M3000

Lat 40°36.6'N  
Long 139°54.1'E

Fukaura

135° E Mean Time

Day	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
1	2.5	2.8	2.8	2.9	2.6	2.7	2.9	2.8	2.6	2.8	3.1	2.8	2.7	2.8	2.9	2.9	3.0	2.9	2.9	3.1	2.7	2.8	2.7	2.6
2	2.7	2.7	2.6	2.9	2.8	2.9	2.9	3.0	2.9	2.9	2.9	2.7	2.9	2.7	2.8	2.9	3.0	3.0	3.2	2.9	2.6	2.9	2.7	2.9
3	J	2.7	2.5	2.7	2.6	2.8	2.8	2.6	2.6	2.7	2.7	2.7	2.6	2.6	2.3	2.5	2.8	2.9	2.9	2.7	2.5	(2.4) <sup>S</sup>	(2.6) <sup>S</sup>	(2.7) <sup>S</sup>
4	3.1	3.0	2.9	A	A	2.8	3.2	2.9	J	3.0	3.1	3.0	2.6	2.8	2.7	2.7	2.8	3.0	3.1	2.7	3.0	2.5 <sup>Z</sup>	2.6	2.6
5	2.5	2.5	2.6	2.5	2.7	2.9	2.8	C	C	C	C	C	C	C	C	C	C	C	C	3.0	2.6	2.7	2.6 <sup>Z</sup>	2.7
6	2.7	2.7	2.6	2.9	2.7	2.8	2.9	A	3.0 <sup>V</sup>	2.8	(2.6) <sup>S</sup>	(2.5) <sup>S</sup>	(2.7) <sup>B</sup>	3.0	2.9	3.1	3.0	3.0	2.9	3.1	2.9	2.7	2.9	2.7
7	2.8	2.7	2.8	2.7	2.8	2.8	3.0	2.8	(2.8) <sup>A</sup>	(2.9) <sup>A</sup>	2.9	J	A	A	2.9	2.9	A	3.1	A	A	2.7 <sup>F</sup>	3.1 <sup>P</sup>	A	F
8	F	2.7 <sup>F</sup>	J <sup>F</sup>	J <sup>F</sup>	F	J <sup>F</sup>	(2.8) <sup>K</sup>	3.0	3.1 <sup>Z</sup>	3.0	2.8	2.9	2.5	2.7	2.7	2.8	3.0	J	3.4	3.0	2.6	3.0	2.7	2.7
9	3.0	F	F	A	A	A	2.8	A	A	(2.8) <sup>B</sup>	(2.8) <sup>B</sup>	B	J	2.8	2.8	2.7	3.1	3.3	3.1	3.1	(3.0) <sup>A</sup>	(3.0) <sup>A</sup>	(2.7) <sup>A</sup>	3.0
10	2.8 <sup>F</sup>	2.7	2.4 <sup>F</sup>	2.5 <sup>F</sup>	2.4 <sup>F</sup>	F	J <sup>F</sup>	2.7	3.3	(2.6) <sup>S</sup>	2.8	3.1	3.0	3.0	2.8	(2.8) <sup>S</sup>	2.9	2.9	3.1	3.1	2.4	2.8	2.6	F
11	F	F	F	F	F	B	B	B	J	3.2	2.9	2.9	J	2.9	3.0	3.1	3.4	3.2	2.9 <sup>V</sup>	2.8	3.1	3.0	2.9	2.8
12	3.0	2.9	2.8	2.9	2.9	3.2 <sup>H</sup>	3.4	3.5	J	3.0	3.0	2.7	3.0	3.0	3.0	3.1	3.0	3.1	3.0	(2.9) <sup>A</sup>	2.9	(2.7) <sup>A</sup>	3.1	F
13	F	F	F	F	F	F	3.1	3.1	3.3	3.1	3.3	J	C	3.2	3.1	3.0	3.0	3.2	3.1	3.0	3.1	2.6	2.6	2.5 <sup>Z</sup>
14	(2.7) <sup>K</sup>	2.9	2.9 <sup>V</sup>	J <sup>F</sup>	2.9	3.3	3.1	J	2.7	2.7	3.0	2.8	C	2.8	2.7	3.0	3.1	3.0	2.8	3.1	2.9	2.6	2.6	2.5 <sup>Z</sup>
15	2.6	2.5	2.8	2.9 <sup>F</sup>	(2.9) <sup>F</sup>	(2.6) <sup>F</sup>	(2.7) <sup>A</sup>	2.9	3.2	(3.0) <sup>C</sup>	2.9	2.7	2.8	2.5	3.0	J	2.8	3.1	3.0	3.1	2.7	2.7	2.6	2.6 <sup>F</sup>
16	2.8	2.6	2.9	3.0	2.8	2.6	2.7	2.7	3.1	C	C	C	3.0	3.0	3.0	3.2	3.0	3.1	3.3	2.9	3.1	2.9	2.8	2.7
17	2.7	2.8	2.7	2.8	2.9	2.9	3.1	3.3	3.0	3.1	3.1	3.0	3.0	3.0	2.9	2.8	2.9	3.1	3.0	3.0	2.9	2.5 <sup>V</sup>	2.7	2.7
18	2.7	2.6	2.8	2.9	2.8	2.7	2.8	3.1	3.0	2.9	3.0	(2.8) <sup>C</sup>	2.7	2.9	3.0	2.9	3.0	3.1	2.9	3.0	2.9	2.9	2.7	2.9
19	2.7	2.7	3.1	3.0	2.7	2.9	C	C	C	C	C	C	C	C	C	C	C	C	C	2.9	2.7	2.6	(2.6) <sup>F</sup>	2.7
20	2.7	2.7	2.7	2.7	2.6	2.7	3.0	3.1	3.2	3.2	3.0	2.9	2.8	2.8	2.8	2.8	2.9	2.8	2.8	3.0	2.8	2.5 <sup>P</sup>	2.6	2.7
21	2.8	2.7 <sup>F</sup>	2.9	(2.6) <sup>F</sup>	2.7 <sup>F</sup>	3.2	3.0	3.0	2.9	2.9	2.7	2.7	2.8	(2.7) <sup>A</sup>	2.7	2.8	2.8	2.8	2.9	3.0	2.8	2.5 <sup>R</sup>	2.4 <sup>F</sup>	2.7
22	J <sup>R</sup>	2.8	F	2.8	3.0	3.2	2.8	3.0	3.0	2.8	2.8	3.0	2.8	2.9	2.8	2.9	2.9	2.9	3.0	2.9	2.8	2.6	2.8	2.7
23	2.7	2.9	2.7	2.8 <sup>H</sup>	2.8 <sup>H</sup>	3.1	3.2	3.2	3.0	2.9	B	2.9	2.9	2.8	3.0	3.0	3.0	2.9	3.0	2.9	2.7	2.6	2.7	2.6
24	2.7	2.6	2.8	2.8	2.9	3.1	3.1	3.1	3.2	3.1	2.9	2.9	(2.7) <sup>B</sup>	2.7	3.0	2.8	2.9	2.9	2.9	3.0	3.0	2.7	2.8	2.9
25	2.8	2.5	2.6	2.7	2.8	3.0	3.3	3.2	3.2	3.1	3.0	2.6	2.7	2.7	2.9	2.9	2.9	3.0	3.0	2.9	2.8	2.8	3.0 <sup>F</sup>	2.8
26	2.8	2.5	2.6	2.7	2.8	2.8	2.9	3.0	3.0	C	C	C	C	C	C	C	C	C	C	3.0	3.1 <sup>S</sup>	3.0 <sup>S</sup>	2.8	2.7
27	2.7	2.7	2.8	2.7	2.7	2.7	3.0	3.0	2.9	3.0	3.0	3.0	2.8	2.8	2.8	2.8	2.9	3.0	2.9	(2.8) <sup>S</sup>	2.8	2.9	2.9	2.7
28	2.8	2.7	2.7	2.6 <sup>F</sup>	(2.5) <sup>S</sup>	2.6	3.2	3.0	2.9	2.9	2.8	(2.6) <sup>A</sup>	2.5	2.6	2.7	2.8	2.9	3.1	3.1	2.9	2.8	2.8	2.6	2.6
29	2.6	2.6	2.7	2.6	2.7	(2.8) <sup>C</sup>	3.0	3.0	2.9	2.9	2.8	2.7	3.0	3.0	3.0	3.1	3.1	(3.0) <sup>C</sup>	3.0	3.0	2.9	2.8	2.7	2.6
30	2.6	2.6	2.6	2.6	2.5	2.6	2.8	2.9	2.7 <sup>F</sup>	2.8	2.9	2.8	2.9	2.8	2.9	2.9	3.0	3.0	2.8	3.0	2.9	2.7 <sup>P</sup>	2.6 <sup>P</sup>	2.6
31	2.6	2.6	2.7	2.6	2.8	2.9	3.0	3.0	3.1	3.1	3.0	3.0	3.0	2.9	3.0	3.0	2.9	3.0	3.1	3.2	2.8	2.6	2.6	2.7
Mean Value	2.7	2.7	2.7	2.7	2.8	3.0	3.0	3.0	2.9	2.9	2.9	2.8	2.8	2.8	2.9	2.9	2.9	3.0	3.0	3.0	2.8	2.7	2.7	2.7
Count	26	28	26	25	26	28	25	26	25	26	24	24	27	28	26	27	27	27	28	30	31	31	30	28

Sweep 1.0 Mc to 11.0 Mc in 1.5 min



Electrical Communication Laboratory, Japanese Ministry of Telecommunications  
(Denki-tsushin Kenkyujo) Gotanda, Shinagawa-ku, Tokyo, Japan

IONOSPHERIC DATA

Lat 41° 36' N  
Long 139° 54' E

Fukaura

fF min

135° E Mean Time

Day	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
1	1.8	1.7	1.6	1.3	1.7	2.1	2.8	3.2 <sup>A</sup>	4.0 <sup>A</sup>	5.4	A	A	A	5.2	5.3	A	A	3.0	2.8 <sup>A</sup>	2.6 <sup>A</sup>	2.6 <sup>A</sup>	2.2	1.9	1.5
2	1.8	1.7	1.8	(1.9) <sup>C</sup>	1.9	1.8	A	3.3	A	A	A	4.8	5.3	5.5	5.4	4.2	A	3.0	2.0	2.4	2.0	1.7	1.9	1.8
3	2.0	2.5	A	2.0	2.0	2.0	A	A	A	A	4.4	5.2	5.3	5.4	5.1	4.1	3.3	3.0	2.3	2.3 <sup>A</sup>	1.5	2.3 <sup>A</sup>	2.1	2.3
4	2.4	2.2	2.2	A	A	2.2	A	3.2	5.6	5.5	5.8	5.5	5.2	5.2	5.2	5.2	5.2	3.8	A	1.7	1.7	1.7	1.7	1.7
5	1.8	2.0 <sup>A</sup>	1.9	1.3	1.8	2.0 <sup>A</sup>	2.3	C	C	C	C	C	C	C	C	C	C	C	5.4	2.3	2.0	2.3 <sup>A</sup>	2.0	1.7
6	1.5	A	A	1.6	1.8	2.3	2.8	A	3.3	A	A	A	A	6.0	5.4	A	4.0	A	A	1.9	1.9	2.0	2.0	2.0
7	2.2	1.2	1.2	1.1	1.1	1.4	A	A	A	A	A	A	A	A	A	A	A	A	A	1.8	1.8	1.8	A	1.8
8	A	1.7	A	1.7	1.7	A	2.6	2.2	4.0	4.0	5.2	5.4	4.9	4.0	5.3	3.8	3.4	3.0	2.3	1.5	1.5	2.0	A	2.2
9	A	A	2.3	A	A	A	A	A	A	A	6.1	5.1	5.4	5.0	4.2	4.5	A	2.9	A	A	A	A	A	A
10	1.6	1.7	A	1.6	1.7	1.8	2.0	A	A	A	4.0	5.6	5.2	5.3	A	A	A	A	2.2	1.6	1.7	1.7	1.4	A
11	1.2	A	A	1.1	1.5	1.5	2.2	A	A	A	A	A	A	A	3.4	A	3.8	A	A	A	2.0	1.5	1.7	1.7
12	1.2	1.2	1.2	1.2	1.3	2.2	(2.9) <sup>C</sup>	3.5	A	3.9	A	A	4.9	5.0	5.5	5.2	3.4	A	A	A	2.0	1.7	1.2	1.6
13	A	A	1.8	1.8	2.0	1.8	3.0	3.0	A	A	A	C	5.4	5.4	5.5	5.2	3.4	A	A	A	1.7	1.7	1.2	1.6
14	1.7	E	1.2	2.5	1.9	1.4	A	A	3.9	A	A	4.1 <sup>B</sup>	A	5.8	A	A	A	A	2.4	1.6	1.6	1.8	2.1	A
15	1.5	A	A	A	1.8	1.8	A	A	A	C	A	A	A	A	A	A	A	A	A	2.3	2.0	1.8	1.3	1.8
16	A	1.2	A	A	1.7	1.6	A	A	A	C	C	C	A	A	A	A	A	A	A	2.3	2.0	1.8	1.3	1.8
17	A	A	A	1.9	2.2	A	A	A	3.2	A	5.2	5.4	4.1	A	A	A	A	A	2.3	1.4	2.0	2.0	2.5	2.0
18	1.9	1.2	1.4	1.9	1.9	A	A	A	A	A	A	C	A	A	A	A	A	A	2.2	2.0	2.0	1.9	1.8	2.0
19	1.8	1.7	1.8	1.8	1.2	A	C	C	C	C	C	C	C	C	C	C	C	C	C	3.6	3.6	A	C	1.7
20	1.2	1.7	1.7	1.7	1.5	1.7	2.6	3.3	3.8	A	5.4	A	5.0	A	A	A	A	A	A	A	A	A	A	2.2
21	2.0	1.4	1.4	1.4	1.8	A	2.1	A	A	A	A	A	A	A	A	A	A	A	A	A	A	1.8	1.7	2.0 <sup>A</sup>
22	A	A	A	1.4	2.0	A	A	A	A	A	4.2	5.2	5.2	5.4	5.3	A	A	A	A	A	A	1.8	2.1 <sup>A</sup>	1.7
23	1.7 <sup>A</sup>	1.8	1.1	1.7	1.5	1.8	A	A	4.4	A	5.4	5.3	A	A	A	5.2	4.2	3.0 <sup>A</sup>	2.7	2.0	2.2	1.7	A	2.1
24	1.7	1.6	1.7	1.8	1.8	1.8	2.7	3.2	A	A	5.2	5.4	5.1	6.0	5.0	5.0	5.0	3.0	2.6	2.0	2.0	2.0	2.0	2.0
25	2.0	A	1.2	1.2	A	1.4	2.4	3.1	3.4	A	5.2	5.4	5.0	4.6	4.0	3.8	4.0	A	3.0 <sup>A</sup>	2.0	A	A	1.8	2.4 <sup>A</sup>
26	2.0	2.0	2.0	2.0	2.0	2.5	3.2	3.2	4.0	C	C	C	C	C	C	C	C	C	C	2.0	2.0	A	A	2.0 <sup>A</sup>
27	2.0 <sup>A</sup>	1.3	E	1.7	1.2	1.5	2.7	3.2	A	A	A	A	A	A	A	4.4 <sup>A</sup>	A	4.2	2.8	2.0	1.8	A	A	1.8
28	1.6	1.4	1.4	1.2	1.4	1.6	A	3.6	4.0	4.8	4.2	A	5.6	4.1	4.1	4.0	3.8	3.0	A	1.7	1.7	1.7	1.2	
29	1.5	1.5	1.6	1.6	1.6	1.6	(2.3) <sup>f</sup>	3.0	A	A	A	A	A	A	4.0	3.8	(3.6) <sup>C</sup>	3.3	2.2	A	A	A	2.4	A
30	2.0	2.0	2.0	2.0	2.0	2.0	2.6	3.2	A	A	6.4	5.3	5.5	A	A	A	A	A	A	A	1.7	2.0	1.7	2.2
31	1.7	1.8	1.8	2.0	2.2	A	2.8	A	4.0	A	A	5.2	5.0	5.0	5.0	4.0	A	2.8	1.9	2.3	1.6	1.6	1.2	1.4
Median Value	1.8	1.7	1.7	1.7	1.8	1.8	2.6	3.2	4.0	(4.8)	5.2	5.4	5.2	5.3	5.1	4.2	3.8	3.0	2.3	2.0	1.9	1.8	1.8	1.9
Count	25	23	23	23	23	18	15	15	12	5	12	14	16	18	14	15	11	11	15	20	23	23	21	26

Sweep 1.0 Mc to 1.7.0 Mc in 1.5 min Manual

Electrical Communication Laboratory, Japanese Ministry of Telecommunications  
(Denki-tsushin Kenkyujo) Gotanda, Shinagawa-ku, Tokyo, Japan

IONOSPHERIC DATA

Lat 40°36'N  
Long 139°34'E

Fukaura

fE min

135°E Mean Time

Day	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
1	G	1.7	G	1.2	1.7	1.5	1.4	1.7	2.5	3.0	3.0	2.1	2.8	B	4.2	4.0	2.9	1.8	1.7	1.7	1.7	1.7	1.5	1.5
2	1.8	1.7	1.8	(1.7) <sup>C</sup>	1.6	1.8	1.8	1.8	2.4	2.6	2.6	4.0	B	B	5.3	2.8	2.8	2.2	2.0	2.2	2.2	1.7	1.8	1.8
3	2.0	2.0	2.2	G	G	B	2.0	2.0	2.8	2.2	2.9	4.1	B	B	B	3.2	2.6	2.3	1.8	1.7	G	1.7	G	G
4	G	G	2.2	2.2	2.2	2.2	2.2	2.2	1.7	2.9	2.3	2.3	2.4	B	B	B	2.8	B	1.7	1.7	1.7	1.8	G	1.7
5	G	1.3	1.9	1.2	1.8	1.7	1.8	C	C	C	C	C	C	C	C	C	C	C	3.5	2.2	2.0	2.0	2.0	1.7
6	1.6	1.6	1.6	1.6	1.8	1.8	2.1	2.0	2.3	3.0	2.9	2.9	4.1	B	2.7	2.6	2.7	2.2	1.9	B	G	G	G	2.0
7	2.0	1.2	1.1	G	1.1	1.5	1.8	1.7	2.3	5.0	4.7	4.7	3.0	2.8	2.9	3.4	2.4	2.2	2.0	1.8	1.8	1.8	1.8	1.8
8	1.3	1.6	1.7	1.7	1.7	1.7	1.7	2.6	2.6	1.7	B	B	4.0	3.0	B	2.2	2.3	1.8	1.5	B	G	2.0	1.4	2.0
9	1.9	1.7	1.8	1.2	1.2	1.7	1.7	1.7	1.7	2.3	4.1	B	B	B	B	2.3	2.2	2.2	1.8	1.5	1.6	1.6	1.6	1.5
10	1.6	1.7	1.7	1.8	1.7	1.8	1.9	1.9	2.0	5.0	B	B	B	2.3	2.3	2.3	2.0	2.7	1.8	1.6	G	G	G	1.2
11	1.2	1.2	E	1.1	1.4	1.5	1.4	1.4	2.0	2.2	2.4	2.4	2.7	2.9	2.6	2.8	2.3	2.0	2.0	1.8	1.7	1.8	1.7	1.7
12	1.2	1.2	1.2	1.2	T	B	C	1.6	3.2	2.2	2.4	2.8	2.9	2.4	4.6	2.6	2.5	1.7	1.7	1.7	1.7	1.8	1.7	1.7
13	1.2	1.2	1.2	1.2	1.2	1.6	2.0	2.5	2.0	2.2	4.0	2.8	(2.7) <sup>C</sup>	2.6	3.0	2.8	2.2	2.2	2.2	1.7	1.7	1.7	1.2	1.2
14	1.7	E	1.3	1.4	1.9	1.3	1.8	1.8	2.4	2.4	1.8	2.9	2.8	3.0	2.8	3.0	2.4	2.9	2.3	1.9	1.6	1.8	1.8	1.6
15	1.5	1.1	1.2	1.2	1.6	1.8	1.6	1.5	2.3	(2.5) <sup>C</sup>	2.6	2.7	3.8	5.0	5.0	2.5	1.4	1.7	1.6	1.8	2.0	1.8	1.8	1.8
16	2.0	1.8	1.2	1.2	1.7	1.7	1.8	1.8	2.0	C	C	C	2.8	2.8	2.6	2.2	2.2	1.5	1.5	1.4	1.5	1.4	1.7	1.8
17	1.5	1.9	1.9	G	1.8	1.8	2.2	2.3	2.0	3.0	3.0	B	2.5	2.2	2.3	2.2	2.2	2.0	2.0	1.8	1.8	1.7	1.7	G
18	1.7	1.2	1.1	1.1	1.5	1.6	1.5	1.7	2.0	2.2	2.8	(2.8) <sup>C</sup>	2.8	2.2	2.2	2.2	2.2	2.1	1.8	1.8	1.8	1.8	1.6	1.4
19	1.6	1.2	1.7	1.1	E	1.6	C	C	C	C	C	C	C	C	C	C	C	C	C	B	B	1.3	(1.5) <sup>C</sup>	1.5
20	1.2	G	G	1.7	G	1.5	1.7	2.3	2.4	2.7	2.8	2.8	3.8	2.8	2.8	2.5	2.3	2.1	2.1	2.0	2.2	2.2	2.0	2.0
21	2.4	1.4	1.4	1.4	1.8	1.8	2.0	2.0	2.2	2.0	3.0	3.0	5.0	2.7	3.3	2.7	2.0	1.7	1.7	1.7	1.7	1.2	1.7	1.2
22	1.4	1.3	1.3	1.4	1.4	1.4	1.4	1.4	2.0	2.4	2.8	2.7	2.8	B	3.0	2.8	2.2	1.7	1.8	1.4	1.5	1.5	1.7	1.4
23	1.4	2.0	2.2	1.7	G	G	2.0	1.0	2.0	2.3	2.3	2.3	2.2	2.2	2.2	1.9	1.8	2.1	2.3	G	2.0	1.7	1.7	1.7
24	1.7	1.6	1.7	1.8	1.8	1.8	1.8	1.8	1.8	2.0	2.6	2.8	B	B	B	B	B	2.6	2.1	G	G	G	G	G
25	G	1.2	1.2	1.2	1.2	B	1.8	1.7	3.4	2.9	3.8	2.9	B	B	B	2.8	B	2.0	2.0	1.8	1.8	1.8	1.8	2.0
26	2.2	G	G	G	G	G	2.0	2.2	B	C	C	C	C	C	C	C	C	C	C	1.8	2.0	2.4	2.0	2.0
27	2.0	1.3	1.4	1.9	1.4	G	1.8	1.7	1.8	3.8	4.0	3.8	3.3	3.2	3.2	2.7	2.8	1.8	1.7	1.8	1.6	1.6	1.6	1.4
28	1.1	1.6	1.2	1.4	1.4	G	1.7	2.1	2.6	3.8	B	5.0	(4.0) <sup>B</sup>	2.3	2.3	1.8	1.4	1.6	1.7	2.1	1.7	1.6	1.7	1.2
29	1.2	1.5	1.6	1.6	1.5	G	C	2.0	2.0	2.2	3.0	3.0	4.0	4.0	B	2.9	B	C	3.2	2.0	2.0	2.0	2.2	2.0
30	G	2.0	2.0	G	G	G	B	2.2	2.5	2.2	2.4	B	B	B	2.8	2.7	2.1	1.5	1.7	1.4	1.5	1.7	1.5	1.8
31	1.7	1.8	1.8	G	2.0	2.0	1.8	2.0	2.2	2.6	2.6	B	3.5	B	B	2.0	2.0	1.9	1.8	1.8	G	G	G	G
Median Value	1.5	1.4	1.4	1.2	1.5	1.6	1.8	2.0	2.2	2.5	2.8	2.8	2.9	2.8	2.8	2.7	2.2	2.0	1.8	1.8	1.7	1.7	1.7	1.7
Count	31	31	31	31	30	27	27	29	28	26	24	21	21	17	21	26	25	26	29	28	30	31	31	31

Sweep 1.0 - Mc to 17.0 Mc in 1.5 min

Manual

Electrical Communication Laboratory, Japanese Ministry of Telecommunications  
(Denki-tsushin Kenkyujo) Gotanda, Shinagawa-ku, Tokyo, Japan

IONOSPHERIC DATA

ft<sub>2</sub>

Shibata

Lat 37°57.0'N  
Long 139°15.8'E

135°E Mean Time

Day	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	
1	7.4	(7.6) <sup>S</sup>	7.3	6.3 <sup>J</sup>	5.9	6.5	7.3	8.0 <sup>J</sup>	8.3	9.0	9.3	9.9	10.4	10.2	9.9	9.2	9.0	9.0	9.4	8.7	(7.8) <sup>P</sup>	8.1 <sup>S</sup>	S	S	S
2	7.5	(7.4) <sup>S</sup>	7.4	7.0	7.0	7.2	8.1 <sup>P</sup>	8.1	7.5	8.5	9.4	9.8	10.1	10.0	10.7	10.5	9.0	9.0	9.1	S	S	S	S	S	S
3	S	S	5.8 <sup>P</sup>	5.6	S	S	S	S	7.4 <sup>J</sup>	8.5	8.5	8.4	(8.2) <sup>F</sup>	7.1 <sup>F</sup>	6.8 <sup>F</sup>	7.5	8.1 <sup>P</sup>	7.4	6.3 <sup>J</sup>	6.3	6.3	6.2 <sup>J</sup>	5.8 <sup>J</sup>	6.5 <sup>P</sup>	
4	6.6	5.0	4.7	4.5 <sup>F</sup>	A	A	A	8.0 <sup>J</sup>	B	8.7	B	7.9 <sup>J</sup>	8.1 <sup>J</sup>	9.1	9.1	9.4 <sup>J</sup>	9.4	8.3	7.9	7.5	(7.0) <sup>J</sup>	6.5 <sup>J</sup>	F	A	
5	5.9 <sup>S</sup>	5.9 <sup>S</sup>	5.8 <sup>S</sup>	5.7	5.2	5.4	6.0	C	C	C	C	C	C	C	C	C	9.2	9.2	8.9	8.6	8.4 <sup>S</sup>	9.2	A	S	
6	8.2 <sup>F</sup>	(7.8) <sup>P</sup>	(7.5) <sup>F</sup>	7.1 <sup>F</sup>	7.5 <sup>S</sup>	6.6 <sup>F</sup>	5.9	6.7	A	A	6.0 <sup>A</sup>	6.4	7.9 <sup>J</sup>	9.3	9.9	8.9	8.9	8.9	8.9	7.4 <sup>S</sup>	6.9	6.9	(6.6) <sup>J</sup>	6.3 <sup>J</sup>	
7	6.6	6.5 <sup>J</sup>	F	(6.1) <sup>S</sup>	5.9	5.7	B	5.9	B	A	(7.1) <sup>A</sup>	8.2 <sup>J</sup>	8.4	8.9	9.2	9.4	9.0	8.2 <sup>J</sup>	7.1 <sup>J</sup>	7.3 <sup>J</sup>	(7.4) <sup>F</sup>	F	F	AF	
8	F	F	F	5.8 <sup>F</sup>	F	A	SF	BF	9.1	7.0	7.0	8.6	9.4	11.4	B	12.8 <sup>S</sup>	12.7 <sup>S</sup>	11.3	(10.3) <sup>S</sup>	6.5	6.7	7.1	5.9	A	
9	S	5.7	S	5.0	5.0	5.5	5.7	5.9 <sup>J</sup>	AF	A	A	11.2	7.3	7.2	7.7	8.1	8.0	B	6.6 <sup>J</sup>	6.8 <sup>J</sup>	6.5 <sup>J</sup>	6.5	A	S	
10	5.5	(6.0) <sup>S</sup>	(5.0) <sup>F</sup>	(5.2) <sup>J</sup>	4.4 <sup>F</sup>	(4.3) <sup>F</sup>	FS	FS	S	A	(6.7) <sup>F</sup>	6.8 <sup>R</sup>	6.7	6.5	(7.6) <sup>A</sup>	7.4	7.3 <sup>F</sup>	7.3 <sup>F</sup>	AF	A	AF	6.5 <sup>S</sup>	5.5	5.2 <sup>S</sup>	
11	5.8	FS	6.2	(6.0) <sup>A</sup>	5.8 <sup>J</sup>	6.1 <sup>J</sup>	7.1 <sup>F</sup>	7.8	9.2	(8.3) <sup>F</sup>	(6.4) <sup>F</sup>	(6.8) <sup>F</sup>	8.2 <sup>J</sup>	7.2 <sup>F</sup>	7.6 <sup>J</sup>	7.6	7.3 <sup>F</sup>	7.3 <sup>F</sup>	AF	A	AF	6.5 <sup>S</sup>	5.5	6.0 <sup>F</sup>	
12	SF	SF	(5.3) <sup>F</sup>	5.1 <sup>F</sup>	5.3	6.0	8.4	C	C	C	C	C	C	C	C	C	C	7.3	8.2	(7.6) <sup>F</sup>	7.0	S	F	A	
13	F	6.3 <sup>F</sup>	F	F	5.3 <sup>F</sup>	5.6 <sup>F</sup>	6.9	7.4 <sup>F</sup>	7.3	7.2 <sup>F</sup>	7.2	7.1	(8.0) <sup>S</sup>	8.9	8.4 <sup>J</sup>	7.5	S	A	A	S	7.6	7.4	6.5 <sup>F</sup>	5.8 <sup>F</sup>	
14	F	F	(5.2) <sup>F</sup>	5.4 <sup>F</sup>	4.8 <sup>F</sup>	5.2 <sup>F</sup>	5.7 <sup>F</sup>	S	7.4	6.4	8.2	8.2	8.2	8.6	9.5 <sup>J</sup>	9.0	7.5	6.8	6.6	6.9	S	7.0	S	6.4 <sup>F</sup>	
15	(5.0) <sup>P</sup>	5.8 <sup>S</sup>	6.6 <sup>S</sup>	5.7 <sup>F</sup>	4.1 <sup>F</sup>	4.4 <sup>F</sup>	5.6	7.7 <sup>F</sup>	8.5 <sup>F</sup>	(8.0) <sup>F</sup>	8.2	(7.8) <sup>A</sup>	7.3	B	A	7.4	6.9	7.4 <sup>J</sup>	7.2	5.9	A	AF	AF	5.7 <sup>F</sup>	
16	5.2	4.8 <sup>F</sup>	5.0 <sup>F</sup>	3.9	4.6	4.2	5.3	5.7	6.4	(7.0) <sup>F</sup>	7.6	8.3	8.7 <sup>J</sup>	(7.4) <sup>F</sup>	7.0 <sup>F</sup>	7.4	7.4	6.8	6.7	7.4	7.1	6.7	S	S	
17	A	S	5.3	5.5 <sup>F</sup>	5.1	5.3 <sup>F</sup>	7.2	8.0	7.8	7.8	7.3	8.2	9.1	8.2	7.8	7.9	7.9	8.0	8.0	S	S	6.9	6.6 <sup>F</sup>	(7.2) <sup>F</sup>	
18	FS	FS	7.8 <sup>F</sup>	5.8	5.8 <sup>F</sup>	5.9	7.2	8.8	9.3	9.6	10.1	10.0	10.0	9.6	9.8	10.0	8.3	7.8	8.9	9.9	8.1	7.5 <sup>S</sup>	(7.5) <sup>S</sup>	7.4	
19	6.8	S	S	6.3	5.5 <sup>S</sup>	(6.8) <sup>J</sup>	8.0 <sup>J</sup>	9.1	C	C	C	C	C	C	C	C	8.7	8.2 <sup>J</sup>	7.8	S	7.0	S	6.6 <sup>S</sup>	(6.6) <sup>S</sup>	
20	6.6 <sup>J</sup>	6.3	6.4 <sup>J</sup>	6.1	(6.0) <sup>J</sup>	5.8	B	7.7 <sup>B</sup>	7.8 <sup>J</sup>	7.5	7.9	8.2	8.0	8.5	9.2	8.6	8.1	8.8	9.2	S	6.7	7.1 <sup>S</sup>	6.0	7.2 <sup>J</sup>	
21	7.1	6.3	6.5	5.9	5.6	5.1	6.3	7.1	AF	8.5	9.2	9.3	9.2	9.4	9.7	9.6	9.2	9.4	9.0	SF	S	S	7.3	7.1	
22	6.5 <sup>S</sup>	7.1	7.0	7.0	6.6	6.6	7.3 <sup>S</sup>	9.0	8.2	8.2 <sup>J</sup>	8.8	9.1	9.1	9.1	9.7	10.0	9.6	9.2	8.2	S	S	S	8.3	(7.8) <sup>F</sup>	
23	7.8	7.4	7.0 <sup>P</sup>	6.8	6.3	6.4	7.3 <sup>S</sup>	7.0	7.1	7.3	8.0	8.2	9.0	9.0	8.6	8.7	7.9	8.1	8.7	7.8	8.0	7.6	7.8	(7.5) <sup>S</sup>	
24	7.1	(6.7) <sup>P</sup>	7.0	6.6 <sup>F</sup>	6.2	6.3	7.6	8.5	8.7	8.5	9.0	9.9	9.8	9.9	10.0	9.8	10.0	9.6	9.0	8.8	7.4	7.7	7.5 <sup>P</sup>	7.7 <sup>P</sup>	
25	7.2	7.0	(7.3) <sup>F</sup>	(7.0) <sup>F</sup>	6.7	7.2 <sup>J</sup>	7.7	9.1	9.6	8.4	8.1	8.3	9.5	9.7	9.5	9.3	9.1	8.8	8.8	9.1	(9.1) <sup>S</sup>	9.0	7.9	7.6 <sup>P</sup>	
26	7.6 <sup>S</sup>	7.0	6.9	6.7	6.0	6.4 <sup>J</sup>	8.3	C	C	C	C	C	C	C	C	C	C	C	9.1	B	7.6 <sup>S</sup>	S	S	S	
27	S	6.2	B	B	6.5	6.5	9.0	10.1	10.0	10.4	10.3	9.8	10.3	11.0	10.8	9.9	(9.6) <sup>F</sup>	9.3	8.9	SF	7.8	7.9	7.3	(7.2) <sup>S</sup>	
28	7.1	6.8	S	6.6	6.8	(6.8) <sup>F</sup>	6.8	6.8	7.0 <sup>K</sup>	7.2 <sup>K</sup>	7.2 <sup>K</sup>	6.8 <sup>K</sup>	6.6 <sup>K</sup>	7.1 <sup>K</sup>	6.9 <sup>JF</sup>	6.9 <sup>K</sup>	7.2 <sup>K</sup>	7.3 <sup>F</sup>	A	C	C	A	C	C	
29	C	C	C	C	C	C	7.3	9.2	9.8	9.7	9.5	10.2	10.7	10.2	9.1	8.9	8.5	8.7	8.5	8.6 <sup>J</sup>	S	S	7.0	6.5 <sup>J</sup>	
30	6.5	6.4 <sup>J</sup>	5.8	5.6	5.7	7.4	9.8	10.2	10.6	10.1	10.1	10.1	9.4	9.7	9.8	9.4	8.9	8.2	8.6	8.2	S	6.4 <sup>P</sup>	S	S	
31	6.3 <sup>J</sup>	6.6	S	6.0 <sup>F</sup>	6.0 <sup>P</sup>	6.0 <sup>P</sup>	S	7.8	8.0	7.4	7.5	(8.0) <sup>C</sup>	8.4	8.0	8.2	8.4	8.2	8.9 <sup>J</sup>	9.0	S	S	S	(6.1) <sup>S</sup>	6.4 <sup>J</sup>	
Mean Value	6.8	6.5	6.4	5.9	5.8	6.0	7.3	7.9	8.2	8.3	8.1	8.2	8.6	9.1	9.2	8.9	8.7	8.4	8.7	7.6	7.3	7.1	7.0	6.6	
Count	21	22	23	28	28	27	24	24	21	23	25	26	26	26	25	27	27	26	26	19	20	19	17	18	

Sweep 1.0 Mc to 1.0 Mc in 1.5 min

Manual

S 1

Electrical Communication Laboratory, Japanese Ministry of Telecommunications  
 (Denki-tsushin Kenkyujo) Gotanda, Shinagawa-ku, Tokyo, Japan

# IONOSPHERIC DATA

hp. F.

Shibata

Lat 37°57.0'N  
 Long 139°15.8'E

135°E Mean Time

Day	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	
1	360 (330) <sup>S</sup>	300	300	300	300	300	300	300	380	300	310	310	310	300	310	300	320	310	290	290	320	310	310	S	S
2	360	340 (350) <sup>B</sup>	340	300	300	300	300	270	310	310	340	360	370	370	370	370	320	310	(320) <sup>S</sup>	S	S	S	S	S	S
3	S	S	310 <sup>S</sup>	310	S	S	S	S	B	230	320	390	360	420	400	420	320	340	320	B	370 <sup>F</sup>	B	B	B	B
4	300	300	A	320	340 <sup>F</sup>	A	A	A	B	270	C	C	C	C	C	C	300	290	200	310	C	B	F	S	S
5	260 <sup>S</sup>	400 <sup>S</sup>	400 <sup>S</sup>	310	310	280	270	C	C	C	C	C	C	C	C	C	300	290	290	340	370 <sup>S</sup>	A	A	SF	SF
6	S	310 <sup>F</sup>	(330) <sup>F</sup>	340	370 <sup>F</sup>	310 <sup>F</sup>	280	A	A	A	A	A	B	B	330	300	300	300	300	300	340	340	370 <sup>S</sup>	S	B
7	360	B	S	360	320	310	B	220	B	A	A	B	210	320	300	290	280	B	B	B	B	F	F	F	AF
8	F	F	F	250 <sup>F</sup>	F	A	SF	B	240	300	310	340	340	340	360	360	320	300	280	260	260	260	260	260	260
9	S	310	S	300	310	320	320	330	A	A	A	320	510 <sup>A</sup>	360	310	290	280	B	B	B	F	A	A	A	S
10	310 (320) <sup>F</sup>	(310) <sup>F</sup>	B	350 <sup>F</sup>	410 <sup>F</sup>	FS	FS	FS	S	A	(480) <sup>F</sup>	300	310	380 (340) <sup>A</sup>	320	300	200	B	B	B	B	B	B	240	330
11	370 <sup>F</sup>	FS	370	A	S	F	310 <sup>F</sup>	320	200	AF	F	F	B	330 <sup>F</sup>	B	290	280 <sup>F</sup>	AF	AF	AF	A	AF	AF	S	F
12	SF	SF	F	320	320	280	260	C	C	C	C	C	C	C	C	C	C	C	C	270	270	AF	S	F	A
13	F	F	F	F	F	270	280	F	B	300 <sup>F</sup>	360	A	S	310	B	300	S	S	A	A	A	240	300	310 <sup>F</sup>	300 <sup>F</sup>
14	F	F	F	(270) <sup>F</sup>	260 <sup>F</sup>	290 <sup>F</sup>	220 <sup>F</sup>	S	300	240 <sup>P</sup>	300	310	300	340	B	300	240	240	250	270	200	S	320	SF	330 <sup>F</sup>
15	(310) <sup>F</sup>	320 <sup>S</sup>	280 <sup>S</sup>	(240) <sup>F</sup>	350 <sup>F</sup>	410 <sup>F</sup>	350	380 <sup>F</sup>	290 <sup>F</sup>	340 <sup>F</sup>	310	(310) <sup>F</sup>	310	B	A	210	320	S	240	250	A	AE	AE	AF	260 <sup>F</sup>
16	340	F	E	240	340	360	340	320	300	(320) <sup>F</sup>	370 <sup>F</sup>	300	(300) <sup>F</sup>	A	AF	300 <sup>F</sup>	S	250	240	240	300	300	310	S	S
17	A	S	330	340 <sup>F</sup>	290	310 <sup>F</sup>	20	260	240	200	280	310	310	310	300	330	(310) <sup>F</sup>	310	290	S	S	320	(340) <sup>F</sup>	(400) <sup>F</sup>	FS
18	FS	FS	360 <sup>F</sup>	280	300 <sup>F</sup>	290	210	280	270	320	300	350	310	320	310	320	300	300	300	300	300	360	360	(370) <sup>S</sup>	320
19	310	S	S	320 <sup>S</sup>	330 <sup>S</sup>	S	B	290	C	C	C	C	C	C	C	C	C	B	280	B	300	S	290	S	S
20	B	340 <sup>B</sup>	B	C	320	320	F	280 <sup>F</sup>	B	320	(320) <sup>F</sup>	310	360	320	310	300	320	220	220	310	S	300	340	310	B
21	310	310	320	280	280	320 <sup>F</sup>	290	310	AF	350	310	360	320	340	320	340	320	220	200	300	360	SF	S	350	300
22	300 <sup>S</sup>	330	350	360	350	350	280	290 <sup>F</sup>	280	B	210	340	370	330	330	320	310	200	200	200	S	S	S	330	(330) <sup>S</sup>
23	360	320	350 <sup>F</sup>	340	290	B	280	260	290	330	310	300	350	310	300	300	300	290	290	290	310	320	320	(310) <sup>S</sup>	320
24	320 (360) <sup>S</sup>	340	320 <sup>F</sup>	280	290	280	290	250	250	330	330	360	360	360	370	330	330	310	290	280	300	300	360	320 <sup>F</sup>	320
25	320	350	S	C	220	B	280	280	280	280	300	360	340	350	310	340	310	310	310	300	360	(360) <sup>F</sup>	330	320 <sup>F</sup>	330
26	320	350	340	370	320	S	280	C	C	C	C	C	C	C	C	C	C	C	C	C	300	B	S	S	S
27	S	370	B	B	B	350	290	280	290	290	300	310	330	330	330	340	360	(310) <sup>F</sup>	270	300	SF	300	300	300	S
28	320	350	S	360	400	(350) <sup>F</sup>	300	320	320	380	420	370 <sup>F</sup>	B <sup>H</sup>	370 <sup>F</sup>	B <sup>H</sup>	350 <sup>F</sup>	310 <sup>F</sup>	F	A	C	C	A	C	C	C
29	C	C	C	C	C	C	270	240	260	300	280	220	300	310	330	330	310	290	290	270	S	S	S	340	B
30	330	B	360	360	380	370	310	290	280	330	300	C	C	370	340	300	280	300	310	310	S	S	340 <sup>F</sup>	S	
31	S	360	S	S	360	310 <sup>F</sup>	S	250	260	260	300	(300) <sup>F</sup>	300	330	330	330	310	270	B	280	S	S	S	S	S
Mean Value	330	340	340	320	320	310	290	290	320	310	330	330	320	330	330	320	310	300	290	300	300	320	340	330	330
Count	18	18	17	22	24	22	23	20	18	21	22	22	22	25	20	27	21	23	21	23	14	16	16	14	10

Sweep 1.0 Mc to 17.0 Mc in 1.5 min Manual

Electrical Communication Laboratory, Japanese Ministry of Telecommunications  
(Denki-tsushin Kenkyujo) Gotanda, Shiragawa-ku, Tokyo, Japan

IONOSPHERIC DATA

h<sub>p</sub>F<sub>2</sub>

37°37'0"N  
139°15'8"E

Shibata

135°E Mean Time

Day	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
1	240	250	240	270	250	230	270	360 <sup>A</sup>	370 <sup>A</sup>	300	330 <sup>S</sup>	300	300	300	290	300	300	300	250	220	220	270	240	240	A	
2	270	AF	250	240	250	250	210	T	300	300	320	320	300	310	290	290	290	290	260	270	280	250	270	260	300	
3	280 <sup>A</sup>	240	250	230	260	300	270	360	370	300	320	370	380	360	420	390	310	220	310	300	290	240	300	300	300	
4	260	260	A	260	240	A	260	240	260	280	280	370	340	340	320	300	300	290	290	280	300	280 <sup>A</sup>	A	A	300	
5	300	310	240 <sup>A</sup>	300	240	250 <sup>F</sup>	230	C	C	C	C	C	C	C	C	C	290	260	260	250	280 <sup>A</sup>	A	A	A	300	
6	260	260	300	270	300	300	260	A	A	A	A	360	330	330	270	300	280	260	250	230	220	270	270	280	280	
7	250	280 <sup>A</sup>	280	270	250	280	300	210	B	A	400	300	300	300	300	270	260	260	230	220	310 <sup>A</sup>	280	300 <sup>A</sup>	AF	AF	
8	280	270	300 <sup>A</sup>	230	300 <sup>A</sup>	A	220 <sup>F</sup>	200	230	300	300	320	360	320	300	300	240	220	210	200	250	230	230	A	A	
9	240	280	260	240	220	A	A	A	A	A	(320 <sup>S</sup> )	A	370	300	290	220	230	240 <sup>F</sup>	200	200	250	300 <sup>A</sup>	A	280	270	
10	240	270	280	270	A	410	A	A	320	A	500	300	310	270	A	320	300	460 <sup>F</sup>	280	210	250	260	260	270	270	
11	280	240	350 <sup>A</sup>	(320 <sup>S</sup> )	240	260	(300 <sup>S</sup> )	320	260	(230 <sup>S</sup> )	200	200 <sup>F</sup>	(340 <sup>S</sup> )	330 <sup>A</sup>	300	290	270	AF	AF	A	AF	AF	AF	280	280	
12	280	300 <sup>A</sup>	300 <sup>A</sup>	290	260	220	210	C	C	C	C	C	C	C	C	C	C	260 <sup>F</sup>	230	(260 <sup>S</sup> )	340 <sup>F</sup>	280	280	(380 <sup>S</sup> )	A	
13	(360 <sup>S</sup> )	(300 <sup>S</sup> )	230	(300)	260	250	220	260	260	290	300	(330 <sup>S</sup> )	340	300	300	280	(240 <sup>S</sup> )	200 <sup>F</sup>	(220 <sup>S</sup> )	230 <sup>F</sup>	230 <sup>F</sup>	220	230	(300 <sup>S</sup> )	(300 <sup>S</sup> )	
14	300 <sup>A</sup>	(300 <sup>S</sup> )	240	220	260 <sup>F</sup>	230	210	270	240	(300 <sup>S</sup> )	290	300	300	330	280	260	260	260	(230 <sup>S</sup> )	230 <sup>F</sup>	270	(240 <sup>S</sup> )	(260 <sup>S</sup> )	280	290	
15	(300 <sup>S</sup> )	(300 <sup>S</sup> )	240 <sup>F</sup>	(200 <sup>S</sup> )	270 <sup>F</sup>	380	300 <sup>A</sup>	340	240 <sup>F</sup>	320	300	(340 <sup>S</sup> )	300	(260 <sup>S</sup> )	A	300	300	240	210	250 <sup>A</sup>	(300 <sup>S</sup> )	350	340	240	240	
16	270	260	280	220	260	280	330	330	300	(320 <sup>S</sup> )	330	300	290	A	AF	300 <sup>A</sup>	S	250	250	260	220	240	240	280	280	
17	(290 <sup>S</sup> )	240	300	260	220	260	270	220	250	290	260	290	300	(290 <sup>S</sup> )	290	(290 <sup>S</sup> )	280	260	260	220	220	200	(300 <sup>S</sup> )	260	260	
18	280	200	280	220	240	240	220 <sup>A</sup>	240	240	300	280	250	290	300	280	280	290	270	270	240 <sup>F</sup>	220	240	260	(300 <sup>S</sup> )	270	
19	280 <sup>F</sup>	AF	230	220	220	260	210	210	C	C	C	C	C	C	C	C	C	230	220	250 <sup>A</sup>	220	220	(300 <sup>S</sup> )	270	270	
20	280	250	290	290	290	(290 <sup>S</sup> )	280	210	240	270	300 <sup>F</sup>	330 <sup>F</sup>	300	(310 <sup>S</sup> )	320	310	290 <sup>A</sup>	300	290	260	220	270	260	260	240	
21	260 <sup>F</sup>	240 <sup>F</sup>	260 <sup>F</sup>	230	220	280	270	270	AF	320	270	300	300 <sup>F</sup>	330	300	300	290	290	240	240	220	240	280	240	280	
22	260	280	280	220	270	250	230	200 <sup>A</sup>	260	270	300	330	350	310	310	300	300	250	260	230	260	290	280	280	300	
23	300 <sup>A</sup>	260	270	280	270	270	240	210	250	280	300	300	300	300	300	290	290	270	240	220	240	250	230	230	230	
24	280	280	270	240	220	230	210	220	200	270	260	300	280	290	300	300	300	260	250	250	230	210	260	260	240	
25	260	260	270	(280 <sup>S</sup> )	280 <sup>F</sup>	250	210	230	250	240	260	300	300	300	270	300	300	240	240	230	240	230	230	210	210	
26	230	250	260	220	240	270	230	C	C	C	C	C	C	C	C	C	C	C	C	240	230	230	250	280	280	
27	240	270	260	240	220	280	220	210	220	270	230	270	300	300	300	300	270	260	240	240	250	250	(300 <sup>S</sup> )	A	A	
28	270 <sup>F</sup>	250	250	250	280	280	220	250	320 <sup>K</sup>	330 <sup>K</sup>	380 <sup>K</sup>	370 <sup>K</sup>	A <sup>K</sup>	370	380 <sup>K</sup>	350 <sup>K</sup>	300 <sup>K</sup>	(270 <sup>S</sup> )	A	C	C	(320 <sup>S</sup> )	C	C	C	
29	C	C	C	C	C	C	240	(240)	250	260	300	300	300	300	270	300	270	250	230	230	(230 <sup>S</sup> )	270	270	270	270	
30	240 <sup>A</sup>	250	270	280	240	280	270	260	260	300	270	C	C	300	290	300	250	250	240	260	250	270	300	300	300	
31	300	300 <sup>A</sup>	270	300 <sup>A</sup>	260	280	240	220 <sup>F</sup>	250	260	280	(280 <sup>S</sup> )	280	280	300	300	250	230	230	200	220	270	280	270	270	
Median Value	280	280	270	260	270	270	230	240	260	300	300	300	310	300	300	300	280	260	240	230	240	270	280	280	280	
Count	30	28	24	30	24	27	28	26	22	23	25	26	24	26	24	24	27	28	24	28	28	24	28	24	28	26

Sweep 1.0 mc to 15.0 Mc in 15 min

Manual

Electrical Communication Laboratory, Japanese Ministry of Telecommunications  
 (Denshi-tsushin Kenkyujo) Gotanda, Shinagawa-ku, Tokyo, Japan

IONOSPHERIC DATA

Lat. 37°57.0'N  
 Long 139°15.8'E

if<sub>1</sub>

Shibata

135°E Mean Time

Day	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
1						Q	L	L	A	A	A	5.6	5.2	(5.2) <sup>A</sup>	5.1	L	A	L	L	A				
2						L	L	A	T	5.4	(5.2) <sup>A</sup>	5.0	A	A	5.4	5.3	4.7	L	L	Q				
3						L	L	4.5	4.6	(4.9) <sup>A</sup>	5.2	5.2	5.3	5.4	5.0	5.0	4.8	Q	L	A				
4						A	A	A	4.8	L	L	A	5.2	5.5	L	L	L	L	L	L				
5						Q	L	C	C	C	C	C	C	C	C	C	L	Q	Q	Q				
6						L	Q	A	(4.6) <sup>A</sup>	(4.8) <sup>A</sup>	4.9	(4.9) <sup>A</sup>	4.9	4.8	5.1	(4.8) <sup>A</sup>	4.4	L	L	L				
7						L	L	Q	B	A	5.5	5.2	A	A	A	A	A	A	A	Q	Q			
8						A	A	A	4.1 <sup>F</sup>	(4.6) <sup>A</sup>	5.0	(5.0) <sup>A</sup>	5.0 <sup>F</sup>	5.2 <sup>F</sup>	(5.1) <sup>A</sup>	4.4	F	Q	Q	Q				
9						A	Q	A	A	A	A	A	A	L	A	L	L	Q	L	Q				
10						3.0 <sup>F</sup>	A	A	4.4	4.6	L	4.9	L	5.2	L	4.7	L	4.1 <sup>F</sup>	L	Q	Q			
11						Q	AF	AF	AF	AF	Q	AF	A	A	A	4.8	4.1	AF	AF	A	A			
12						Q	Q	Q	C	C	C	C	C	C	C	C	C	L	L	A	Q			
13						A	Q	Q	L	L	L	A	5.0 <sup>F</sup>	5.1 <sup>F</sup>	5.0	5.0	AF	Q	A	Q				
14						Q	Q	L	L	L	5.0 <sup>F</sup>	5.1	5.0	5.1 <sup>L</sup>	4.9 <sup>F</sup>	(4.5) <sup>A</sup>	(4.1) <sup>A</sup>	A	Q	Q				
15						(3.1) <sup>L</sup>	A	5.0	(4.8) <sup>F</sup>	A	A	A	A	A	A	4.9	4.5	L	Q	Q				
16						A	3.8	4.4	4.6	A	A	5.3	A	A	A	A	(4.1) <sup>A</sup>	3.7 <sup>L</sup>	Q	Q				
17						Q	L	Q	4.6 <sup>L</sup>	4.9	5.0 <sup>L</sup>	5.1 <sup>L</sup>	L	5.0	(4.8) <sup>L</sup>	4.8 <sup>L</sup>	4.5 <sup>L</sup>	4.0	Q	Q				
18						A	A	EA	A	L	5.3 <sup>L</sup>	L	B	L	A	A	A	Q	A	Q				
19						Q	Q	Q	C	C	C	C	C	C	C	C	L	Q	A	Q				
20						Q	Q	Q	A	A	A	A	B	A	A	5.5	5.0 <sup>L</sup>	L	Q	Q				
21						L	L	L	AF	(5.6) <sup>L</sup>	5.3 <sup>L</sup>	(5.5) <sup>L</sup>	5.2	(5.4) <sup>L</sup>	5.2	L	L	AF	AF	A				
22						Q	Q	A	L	5.0	5.3 <sup>L</sup>	L	L	L	5.5 <sup>L</sup>	5.4 <sup>L</sup>	L	L	L	L	AF			
23						L	L	Q	L	4.7	(5.0)	L	5.3	5.3	5.3 <sup>L</sup>	5.2 <sup>L</sup>	L	L	L	A	Q			
24						Q	Q	Q	Q	L	(5.3) <sup>F</sup>	L	(5.4) <sup>L</sup>	5.2 <sup>L</sup>	L	L	L	L	L	L	Q			
25						Q	Q	L	L	5.2	L	5.7	L	5.4	L	L	Q	L	Q	Q				
26						Q	Q	C	C	C	C	C	C	C	C	C	C	C	L	A				
27						Q <sup>a</sup>	Q	Q	Q	L	A	L	5.8	L	5.5	L	C	A	Q	Q				
28						Q	Q	L	L	5.1	5.1	5.2	A	5.2	5.0	4.7	A	A	A	C				
29						C	L	L	L	L	(5.6) <sup>L</sup>	A	L	L	L	L	L	L	L	Q	Q			
30						Q	L	L	L	A	A	C	5.4	5.5	5.0	L	L	L	Q	A				
31						Q	L	Q	L	L	(5.1) <sup>L</sup>	(5.2) <sup>L</sup>	5.2	L	L	L	L	L	Q	Q				
Median Value						-	-	-	4.6	4.9	5.2	5.2	5.2	5.2	5.2	5.0	4.5	-	-	-				
Count						2	1	3	8	11	14	15	12	15	17	15	19	3	-	-				

Speed Log. Mc to 1.62 Mc. in 1.5 min. Manual

Electrical Communication Laboratory, Japanese Ministry of Telecommunications  
(Denki-tsushin Kenkyujo) Gotanda, Shinagawa-ku, Tokyo, Japan

IONOSPHERIC DATA

h<sub>F</sub>i

Lat 37°37.0'N  
Long 139°15.8'E

Shibata

135°E Mean Time

Day	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
1						Q	200	260	A	A	A	240	A	A	220	A	A	240	230	A				
2						230	220 <sup>A</sup>	A	T	190	A	A	A	A	200 <sup>A</sup>	210	210 <sup>A</sup>	220 <sup>A</sup>	220	Q				
3						250	200 <sup>A</sup>	A	A	A	230	[220] <sup>A</sup>	200 <sup>A</sup>	200	200	190	200	Q	260	A				
4						Q	A	A	A	200	240 <sup>A</sup>	200	A	A	A	210	220	[240] <sup>A</sup>	250	240				
5						Q	200	C	C	C	C	C	C	C	C	C	220	Q	Q					
6						260	Q	A	A	A	A	A	A	A	190	200	[200] <sup>A</sup>	200	200	210				
7						240	A	Q	B	A	A	200	A	A	A	A	A	A	A	Q				
8						A	A	A	180	[190] <sup>A</sup>	200	200	200	190	230	210	210	Q	Q	Q				
9						A	Q	A	A	A	A	A	A	A	A	A	240	Q	200 <sup>F</sup>	Q				
10						A	A	A	A	200	200	200	200	200	200	A	A	A	250	Q				
11						Q	AF	[250] <sup>A</sup>	AF	Q	AF	AF	A	A	A	A	220	AF	AF	A				
12						Q	Q	C	C	C	C	C	C	C	C	C	C	C	220	210 <sup>A</sup>	A			
13						A	Q	Q	210 <sup>F</sup>	220	[210] <sup>A</sup>	200	200	200	200	200 <sup>A</sup>	200 <sup>A</sup>	200 <sup>A</sup>	200	Q				
14						Q	Q	230	[230] <sup>A</sup>	220 <sup>A</sup>	[180] <sup>F</sup>	200	200	240 <sup>A</sup>	210	[210] <sup>A</sup>	210	A	Q	A				
15						A	A	200	210	A	A	A	A	A	A	A	250	210 <sup>A</sup>	210	Q				
16						A	250	200	[200] <sup>F</sup>	A	A	200	A	A	A	A	220 <sup>A</sup>	200	Q	Q				
17						Q	240	Q	A	200	200	200	A	A	A	200	200	220	220	Q	Q			
18						A	A	220 <sup>A</sup>	A	200 <sup>A</sup>	200	200	B	200	A	A	A	A	Q	A	Q			
19						Q	Q	Q	C	C	C	C	C	C	C	C	210	Q	A	Q				
20						Q	Q	Q	A	A	A	210	A	A	A	A	220	240	Q	Q				
21						250	220	230	AF	210	200	210	200	200	200	220	200	AF	AF	A				
22						Q	Q	A	240	210 <sup>F</sup>	220 <sup>A</sup>	210	200	190	200	220	210	230	210 <sup>A</sup>	AF				
23						230	220	Q	200	200 <sup>A</sup>	190	200	200 <sup>A</sup>	210	220 <sup>A</sup>	230	250	260 <sup>A</sup>	A	Q				
24						Q	Q	Q	Q	200	180	200	210	200	210	[210] <sup>A</sup>	220	220	230	Q				
25						Q	Q	210	200	200	180	200	190	200	200	190	Q	A	Q	Q				
26						Q	Q	C	C	C	C	C	C	C	C	C	C	C	230	A				
27						Q	Q	Q	Q	200	A	200	230	210	220	220	[230] <sup>A</sup>	240	Q	Q				
28						Q	Q	220	220	200	210	190	A	200	200	220	220	A	A	C				
29						C	210	200 <sup>F</sup>	220	200	200	190	A	220	200	210	210	220	Q	Q				
30						Q	240	210	220	A	A	C	C	230	200	200	220	220	Q	Q				
31						Q	210	Q	210	200	200	[200] <sup>F</sup>	200	200	210	200	200	200	Q	Q				
Mean Value						250	220	220	210	200	200	200	200	200	200	210	220	220	230	-				
Count						6	11	11	15	16	16	19	13	17	19	19	24	15	11	2				

Sheep - I.S. Mc to I.S. Mc in 1.5 min

Manual

Electrical Communication Laboratory, Japanese Ministry of Telecommunications  
 (Denki-tesushin Kenkyujo) Gotanda, Shinagawaku, Tokyo, Japan

IONOSPHERIC DATA

Lot 47-5210N  
 Losp 13991587E

Shibata

fE

13.5° E Mean Time

Day	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
1						(2.0) <sup>f</sup>	(2.6) <sup>f</sup>	A	A	A	A	A	A	A	(3.5) <sup>f</sup>	(3.7) <sup>f</sup>	3.5	3.0	(2.1) <sup>f</sup>	A				
2						1.4 <sup>A</sup>	A	A	3.7	3.7	3.8	3.9	B	B	A	3.8	3.5	3.0 <sup>A</sup>	(2.4) <sup>f</sup>	1.8				
3						1.7	A	2.1	3.3	3.7 <sup>F</sup>	A	A	A	A	(3.5) <sup>f</sup>	(3.4) <sup>f</sup>	3.2	3.0	2.1	A				
4						A	A	A	A	A	A	A	4.0	3.7 <sup>B</sup>	3.5 <sup>A</sup>	3.2	3.2	3.0	A	A				
5						A	(2.3) <sup>F</sup>	C	C	C	C	C	C	C	C	C	A	A	A	A				
6						B	A	3.0	3.2	A	3.5 <sup>A</sup>	B	A	(3.7) <sup>f</sup>	3.6	(3.4) <sup>f</sup>	A	A	2.2 <sup>A</sup>	B				
7						A	A	2.9	B	B	A	A	A	A	A	3.6 <sup>A</sup>	(3.5) <sup>f</sup>	(2.9) <sup>f</sup>	A	A				
8						A	A	A	A	A	A	A	A	A	A	A	A	2.8 <sup>A</sup>	2.2	E				
9						A	A	A	A	A	A	A	A	A	A	3.5	3.0	2.8	A	A				
10						A	A	A	A	3.2 <sup>A</sup>	3.4	A	B	3.5	A	3.4	3.0 <sup>A</sup>	2.9 <sup>A</sup>	A	A				
11						A	2.2 <sup>F</sup>	A	3.2	3.4	3.5	A	A	A	A	A	3.0	(2.4) <sup>f</sup>	A	AF				
12						A	A	C	C	C	C	C	C	C	C	C	3.2	2.4	A	A				
13						A	A	A	AF	A	A	A	A	A	A	A	A	A	A	A				
14						A	A	A	3.2 <sup>F</sup>	3.3 <sup>F</sup>	(3.5) <sup>f</sup>	(3.7) <sup>f</sup>	A	A	A	A	A	A	A	A				
15						1.5 <sup>F</sup>	A	3.0 <sup>F</sup>	3.4	A	A	A	A	A	A	A	3.3	A	A	A				
16						1.6	A	A	3.3	A	A	A	A	A	A	A	A	A	A	A				
17						A	AF	A	A	A	B	B	A	A	A	A	A	A	AF	2.0	1.6			
18						A	A	A	A	A	A	A	B	A	A	A	A	A	A	A				
19						B	A	A	C	C	C	C	C	C	C	C	3.3	2.9	A	A				
20						A	2.5 <sup>F</sup>	3.0	3.5	3.4	A	A	A	A	A	A	3.3	3.2	A	A				
21						B	2.3 <sup>F</sup>	3.0	(3.4) <sup>f</sup>	A	A	A	(3.5) <sup>f</sup>	A	A	A	A	A	AF	A				
22						A	(2.4) <sup>f</sup>	A	A	A	A	B	A	A	A	A	3.6	3.0	A	A				
23						B	A	3.1	A	A	A	A	A	A	A	3.7	3.6	(3.3) <sup>f</sup>	2.9 <sup>A</sup>	A				
24						A	(2.5) <sup>f</sup>	2.9	3.7 <sup>A</sup>	3.5	A	A	3.9	B	3.9	3.0	A	2.9	(2.1) <sup>f</sup>	(1.4) <sup>B</sup>				
25						B	2.4	3.1 <sup>A</sup>	(3.2) <sup>f</sup>	(3.4) <sup>f</sup>	A	A	A	A	B	A	A	3.4	3.0	A	B			
26						B	2.2	C	C	C	C	C	C	C	C	C	C	C	A	B				
27						B	2.3	3.0	3.3	3.6	A	3.8 <sup>A</sup>	A	A	A	A	A	C	A	A				
28						B	2.3 <sup>F</sup>	3.0	3.4	3.5	(3.6) <sup>f</sup>	3.6	A	3.9	A	3.4	3.4	2.8	A	C				
29						C	A	(3.3) <sup>f</sup>	3.6	3.8	(3.8) <sup>f</sup>	A	A	A	A	A	3.2	A	2.3 <sup>A</sup>	A				
30						A	2.0 <sup>F</sup>	3.1	A	3.5	B	C	C	3.7	B	A	A	A	(2.1) <sup>f</sup>	A				
31						A	A	A	3.4	A	A	C	B	4.0	(3.6) <sup>f</sup>	B	A	2.7	A	A				
Median Value						1.7	2.7	3.0	3.3	3.5	3.5	3.8	-	3.7	3.6	3.5	3.3	2.9	2.1	-				
Count						5	1.2	1.4	1.5	1.2	1.7	6	2	6	17	13	17	6	9	4				

Sweep 4.0 Mc to 11.2 Mc in 1.5 min

Manual



Electrical Communication Laboratory, Japanese Ministry of Telecommunications  
 (Denki-tsushin Kenkyujo) Gotanda, Shinagawa-ku, Tokyo, Japan

IONOSPHERIC DATA

h'F

Lat. 37°57.0'N  
 Long. 139°15.8'E

Shibata

135°E Mean Time

Day	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	
1		A	A	A	A	A	A	A	A	A	A	A	A	A	A	100	100	100	A	A					
2		A	A	A	A	A	A	A	A	A	A	A	A	A	A	100	100	100	A	A					
3		100	1100 <sup>1</sup>	100	100	A	B	A	A	A	A	A	A	A	100	1100 <sup>1</sup>	100	1100 <sup>1</sup>	100	A					
4		A	A	A	A	A	A	A	A	A	A	A	A	A	100	100	100	100	A	A					
5		A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A					
6		B	A	A	100	1100 <sup>1</sup>	100	1100 <sup>1</sup>	100	100	100	100	100	100	100	100	100	1100 <sup>1</sup>	1100 <sup>1</sup>	B					
7		A	A	A	A	A	A	A	A	A	A	A	A	A	A	100	100	100	A	A					
8		A	A	A	A	A	A	A	A	A	A	A	A	A	A	100	100	100	E						
9		A	A	A	A	A	A	A	A	A	A	A	A	A	A	100	100	100	A	A					
10		A	A	A	A	A	A	A	A	A	A	A	A	A	A	100	100	100	A	A					
11		A	100	100F	100	100	100	100	100	100	100	100	100	100	A	A	A	100	120	A	AF				
12		A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A					
13		A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	B					
14		A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A					
15		100	A	A	A	A	A	A	A	A	A	A	A	A	A	100	100	100	A	A					
16		A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A					
17		A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	B					
18		A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A					
19		B	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A					
20		A	100	100	100	100	100	100	100	100	100	100	100	100	A	A	100	100	A	A					
21		110	100	100	100	100	100	100	100	100	100	100	100	100	A	A	100	100	A	AF	A				
22		A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	100	100	100	A	A				
23		B	A	A	A	A	A	A	A	A	A	A	A	A	A	100	100	100	A	A					
24		A	100	100	100	100	100	100	100	100	100	100	100	100	A	A	100	100	A	3					
25		B	100	100	100	100	100	100	100	100	100	100	100	100	A	A	100	100	A	B					
26		B	110	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	A	B				
27		B	100	100	100	100	100	100	100	100	100	100	100	100	A	A	A	A	A	A					
28		B	110	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	A	C					
29		C	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	100	A	100	A				
30		A	110	100	100	100	100	100	100	100	100	100	100	100	B	C	C	100	100	A	A				
31		A	A	A	A	A	A	A	A	A	A	A	A	A	A	100	100	100	A	100	A				
Median Value	-	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
Count	3	11	14	17	15	8	10	8	9	11	16	17	19	6											

Sweep 1.0 Mc to 1.75 Mc in 1.5 min

Manual

Electrical Communication Laboratory, Japanese Ministry of Telecommunications  
(Denki-tsushin Kenkyujo) Gotanda, Shinagawa-ku, Tokyo, Japan

IONOSPHERIC DATA

37°57'0N  
139°15'8E

Shibata

fes

135°E Mean Time

Day	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
1	2.4	5.3	4.3	3.9	3.4	2.2	5.2	5.2	6.2	7.2	8.1	6.4	11.6	7.4	4.6	7.2	(7.1)	4.8	5.7	3.0	2.8	3.1	3.2	3.1
2	3.5	3.4	3.0	4.4	3.0	5.3	5.0	-G	5.9	7.2	7.3	7.2	5.9	(7.1)	4.9	4.9	6.3	6.8	3.5	3.0	2.8	3.0	2.9	3.0
3	4.5	5.3	3.1	2.9	2.7	3.5	3.7	5.6	6.0	6.5	5.6	3.6	5.5	4.9	3.7	5.2	(5.5)	3.9	3.9	3.0	3.6	2.4	3.0	1.7
4	3.2	3.0	5.9	3.6	2.8	7.3	1.0	9.2	6.9	4.4	5.0	(4.6)	5.2	5.2	5.1	4.5	7.5	4.1	4.2	4.1	C	C	C	C
5	3.2	3.2	3.0	3.2	3.2	(4.3)	3.8	C	C	C	C	C	C	C	C	C	3.9	7.8	5.2	6.3	5.2	7.5	8.8	8.2
6	4.1	4.4	6.8	2.9	2.9	5.4	8.7	(10.4)	12.8	7.0	6.5	6.1	6.1	4.1	6.8	4.7	5.9	4.7	3.1	3.9	2.6	3.1	C	2.7
7	3.1	2.8	2.9	2.9	2.9	3.4	4.2	4.3	B	13.2	14.5	12.6	(12.8)	(7.6)	6.4	7.5	13.1	7.4	4.2	7.4	7.5	5.6	7.2	8.6
8	(7.5)	4.7	5.4	4.6	6.8	8.9	(7.5)	(7.1)	(5.6)	5.6	4.0	4.6	4.3	5.4	4.6	4.7	5.7	3.8	2.8	7.4	2.6	5.4	2.8	(7.6)
9	4.6	5.5	(5.7)	5.4	5.4	4.7	3.5	5.2	6.7	(11.2)	7.5	(7.5)	8.7	7.2	(5.6)	5.8	4.1	4.8	3.8	3.3	7.1	4.2	7.1	5.4
10	3.2	3.5	3.5	3.4	3.1	3.2	4.8	5.3	5.8	7.3	5.7	3.9	C	5.8	11.3	11.8	8.0	(4.0)	7.4	6.4	3.0	3.7	3.0	5.2
11	C	4.2	6.0	7.3	4.0	4.5	5.4	7.1	7.3	14.1	4.2	4.4	8.8	6.7	5.9	5.4	4.0	7.3	(7.2)	7.2	7.3	5.4	5.4	5.3
12	4.5	2.8	4.2	3.8	4.3	3.4	3.3	4.1	C	C	C	C	C	C	C	C	C	5.4	6.4	8.4	8.2	7.2	5.4	5.4
13	7.3	(5.3)	2.6	4.9	4.0	4.1	4.6	4.3	4.5	5.6	5.7	7.1	6.2	5.5	4.5	4.6	7.4	12.6	13.2	8.4	4.5	3.0	3.8	4.8
14	7.1	4.4	3.2	3.5	3.3	4.1	4.3	(6.5)	5.2	6.2	6.2	(6.3)	5.1	7.2	4.8	8.0	8.5	7.3	3.1	4.4	4.5	5.2	3.2	4.4
15	4.4	3.5	5.5	4.1	2.8	4.7	7.0	5.2	6.3	6.4	7.2	1.6	7.2	6.9	9.4	4.8	5.8	4.2	4.8	3.8	3.8	8.1	7.4	5.4
16	2.3	C	3.0	C	C	2.3	4.0	3.4	(4.8)	9.7	7.6	8.6	8.5	11.3	7.2	7.5	5.3	4.1	3.9	3.2	2.8	2.8	2.8	3.8
17	7.9	6.3	4.3	1.9	3.8	3.1	3.1	4.1	5.2	4.6	B	B	7.5	8.4	6.4	6.8	7.9	3.8	3.8	5.1	2.7	2.4	5.1	5.2
18	4.3	4.5	2.9	3.9	3.1	3.8	5.4	7.3	6.3	5.1	(6.0)	4.6	C	C	C	7.1	6.6	6.3	4.8	3.8	9.2	6.4	3.7	4.3
19	4.5	3.9	3.3	2.9	3.1	2.6	3.0	3.4	C	C	C	C	C	C	C	C	5.1	4.7	4.5	4.7	3.8	3.5	4.4	3.4
20	3.2	3.2	3.3	2.8	C	2.5	3.2	4.4	5.6	5.9	8.3	7.4	4.8	7.2	6.4	7.5	4.2	5.2	3.8	3.5	3.7	3.6	3.9	3.8
21	3.8	4.6	4.1	2.6	2.4	2.7	4.5	(4.1)	11.2	7.3	4.5	5.1	5.2	5.0	6.4	7.0	(6.5)	6.2	8.2	5.4	4.8	4.1	3.4	4.4
22	3.7	4.6	(4.1)	2.7	2.6	4.3	2.9	4.8	5.6	9.7	7.8	4.4	4.2	4.3	4.9	4.9	4.4	4.3	3.9	3.9	5.1	4.6	4.4	4.4
23	4.7	4.2	2.9	3.0	3.6	B	2.9	4.1	4.4	4.4	4.0	4.4	5.5	4.5	4.3	4.9	4.9	4.3	3.7	3.2	2.3	3.5	2.8	5.7
24	4.8	3.4	3.6	2.7	3.4	2.1	3.4	4.0	4.1	C	4.6	4.4	C	B	4.5	3.7	3.2	3.6	2.8	3.4	2.8	5.4	5.4	1.5
25	C	C	1.1	C	3.8	2.9	3.7	3.6	4.3	4.8	5.1	4.2	4.3	B	4.4	3.8	4.7	4.4	3.4	2.1	4.2	4.2	4.4	2.9
26	2.1	1.4	1.2	1.7	Y	C	4.1	C	C	C	C	C	C	C	C	C	C	C	C	3.0	7.3	5.3	4.0	3.5
27	2.8	2.6	2.5	1.8	2.6	B	4.5	(3.3)	(4.4)	5.3	4.8	5.1	6.1	6.7	6.7	6.6	C	4.2	3.6	3.3	3.2	3.9	7.2	6.1
28	3.8	2.8	2.8	2.8	2.1	2.2	2.8	4.4	4.4	4.8	5.1	4.6	7.0	4.4	4.4	4.4	4.8	6.3	7.6	C	C	7.8	C	C
29	C	C	C	C	C	C	3.5	6.2	4.5	5.0	5.6	5.2	8.4	5.8	5.7	3.8	C	4.8	2.9	3.1	8.0	8.4	6.9	3.2
30	4.2	3.2	2.9	4	(3.1)	2.5	2.7	(4.3)	4.4	7.4	5.8	C	C	4.1	4.5	4.6	3.3	(4.1)	3.2	3.5	8.9	3.1	4.8	2.4
31	3.0	3.0	1.4	4.6	2.9	2.6	3.1	3.8	3.5	3.9	7.1	C	6.4	5.7	5.6	3.7	4.9	2.9	2.6	2.8	3.6	2.6	2.6	2.0
Median Value	3.8	3.5	3.3	3.0	3.1	3.2	4.1	4.4	5.6	5.9	5.8	5.4	5.9	5.8	5.6	4.4	5.4	4.7	3.4	3.8	7.9	3.9	3.6	4.3
Count	3.0	3.0	3.0	2.9	2.9	2.8	3.1	2.8	2.6	2.7	2.6	2.4	2.5	2.5	2.7	2.7	2.8	3.0	3.1	3.0	2.9	3.1	3.0	3.0

Electrical Communication Laboratory, Japanese Ministry of Telecommunications  
(Denki-tsushin Kenkyujo) Gotanda, Shinagawa-ku, Tokyo, Japan

# IONOSPHERIC DATA

Station: **Shibata**

Lat. 37°37.0'N  
Long. 139°15.8'E

F<sub>2</sub>-M3000

135°E Mean Time

Day	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	
1	2.9 (2.8)S	2.8	J	2.9	3.0	3.0	3.0	3.0	2.8	3.0	3.1	2.8	3.0	3.1	2.9	3.0	3.1	3.0	3.2	3.1	(2.8)F	2.7	S	S	S	S	
2	2.8	2.8	2.9	2.8	2.9	3.0	3.0	3.1	3.0	3.0	2.9	2.9	2.8	2.7	2.9	3.0	2.8	3.1	2.9	S	S	S	S	S	S	S	
3	S	S	2.9	S	S	S	S	S	J	2.9	2.8	2.7	(2.8)F	2.9	2.6	2.8	3.0	2.8	3.1	J	2.7	J	J	J	J	2.6	
4	3.1	3.0	2.9	2.8	2.9	3.0	3.0	3.0	B	3.2	B	J	J	2.8	3.1	2.8	3.1	3.2	3.0	2.9	C	J	F	F	F	S	
5	2.7	2.6	2.6	2.8	3.0	3.1	3.0	C	C	C	C	C	C	C	C	C	(3.1)F	3.1	3.2	3.1	2.7	2.7	2.7	2.7	2.7	2.7	
6	2.9	3.0	2.9	2.9	(2.7)F	3.0	3.0	3.4	A	A	3.1	B	J	3.0	3.1	3.1	3.0	3.0	J	3.2	2.8	2.9	S	J	J	J	
7	2.8	J	2.7	2.7	3.0	3.1	B	3.5	B	A	(2.8)F	J	2.9	3.0	3.1	3.1	3.4	J	J	J	2.7	2.7	F	F	F	2.9	
8	F	F	F	F	F	A	SF	B	3.5	3.2	3.0	2.8	2.7	2.8	B	2.9	3.3	3.2	(3.1)F	3.0	2.6	2.9	F	F	F	2.9	
9	S	3.0	S	3.1	3.0	3.1	3.1	J	S	A	A	3.1	2.4	2.9	3.0	3.2	3.3	B	J	S	J	J	J	J	J	2.9	
10	3.2	(2.9)F	(3.0)F	JF	2.7	(2.5)F	SF	FS	S	A	(2.8)F	(2.9)F	3.0	2.9	(3.0)F	3.2	3.3	B	S	S	S	S	S	S	S	2.9	
11	2.8	FS	2.7	A	J	J	2.6	3.1	3.2	AF	3.1	F	J	(2.9)F	J	3.3	3.3	AF	AF	A	AF	AF	S	S	S	2.7	
12	SF	SF	JF	2.9	2.9	3.0	3.3	C	C	C	C	C	C	C	C	C	C	C	(3.3)F	3.2	3.0	3.0	S	S	S	2.7	
13	F	JF	F	F	JF	3.1	3.1	JF	J	3.2	3.4	A	S	3.1	J	3.1	S	A	A	S	3.4	3.1	3.2	F	F	F	2.9
14	F	2.9	3.3	3.3	3.2	3.2	3.2	S	3.0	2.9	3.0	3.1	3.0	3.0	J	3.1	3.3	3.5	3.2	3.1	S	2.8	S	S	S	2.9	
15	(3.0)F	(2.4)	3.2	3.3	3.3	3.3	2.8	2.8	3.1	(2.9)F	3.0	(3.0)F	3.1	B	A	3.0	3.0	J	S	3.1	A	JF	AF	AF	AF	2.9	
16	B	J	JF	3.2	2.9	2.9	2.9	3.1	3.1	(3.0)F	2.9	3.2	FZ	A	3.1	3.2	S	3.3	3.2	3.1	3.0	3.0	S	S	S	S	
17	A	S	3.1	2.9	3.1	2.9	3.2	3.2	3.3	3.3	3.4	3.1	3.1	3.1	3.0	2.9	3.0	3.2	3.1	3.0	3.0	2.9	(2.8)F	FS	FS	2.9	
18	FS	FS	2.5	3.1	3.0	3.1	3.1	3.2	3.2	3.1	3.1	2.9	3.2	C	C	C	3.3	J	2.2	S	3.2	S	S	S	S	2.9	
19	3.0	S	S	3.0	2.9	S	J	3.2	C	C	C	C	C	C	C	C	3.3	3.3	J	2.2	S	3.2	S	S	S	2.9	
20	J	3.0	J	J	C	2.9	B	3.3	J	3.0	3.0	3.1	2.9	2.9	3.0	3.0	2.9	2.9	3.0	S	3.2	S	S	S	S	2.9	
21	3.1	2.8	3.2	3.2	3.0	3.0	3.2	3.0	AF	2.8	2.9	2.6	2.9	2.8	2.9	2.8	2.8	3.1	3.1	2.7	SF	S	S	S	S	2.9	
22	2.9	2.9	2.8	3.2	2.8	2.9	3.1	3.1	3.4	J	3.8	2.9	2.7	2.9	3.0	3.1	2.9	3.3	3.1	S	S	S	S	S	S	2.8	
23	2.8	2.9	2.9	2.9	3.2	J	3.4	3.3	3.3	2.9	3.0	2.9	2.8	3.0	3.0	3.0	3.1	3.2	3.0	3.1	2.9	2.9	3.0	3.0	3.0	2.9	
24	2.8	(2.7)F	2.8	2.9	3.2	3.1	3.2	3.5	3.3	3.0	2.7	3.1	2.7	2.8	2.9	2.8	3.0	3.0	3.3	3.1	3.0	3.2	2.8	3.0	3.0	2.9	
25	3.1	3.0	JF	C	3.0	J	3.4	3.3	3.2	3.3	3.0	2.8	2.8	2.8	3.0	2.8	3.0	3.0	3.1	2.8	(2.9)F	3.1	3.2	S	S	2.9	
26	2.8	2.7	2.9	2.9	3.0	J	3.1	C	C	C	C	C	C	C	C	C	C	C	C	3.0	3.0	3.0	S	S	S	2.9	
27	3.0	2.9	S	2.8	2.6	(2.8)F	3.0	3.0	3.1	3.1	3.1	3.0	2.9	2.9	3.0	2.9	(3.0)F	3.2	3.1	SF	3.2	3.0	3.2	3.0	3.2	2.9	
28	C	C	C	C	C	C	C	C	3.1	3.0	2.9	2.8	A <sup>K</sup>	2.9	3.0	3.0	3.2	3.2	A	C	C	A	C	C	C	2.9	
29	C	C	C	C	C	C	C	C	3.4	3.0	2.4	3.1	3.1	3.1	3.1	2.8	2.9	3.1	3.1	3.3	J	S	S	S	S	2.8	
30	3.0	J	2.7	2.8	2.7	3.0	3.1	3.1	3.2	2.9	3.1	C	C	2.9	2.9	3.0	3.0	3.1	3.0	3.0	S	S	S	S	S	2.8	
31	J	2.9	S	J	2.8	3.0	S	3.3	3.5	3.3	3.1	(3.1)F	3.1	3.0	2.9	3.0	3.2	J	3.3	S	S	S	S	S	S	2.9	
Median Value	2.9	2.9	2.9	2.9	2.9	3.0	3.0	2.9	3.2	3.0	3.0	2.9	2.9	2.9	3.0	3.0	3.0	3.1	3.1	3.1	2.9	2.9	2.9	2.9	2.9	2.9	
Count	1.8	1.9	1.9	2.1	2.4	2.2	2.3	2.0	1.8	2.1	2.4	2.1	2.0	2.5	2.1	2.7	2.7	2.7	2.2	2.2	2.1	1.6	1.5	1.5	1.5	1.1	

Sheep 1.0 Mc to 1.5 Mc in 1.5 min

Manual

Electrical Communication Laboratory, Japanese Ministry of Telecommunications  
(Denkitsu-shin Kenkyujo) Gotarada, Shinagawa-ku, Tokyo, Japan

# IONOSPHERIC DATA

f<sub>min</sub>

Lat. 37°37.0'N  
Long. 139°15.8'E

Shibata

135°E Mean Time

Day	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
1	1.7	1.9	A	A	1.9	2.0	2.6 F	A	A	A	4.5	A	A	A	3.9	A	3.4	A	A	1.9	1.4	A	A	A
2	1.5	A	1.8	1.4	1.9	A	A	A	3.8	4.1	A	A	A	A	4.1	4.1	A	A	2.2	1.8	1.5	1.9	1.8	A
3	A	1.4	1.9	2.1	1.2	1.7	A	A	A	A	4.7	A	4.6	4.1	3.6	3.5	3.4	3.0	2.1	A	C	1.4	1.4	1.2
4	1.5	1.3	A	1.5	A	A	A	A	A	A	4.1	A	A	A	4.1	3.8	A	A	2.4	A	C	1.5	1.5	1.7
5	A	A	1.3	1.3	1.4	1.9 F	2.3	C	C	C	C	C	C	C	C	C	A	A	A	A	A	A	A	A
6	1.7	A	A	1.6	A	1.7	A	A	A	A	A	A	A	4.1	3.7	A	3.6	3.0	2.3	1.6	1.6	1.4	1.4	E
7	E	1.6	E	E	F <sub>min</sub>	1.6	A	3.1	B	A	A	A	A	A	A	A	A	A	A	2.3	A	A	A	A
8	1.7	A	2.0	A	A	A	A	A	3.6	A	4.1	A	4.0	4.2	3.9	3.9	3.4	2.9	2.3	1.6	1.4	1.5	1.5	A
9	1.9	A	A	2.0	1.2	A	A	A	A	A	A	A	A	A	A	A	A	3.3	A	1.6	A	A	A	E
10	1.4	1.3	1.3	1.8	A	A	A	A	A	A	3.7	3.7	3.8	3.8	A	A	A	A	A	1.5	A	1.7	1.8	1.2
11	1.2	1.2	A	A	2.0	1.7	F A	3.0	A	A	A	A	A	A	A	A	3.2	AF	AF	A	AF	AF	A	1.7
12	1.7	A	1.4	1.4	1.4	1.7	1.9	C	C	C	C	C	C	C	C	C	C	2.6	A	1.7	A	1.7	1.5	A
13	A	A	1.4	A	1.3	A	A	A	A	A	A	A	4.3	A	3.8	3.9	A	2.8	A	1.7	A	1.7	1.5	A
14	A	A	A	1.7	1.8	2.3 F	A	2.7	A	4.2	3.7	4.0	4.0	4.8	A	4.8	3.3	A	2.5	A	1.5	AF	1.5	1.5
15	A	A	A	A	1.4	A	A	A	3.1	3.6	A	A	A	A	A	4.0	3.2	3.1	2.1	1.8	A	A	2.4	1.3
16	1.2	1.2	1.7	1.4	E	1.6	A	A	A	A	A	A	A	A	A	A	A	2.8	2.3	1.8	1.6	1.4	1.7	A
17	A	1.2	E	E	E	1.7	2.5 F	3.3 F	3.9	3.9	3.8	3.0	4.6	A	3.8	3.7	3.9	2.4	2.4	1.6	1.5	1.7	A	1.6
18	1.8	1.2	1.5	1.5	1.6	2.0	A	A	A	A	A	A	5.9	A	A	A	A	2.0	2.4	2.0	2.0	A	A	1.8
19	1.8	1.3	E	E	1.4	2.0	A	3.0	C	C	C	C	C	C	C	C	3.6	3.3	A	2.3	AE	AF	A	2.0
20	1.7	E	1.2	1.4	1.5	2.7 F	2.3	A	A	A	A	A	4.4	A	A	A	3.7	3.6	2.6	1.9	1.4	1.7	1.4	1.5
21	AF	AF	AF	1.6 F	E	A	2.5 F	3.2	A	3.9	4.5	4.5	4.4	4.2	4.3	4.4	3.6	A	A	A	AF	2.1	AF	1.8
22	1.6	A	1.9	1.4	E	2.1	3.0	A	4.2	4.5	A	4.4	4.0	4.0	3.9	3.7	3.5	3.0	A	A	A	1.5	2.0	A
23	A	1.8	1.8	2.0	A	1.4	2.0	A	3.5	A	3.9	4.2	4.0	4.4	4.5	4.2	3.8	A	A	1.5	1.6	1.7	1.7	1.7
24	1.5	A	1.7	1.2	1.1	1.7	AF	3.3	3.5	3.9	4.0	4.4	4.7	4.3	4.1	A	3.2	3.0	2.2	1.4	1.4	1.4	1.4	
25	E	E	E	E	AF	1.6	2.7	3.1	3.7	A	4.3	4.2	4.3	4.4	4.2	3.9	3.5	A	2.9	1.5	1.7	1.8	1.7	1.5
26	1.5	1.1	E	E	1.5	1.5	2.3	C	C	C	C	C	C	C	C	C	C	C	AF	A	2.7	A	2.0	1.6
27	1.7	1.3	E	E	1.2	1.5	2.3	3.2	3.6	4.0	A	4.2	4.8	4.6	4.3	A	C	A	2.2	1.7	2.8	2.4	A	A
28	AF	1.3	1.2	1.2	E	1.4	2.4	3.3	3.4	3.8	4.4	4.3	A	4.1	3.9	3.7	3.5	A	C	C	A	C	C	1.7
29	C	C	C	C	C	C	3.0	3.2	3.9	3.8	A	4.5	A	4.4	A	4.2	3.4	2.8	A	1.9	1.8	A	A	1.6
30	A	1.8	1.6	E	E	1.4	2.3	3.1	3.7	A	6.8	C	C	4.3	4.0	4.2	3.3	2.8	2.1	A	A	1.6	A	A
31	A	A	1.1	A	1.8 F	A	3.1	3.3 F	3.7	4.0	4.3	4.4	4.4	4.4	4.0	3.7	3.2	3.0	2.2	1.5	1.5	1.5	1.4	1.1
Median Value	1.6	1.3	1.4	1.4	1.3	1.7	2.4	3.2	3.7	4.0	4.1	4.3	4.4	4.3	4.0	3.9	3.5	3.0	2.3	1.7	1.6	1.6	1.6	1.5
Count	18	17	20	23	24	22	16	15	13	10	14	13	13	14	17	15	18	17	16	18	17	19	18	20

Sweep 1.0 Mc to 17.0 Mc in 1.5 min

Manual

Electrical Communication Laboratory, Japanese Ministry of Telecommunications  
(Denritsushin Kenkyujo) Gotanda, Shinagawa-ku, Tokyo, Japan

IONOSPHERIC DATA

37°57.0'N  
139°15.8'E

Shibata

f<sub>min</sub>

135°E Mean Time

Day	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
1	E	E	E	E	E	1.4	1.4	1.7	1.7	2.0	2.1	2.1	2.2	2.2	3.0	2.2	2.4	1.5	1.6	1.4	1.4	1.4	1.4	1.4
2	1.3	E	E	E	E	1.4	2.0	2.1	2.3	2.2	2.6	2.4	2.0	4.3 <sup>B</sup>	2.7	2.2	1.7	1.7	1.6	1.4	1.3	1.4	1.4	1.4
3	E	E	1.2	E	E	E	1.5	1.5	1.6	1.9	2.0	3.8	3.5	2.3	2.2	2.1	1.8	1.4	1.5	1.4	1.4	1.4	1.4	1.2
4	1.3	1.3	E	E	E	1.4	1.4	1.4	1.4	1.8	2.0	2.1	2.2	2.1	2.1	2.1	1.8	1.8	1.8	1.4	1.4	1.4	1.4	1.4
5	1.2	E	E	E	E	1.4	1.5	C	C	C	C	C	C	C	C	2.0	2.0	1.8	1.9	1.4	1.4	1.4	1.5	1.2
6	E	1.2	E	E	E	1.6	1.6	1.9	2.2	2.2	2.1	3.4	3.1	2.2	2.2	2.2	2.0	2.0	1.8	1.6	1.6	1.6	1.7	1.4
7	E	E	E	E	E	1.4	1.8	1.9	1.9	3.2	3.0	2.3	3.0	3.0	2.2	2.9	2.1	2.0	1.7	1.5	1.4	1.5	1.4	1.4
8	1.1	E	E	E	E	1.4	1.6	1.8	1.9	2.6	3.3	2.4	2.9	3.0	3.6	3.0	2.6	1.8	1.6	1.4	1.7	1.7	1.7	1.4
9	1.2	E	E	E	E	1.2	1.6	1.7	1.8	2.1	2.0	2.6	2.3	2.1	1.9	1.9	1.5	1.6	1.5	1.6	1.5	1.6	1.4	1.4
10	E	1.1	1.1	E	E	1.4	1.5	1.5	1.7	1.9	2.1	2.0	2.2	2.2	2.3	2.2	1.9	1.6	1.5	1.4	1.4	1.4	1.4	1.4
11	1.1	1.1	E	E	E	1.4	1.4	1.5	1.6	1.9	2.1	2.0	2.2	2.2	2.4	2.4	2.3	1.7	1.6	1.6	1.5	1.6	1.4	1.5
12	1.6	1.4	E	E	E	E	1.4	C	C	C	C	C	C	C	C	C	C	1.7	1.4	1.6	1.4	1.6	1.4	1.2
13	E	E	E	E	E	1.4	1.5	1.7	1.9	1.9	2.4	2.5	2.1	2.1	1.9	1.9	1.7	1.6	1.6	1.6	1.5	1.4	1.5	1.6
14	1.5	E	E	E	E	1.1	1.6	1.6	1.7	2.0	2.3	2.1	1.9	2.0	2.1	1.6	1.9	1.6	1.5	1.4	1.4	1.4	1.4	1.4
15	E	E	E	E	E	1.1	1.6	1.5	1.7	1.9	1.9	2.0	2.1	2.5	2.0	1.8	1.7	1.6	1.6	1.5	1.7	1.5	1.3	1.1
16	2.0	1.4	E	E	E	1.4	1.5	1.6	1.9	1.8	1.9	2.2	1.9	2.0	1.9	1.9	1.8	2.0	1.5	1.5	1.7	2.6	1.4	1.4
17	E	E	E	E	E	1.3	1.4	1.6	1.6	2.5	2.1	2.2	2.2	1.9	2.0	2.1	2.1	1.5	1.5	1.6	1.6	1.4	1.5	1.4
18	1.2	E	E	E	E	E	1.4	1.5	1.7	1.9	2.0	2.4	3.3	3.4	3.3	2.4	1.6	1.5	1.5	1.4	1.5	1.4	1.4	1.4
19	E	E	E	E	E	1.5	1.5	1.5	C	C	C	C	C	C	C	C	1.7	1.5	1.5	1.4	1.5	1.4	1.4	1.4
20	E	E	E	E	E	1.4	1.6	1.7	2.0	2.0	2.1	2.3	3.4	3.4	2.2	2.1	1.9	1.8	1.6	1.4	1.4	1.4	1.4	1.4
21	E	1.2	E	E	E	1.1	1.6	1.6	1.6	1.6	2.1	2.2	2.2	2.1	2.1	2.0	1.8	1.7	1.4	1.5	1.5	1.5	1.5	1.4
22	E	E	E	E	E	1.1	1.4	1.6	1.7	1.9	2.1	3.2	2.2	2.1	1.9	2.0	1.8	1.6	1.6	1.4	1.5	1.4	1.4	1.2
23	E	E	E	E	E	B	1.4	1.5	1.8	1.8	2.1	2.3	2.2	2.0	1.8	2.0	1.6	1.6	1.6	1.5	1.5	1.5	2.2	1.2
24	E	E	E	E	E	1.2	1.6	1.6	1.8	1.9	2.0	2.1	2.3	3.4	2.4	1.8	1.6	1.7	1.6	1.7	2.4	1.4	1.4	1.4
25	G	G	E	E	E	1.6	1.4	1.7	1.6	1.7	2.4	2.2	3.2	3.2	2.4	2.0	1.7	1.6	1.6	1.8	1.5	1.5	1.4	1.5
26	1.3	1.2	1.1	E	E	G	1.5	1.6	C	C	C	C	C	C	C	C	C	C	1.4	1.5	1.4	1.4	1.5	1.2
27	1.2	1.7	1.6	E	E	(1.2) <sup>B</sup>	1.6	1.6	1.7	1.9	1.9	2.2	2.1	2.2	2.0	1.8	1.8	1.7	1.4	1.4	1.4	1.4	1.4	1.4
28	1.3	1.1	E	1.2	E	1.4	1.4	1.5	1.6	1.8	2.0	2.1	2.1	2.2	2.1	2.2	1.8	1.7	1.4	C	C	1.4	1.4	1.4
29	C	C	C	C	C	C	C	C	1.8	1.9	2.0	2.1	2.2	2.1	1.9	2.2	1.8	1.7	1.8	1.4	1.4	1.4	1.4	1.4
30	E	1.1	1.1	G	1.1	1.1	1.5	1.5	1.7	2.1	4.6	C	C	3.2	2.1	2.0	1.8	1.8	1.4	1.4	1.4	1.4	1.4	1.2
31	1.2	1.1	1.1	1.1	1.1	1.2	1.6	1.6	2.0	2.1	2.1	2.3	2.4	2.6	2.0	1.7	1.6	1.9	1.8	1.5	1.5	1.5	2.0	1.1
Median Value	E	E	E	E	E	1.4	1.5	1.6	1.7	1.9	2.1	2.3	2.3	2.2	2.1	2.0	1.8	1.7	1.6	1.5	1.5	1.4	1.4	1.2
Count	30	30	30	29	29	27	31	28	27	27	27	26	26	27	27	27	24	30	31	30	29	31	30	30

Sheep 1.0 Mc to 1.7 Mc in 1.5 min Manual

Electrical Communication Laboratory, Japanese Ministry of Telecommunications  
(Denko-tsumin Kenkyujo) Gotanda, Shimagawa-ku, Tokyo, Japan

# IONOSPHERIC DATA

Kokubunji, Tokyo

Lat. 35°42.4'N  
Long. 139°29.3'E

135°E Mean Time

f<sub>o</sub>F<sub>2</sub>

Day	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	
1	7.9	(7.7) S	(7.0) S	6.3	5.9	6.3	(6.9) S	(7.4) S	7.8	8.8	9.2.8	10.1	11.1	(11.5) B	10.4	9.9	(10.0) S	10.1 J	10.3	8.5	8.9	8.2	(7.6) S	7.4	
2	7.4 F	7.3	6.7	7.2 J	6.9	6.9	8.0	8.4	7.9	8.4	9.7 P	10.3	10.7	10.9	11.5	11.4	9.6	9.4	9.7	7.9	7.9	8.3	8.2	7.8	
3	7.0	7.3	6.9 J	7.2	6.9	7.4 F	8.2	8.6	8.7	9.2	9.0	8.8	8.8	7.8	7.3	8.2	8.5	7.4	7.3 J	6.7	6.5	6.6	6.4	6.3	
4	6.7	5.1	(4.9) B	4.6	4.8	4.7	6.7	8.3	8.4	8.4	6.4	8.1	8.5	9.6 P	9.0	9.6	(8.2) S	8.1	8.3 H	8.2	7.1	6.6	6.8	6.3	
5	6.9 J	5.8	6.1	5.7	5.7	5.9	6.6	7.0	7.9 J	8.2	10.6	8.4	B	9	9.7	9.6	9.9 J	9.4	9.0	8.7	8.4	8.8	9.0	(9.0) C	
6	9.0	8.9 F	6.9 F	7.6 F	7.2 F	7.0	5.9	6.6	6.8	(7.0) F	7.1	6.9	7.1	10.2	10.7	10.3	9.6	8.9	8.7	7.3	7.1	6.9	6.8	6.5	
7	6.7	6.5	6.1	6.1	6.0	6.0	6.7	6.8	C	A	A	A	7.0	10.1	9.8 P	10.0	9.6	8.7 P	8.3 P	7.2 P	7.6	F	F	F	
8	F	F	F	F	F	9.2	8.2 F	8.3	6.9	7.1	8.4	10.0	11.8	12.4	13.1	12.9	12.3	(9.5) S	6.6	6.6	6.9	6.9	6.0	(6.3) A	
9	6.6	5.8	5.9 F	8.8	B	B	5.6 F	6.5 J	B	A	7.6 J	7.7	7.3	8.7	9.3	(8.1) S	6.9	6.5	6.9	6.9	6.7	6.5	6.6 J	6.4 F	
10	5.7	5.2	5.1 F	(4.9) F	(4.4) F	(4.0) F	5.6	B	A	6.7	6.9	6.7	7.3	A	A	7.5 J	7.9	8.2	7.9	7.7	6.5 J	6.1	5.8	5.8	
11	5.3	5.4 F	5.5 F	5.8 F	(5.8) F	(5.7) F	(5.5) C	8.3	8.5	8.1	S	A	8.5	(8.4) A	8.2 J	(8.1) A	7.9	8.7	A	S	7.2 P	7.3	7.4	6.8 F	
12	6.0 F	(5.7) F	5.4 F	5.4 F	5.3	5.7	S	9.4	6.9	6.1	7.1	7.9	9.0	9.5	9.9	(9.3) S	8.7	8.7	8.0	7.9	7.3	S F	S F	6.7 F	
13	5.9	S F	S F	S F	5.7 F	F S	F S	8.4 F	7.6	7.4	7.6	7.6 S	8.0	9.2	8.9	8.0	A	A	A	A	A S	7.8	7.1 F	A F	
14	6.9	6.4 F	5.9 J F	5.6	4.6	5.5 F	6.9	7.8	7.8	7.7	9.1	9.0	B	9.1	11.0	9.5	8.4	7.5	6.8	6.9	6.7	6.8	6.8	5.9	
15	6.8	6.4	6.7	6.5	4.3	4.3	5.4	8.2	9.5	(9.5) A	9.5	9.5	9.6	9.3	8.3	8.0 J	7.4	7.8	8.4	6.3	5.2 J	5.3 A	F	5.8 F	
16	5.4 F	5.3 F	5.1	4.8	4.7	5.6	5.3	6.6	7.6	8.4 J	A	9.2	A	7.9	7.9	7.9 J	8.1 J	7.3 S	7.0	7.6	7.7	7.0	7.0	5.7 P	
17	6.2	5.7	5.9	5.7 P	5.0	5.1	7.2	9.5	7.9	C	C	C	9.0	9.5	8.4	8.2	8.5	8.6	8.6	8.1	7.0	S	S F	S F	
18	S F	C	C	C	C	C	C	C	10.0	10.2	10.6	10.9	10.8	10.8	10.7	10.7	9.0	8.8	9.6	(9.3) S	8.5	8.2 S R	8.1	7.9	
19	7.5	7.0	7.9	7.1	5.9	6.3	8.9	(9.1) S	9.1	9.7	(10.3) A	10.9	11.0	10.8	10.1	10.3	9.8	A	A	8.6	7.9	(7.6) C	7.3	6.7	
20	7.0	6.5	6.6	6.4 F	5.9	6.3	7.7	8.2	8.1 P	7.6	A	A	8.8	9.1 P	9.6	9.2	8.9	9.4	9.6	9.4	7.5	6.9	7.7	7.3	
21	7.8	6.8	6.9	6.6 F	5.5 F	5.5 F	7.0	7.4	8.0	8.8	9.7	9.7	10.1	9.9	10.6	10.5	10.0	10.2	9.5 S	(8.7) A	7.9	7.6	(7.8) S	7.9	
22	7.6	7.4	7.3	7.0	6.4	6.6	C	S	8.7	8.3	8.9	C	S	10.3	10.6	10.7	9.9 J	9.7	9.2 P	8.5	S	S	(9.0) S	(8.9) J	
23	S	8.3 F	7.8	(7.2) C	6.8	6.7	8.1	7.5	7.4	7.8	8.9	9.3	9.9	(9.7) C	9.4	9.1	8.6	8.6	8.9	8.5	8.4	8.0	8.4	7.6	
24	7.4	7.1 J	7.1	7.0	6.6	6.6	8.2	9.3	8.9	8.9	9.5	10.8	10.6	10.9	11.0	11.1	10.7	10.1	9.4	C	C	C	C	C	
25	C	C	C	C	C	C	C	10.3	10.3	9.0	8.4 H	(9.1) C	9.8	10.2	9.7	9.6	9.6	9.0	9.2	9.3	9.1	9.0	8.2	7.9	
26	7.6	7.2	7.0	6.7	6.3	7.2	9.0	11.2	11.1	9.7	9.6	10.0	10.1	C	C	C	10.5	9.8	S	S	8.6 J	8.2	7.7 P	7.3	
27	7.3	7.6	8.0	7.2	6.6	6.7	S	10.3	10.3	10.4 P	10.9	10.5	10.8	11.3	11.4	10.5	10.2	9.5	9.3	9.2	8.4	S	8.0 J	7.3	
28	7.3	7.0	6.9	6.6	6.4	6.7 F	7.5	7.0	C	7.0	6.8	6.9	7.5	7.3 J	7.3	7.4	7.4	7.4	7.8	6.2	6.3	5.7	6.3	6.4	
29	6.7 P	6.8	6.1	6.1	5.7	5.7	7.1	9.0	10.2	9.8	9.4	10.3	11.2	10.7	9.7	9.3	9.1	8.9	(8.7) B	8.4	7.5	6.8	6.8	7.0	
30	6.9	6.8	5.9	5.8	5.8	5.9	7.6	9.8	10.7	10.2	10.8	10.2	10.5	10.0	10.2	10.0	9.6	8.6	8.8	(7.9) C	7.0 J	6.7	7.3	6.3	
31	6.9	7.3	7.3	6.7	6.4	6.5	(8.6) S	8.8 S	8.5	7.9	C	C	C	C	C	C	C	C	C	C	C	C	C	C	
Median Value	6.9	6.8	6.7	6.5	5.9	6.2	7.1	8.3	8.4	8.4	9.2	9.2	9.7	10.0	9.8	9.3	9.1	8.8	8.7	8.1	7.5	7.0	7.4	6.8	
Count	25	27	27	27	28	26	25	28	27	27	24	25	26	28	28	29	29	28	27	28	27	25	24	24	25

Sweep 1.0 Mc to 17.0 Mc in 1.5 min

Manual

Electrical Communication Laboratory, Japanese Ministry of Telecommunications  
(Denki-tsushin Kenkyujo) Gotanda, Shinagawa-ku, Tokyo, Japan

Lat. 35°42.4'N  
Long. 139°33.3'E

Kokubunji, Tokyo

135° E Mean Time

hp F<sub>2</sub>

IONOSPHERIC DATA

Day	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	
1	320	S	(280)S	320	300	300	(240)S	S	B	360	320B	320	310	B	310	300	S	B	310	290	340	360	(360)S	350	
2	F	330	310	B	280	230	260	260	250	330	310P	340	340	340	320	310	300	300	290	280	350	380	380	380	
3	350	360	S	320	360	350	360	350	350	330	310	310	300	300	420	350	300	300	B	270	270	320	320	350	
4	270	230	B	AS	310	300	280	260	250	240	310	310	340	340P	310	300	S	280	310 <sup>H</sup>	270	270	310	B	B	
5	B	390	320	320	270	250	320	270	B	280	280	B	B	B	270	300	310	260	270	280	B	360	300	C	
6	330	340P	F	F	F	250	310	270	280	AF	370	320	340	S	290	310	290	280	260	280	340	340	320	360	
7	330	330	320	320	280	270	260	240	C	A	A	A	A	370	300P	290	250	240P	250P	290P	320	F	F	F	
8	F	F	F	F	F	F	F	F	240	250	330	370	370	380	320	300	290	270	S	300	360	330	330	A	
9	A	290	310F	330	B	B	F	B	B	A	A	A	280	320	290	280	S	A	270	290	330	F	F	A	
10	310	340	330F	F	F	F	F	390	A	A	300	A	260	A	A	A	290	260	260	250	S	300	320	330F	
11	320	330F	330F	340F	F	(340)F	(310)C	270	280	A	S	A	260	A	A	A	260	AF	AS	AS	300P	320	300	360F	
12	310F	F	340F	330F	310	300	S	230	240	230	310	290	300	280	290	(270)S	250	250	240	A	A	SF	SF	340	
13	SF	SF	SF	SF	SF	SF	SF	260	250	320	250	330S	320	320	280	270	A	A	300	A	AS	320	280F	AF	
14	BF	F	F	270	280	300F	250	300	250	320	310	300	B	340	290	260	260	250	260	280	330	330	370	330	
15	360	380	320	250	360	390	290	340	300	(310)A	310	A	300	290	310	B	270	200	240	250	A	A	F	320F	
16	340F	340F	330	320	330	330	310	280	290	C	A	280	280	290	310	B	300	290	270	300	290	300	320	270P	
17	320	340	340	310P	290	300	240	260	220	C	C	C	280	310	320	290	270	300	310	(290)S	350	350K	360	270	
18	SF	C	C	C	C	C	C	C	320	310	300	300	330	310	320	310	270	300	A	A	310	330	(370)C	400	
19	320	360	340	310	330	340	260	S	290	340	A	A	340	330	310	300	360	330	310	280	350	350	360	380	
20	380	390	390	370	400	340	300	290	280	350	A	A	370	380F	350	340	320	S	S	A	330	350	S	310	
21	340	350	320	290F	250F	300F	230	260	280	340	300	300	330	340	320	290	S	S	280P	320	S	S	(360)S	B	
22	320	320	340	290	340	320	C	S	270	280	350	C	S	340	320	310	B	270	280P	320	S	S	310	300	
23	S	300F	320	(340)C	250	260	220	210	240	280	310	300	300	(300)C	290	290	290	290	260	310	320	320	310	300	
24	290	S	310	270	290	260	240	250	240	200	300	330	320	320	320	310	200	270	260	C	C	C	C	C	
25	C	C	C	C	C	C	C	280	250	240	320H	(320)C	310	300	310	310	300	300	280	270	280	290	290	270	
26	290	320	300	320	320	300	330	270	280	300	300	380	360	380	C	C	270	250	S	S	B	280	310F		
27	320	330	280	260	290	300	S	260	230	270	280	270	320	300	350	310	310	310	270	290	290	S	B	360	
28	320	360	330	360	390	F	270	280	C	C	350	350	420	380	B	330	290	260	260	270	310	290	340	320	
29	360F	370	360	320	310	290	270	250	250	280	320	310	290	290	290	300	290	280	(280)B	270	290	340	330	360	
30	320	300	360	370	370	370	310	290	280	330	300	330	320	330	320	290	290	290	280	C	B	370	390	370	
31	410	370	330	300	330	(240)S	270S	240	280	280	C	C	C	C	C	C	C	C	C	C	C	C	C	C	
Median Value	330	340	330	320	310	300	270	270	250	300	310	320	320	320	310	300	290	270	270	280	330	330	330	330	340
Count	28	23	23	23	24	24	23	24	25	23	23	21	25	25	26	25	23	24	24	23	21	23	21	21	

Sweep 1.0 Mc to 11.0 Mc in 1.5 min

Manual

Electrical Communication Laboratory, Japanese Ministry of Telecommunications  
(Deputi-tsunshu Kenkyujo) Gotanda, Shinagawa-ku, Tokyo, Japan

IONOSPHERIC DATA

Lat. 35 42.4'N  
Long. 139 29.3'E

Kokubunji, Tokyo

h<sub>1</sub>

135° E Mean Time

Day	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
1	250 (260)F	230	200A	200A	(200)F	250	210	190H	300	320	300	300	300	270	290	290	270	280	280	220	230	250	250	290A
2	270	250	210	230	220	210	210	240	250	310	290	330	300	280	290	280	280	250	260	210	280A	300A	270	270
3	280	270	250	250	260	280	320	320A	340	310	290A	300	290	290	420	340	280	250	230	230	210	230	280	270
4	200	200	240	AS	270	230	250	250	(240)B	240	310	280	330	340	300	260	250	240	230H	230	240	230	280	270
5	260	280	280	260	240	230	250	230	(240)B	240	270	240	290	(280)B	270	280	260	250	240	230	240	(260)A	250	(250)C
6	250	290	320F	300F	290A	230	320	290	280	270	300	(320)B	330	300S	270	260	260	260	260	240	240	240	240	260
7	240	240	250	240	220	220	230	220	C	A	A	A	A	280	250	260	220	220	230	220A	240F	260	230	(270)A
8	270A	270	280	270	280	260A	250	230A	230	250	300	360	330	290	300	280	260	240	220	210	270	230	230	A
9	A	250	250	250	230	260	250	260F	280	A	A	A	270	300	290	260	230	(240)A	250A	250	230	290A	280A	(270)A
10	260	250	270	270	280A	330	(340)A	350	(360)A	360	300	320	330	A	A	300	290	260	240	230	270	240	240	280
11	280	260	280	270	250	260	(260)C	260	(270)A	(280)A	S	A	300	(300)A	(300)A	(280)A	250	(270)A	A	(260)A	A	(290)A	260A	260A
12	270	260	260	270	250A	250	230	220	230	210	300	290	290	250	270	260	240	220	220	(260)A	290F	270E	270F	260A
13	(330)A	(200)A	230	220	230	230	220	220	230	310	290	330	320	300	270	270	A	A	A	A	A	A	A	300
14	280A	300A	270F	250A	240	240	230	230	240	250	300	290	270	330	270	240	260A	200B	240	220	210	290A	300A	(310)A
15	280	310A	260	220	260	290	240	320	290	(300)A	300	A	290	280	310	270	270	230A	210A	230A	340A	300A	320	250
16	270	250	250	240	250	250	(270)L	230F	280	270	(280)A	280	290	280	300	290	260	210	230	220	220	210	260	240A
17	260	280	290A	230	220A	250	210	240	210	C	C	C	260	270	290	300	290	280	230	220	240	(260)A	300A	270A
18	260	C	C	C	C	C	C	C	270A	250A	290	290	310	280	280	270	260	270	270	240	240A	(270)A	(300)A	270F
19	250	280	260	240	240	260	220	210	250	A	A	A	A	A	300	(290)A	280	230	A	A	A	A	C	310A
20	A	290	AF	280	(300)A	280	230	240	290	A	A	A	370	370	320	330	340	240	270F	260F	220	280	310	
21	250	290	250	210	200	230	210	(200)A	180	310A	260	300	280A	300	300	280	270	S	220	A	A	300A	250	250
22	250	270	270	220	240	230	(240)C	210	220F	240	280	290	320	320	280	290	250	250	230	220A	280F	270	250	250
23	(280)A	250A	250	240	230S	230A	210	190	180	250	290	290	240	(260)C	270	280	220	250	210	220	230	230	230	220
24	240	260	250	250	250	230	210	190	200	230	260	300	300	290	290	290	250	230	210	C	C	C	C	C
25	C	C	C	C	C	C	C	C	200	190	180H	(240)C	300	290	210	300	300	200	220	210	220	220	220	220
26	210	220	260	260	250	260	230	250	280	240	340	340	320	300	C	240L	220	210	210F	210	210F	210	210	250A
27	250	250A	230	210	230	260	260	280	210	210	250	250	300	290	290	290	280	260	220	220	220	220	210	A
28	270	AF	260	260	340F	240	270	C	C	350	350	310	400	350	310	330	290	250	220A	210	270F	270	280	280
29	280	290	270	260	230A	250	200	230A	210	220	230	300	290	250	270	290	270	250	230	230	240	250	300A	310A
30	290	260	280	280	290	290	230	220	260	270	270	310B	310	280	300	300	260	240	250	(250)C	250	310	300	300
31	310	300	230	220	280	280	220	210	240	230	C	C	C	C	C	C	C	C	C	C	C	C	C	C
Mean Value	270	260	260	250	250	230	230	230	240	250	270	300	300	290	290	280	260	250	230	220	240	260	260	270
Count	28	28	28	26	29	29	29	30	29	25	24	23	28	29	28	29	27	27	28	26	25	28	29	26

Sweep 1.0 Mc to 17.0 Mc in 1.5 min

Manual



Electrical Communication Laboratory, Japanese Ministry of Telecommunications  
 (Denki-tsushin Kenkyujo) Gotanda, Shinagawa-ku, Tokyo, Japan

fr.

# IONOSPHERIC DATA

Kokubunji, Tokyo  
 Lat. 35°42'4"N  
 Long. 139°29'3"E

135°E Mean Time

Day	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
1						Q	A	A	5.0	(53)A	5.7	A	B	S	B	A	5.1L	4.7	L	Q				
2						Q	Q	L	5.0L	(55)A	5.3L	A	B	A	A	5.2	4.8	4.8	L	A				
3						L	L	A	A	A	(56)A	5.1	5.1	A	5.1	4.9	4.5	L	L	Q				
4						Q	L	L	A	A	L	5.0	5.6	5.6	L	A	(51)L	(44)L	L	A				
5						L	L	L	4.3	B	5.2	5.6	B	B	B	A	L	L	A	A				
6						Q	L	4.5	4.8	(46)A	(44)J	4.8	4.5J	4.9J	4.3	S	4.9L	L	A	Q				
7						A	A	3.6L	A	C	A	A	A	A	A	A	5.0L	4.4L	L	Q				
8						A	A	A	L	L	5.1L	5.4	5.4	5.2	5.2	4.9	4.4L	L	A	A				
9						Q	Q	L	L	A	A	A	A	A	A	A	A	A	A	A				
10						2.6L	A	A	A	4.7	4.8	5.7	4.9	A	A	A	4.6	4.1	AF					
11						C	A	A	A	A	A	A	A	A	A	A	A	AF	A					
12						Q	L	L	Q	A	L	5.0S	A	A	A	A	L	L	L	A				
13						Q	2.2	A	L	5.5	5.8	L	A	A	A	A	A	A	A	A				
14						Q	L	A	4.6L	4.6L	(50)B	5.3	4.8B	B	A	A	A	A	L	Q				
15						A	A	A	L	A	A	A	A	A	A	A	A	A	AF	A				
16						Q	L	Q	4.8	(50)L	A	(53)A	A	A	A	5.4L	L	L	Q	Q				
17						A	Q	L	L	C	C	C	L	5.2	L	L	L	L	Q	Q				
18						C	C	C	A	A	B	L	6.2L	L	5.5	A	A	L	Q	Q				
19						Q	Q	Q	L	A	A	A	A	L	A	L	Q	A	A	Q				
20						Q	Q	Q	5.9L	A	A	A	(61)L	(58)L	L	L	L	L	Q	AF	AF			
21						Q	Q	A	Q	A	(54)L	(56)L	A	5.1L	L	L	L	S	Q	A				
22						Q	C	Q	A	L	L	L	5.7L	L	L	(56)L	L	L	L	(27)A				
23						A	L	A	Q	L	L	5.8	(48)L	(48)C	(48)L	L	Q	L	L	Q				
24						Q	L	Q	Q	L	L	6.0L	L	L	5.5	L	4.9L	4.0L	Q	C				
25						C	C	Q	Q	Q	Q	C	L	L	Q	L	L	L	Q	Q				
26						Q	Q	L	L	L	L	5.0L	5.5	5.5L	5.8	C	L	L	L	Q				
27						Q	Q	Q	L	A	L	Q	L	Q	A	A	4.9	L	L	Q				
28						L	Q	L	C	C	5.3	5.4	5.3	5.3	5.0	4.6	4.6J	Q	Q					
29						Q	Q	Q	A	L	L	L	5.3L	A	A	S	S	B	Q	Q				
30						Q	Q	Q	L	A	L	B	A	A	L	L	L	L	L	Q				
31						A	A	Q	S	B	C	C	C	C	C	C	C	C	C	C				
Mean Value									5.0	5.2	5.4	5.3	5.4	5.2	5.3	5.0	4.9	4.4						
Count					1	2	2	2	6	8	10	14	13	11	12	6	11	7						

Sweep 1.0 Mc to 17.0 Mc in 1.5 min Manual

Electrical Communication Laboratory, Japanese Ministry of Communications  
(Denkatsushin Kenkyujo) Gotanda, Shinagawa-ku, Tokyo, Japan

# IONOSPHERIC DATA

h'F<sub>1</sub>

Kokubunji, Tokyo

Lat. 35°42.4'N  
Long. 139°29.3'E

135°E Mean Time

Day	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	
1						Q	A	A	Z00	(Z00)A	A	A	B	S	B	A	Z20A	Z30	Z60	Q					
2						Q	Q	Z10	A	(Z10)A	Z30A	A	A	B	A	Z20	Z00	Z10	Z40	A					
3						Z60	Z20	A	A	A	A	190	(180)A	(190)A	Z20	Z00	Z00	Z00	Z50	Q					
4						Q	Z00	(Z00)A	Z00	(Z20)A	Z30A	190	Z40	190	Z20	A	A	Z20	Z10	A					
5						Z30	Z30	Z20	(Z00)B	180	Z00	B	B	B	B	A	Z60	Z00	A	A					
6						Q	Z10 F	Z20	A	A	A	Z20A	(Z10)A	Z00A	A	A	190	Z10	A						
7						A	(Z00)S	A	C	A	A	A	A	A	A	A	Z00	Z00	Z10						
8						A	A	A	190	180	Z00	Z00	Z00	Z00	Z50	Z10	Z10	Z20	180	A					
9						Q	Q	Z40	Z10A	A	A	A	Z20	Z50	Z50	A	A	A	A						
10						Z90	A	A	A	Z00A	190	(190)A	190	A	A	Z20A	AF	AF							
11							C	A	A	A	A	A	Z40A	A	A	A	A	AF	A						
12						Q	Z20	Z20	Q	A	A	180A	(180)A	(Z10)A	Z40	Z00	170	Z00	Z10	A					
13						Q	Z20	(Z10)A	Z00A	Z00	Z10A	A	A	A	A	A	A	A	A						
14						Q	Z20	(Z00)A	(180)S	170	170	Z30B	B	B	A	A	(Z50)A	A	Z10	Q					
15						A	A	A	A	A	A	A	A	A	Z30	A	A	Q	AF	A					
16						Q	Z20	Q	Z20	Z20	(Z10)A	Z00	A	A	Z20	(Z00)A	Z30	Q	Q	Q					
17						A	Q	Z00	Z00	C	C	(170)B	170	(Z10)A	Z50	Z40	Z10	Q	Q						
18						C	C	C	A	A	180	Z00	Z20	Z30	Z10	A	A	Z30	Q						
19						Q	Q	Q	Z00	A	A	A	A	Z00	A	A	Q	A	Q						
20						Q	Q	Q	Z30	A	A	A	Z50A	Z60A	Z40A	Z30	Z30	Q	AF	A					
21						Q	Q	Q	A	Q	190	180	A	180	Z00	180	A	S	Q	A					
22						Q	C	Q	A	170	Z20	180	160	180	Z20	190	Z00	Z10	Z20	180					
23						A	Z00A	A	Q	190	190	190	140	(150)C	160	Z50	Q	Z30	Q						
24						Q	Z00	Q	Q	Z00	180	190	190	190	190	Z00	Z00	Z10	Q						
25						C	C	Q	Q	Q	Q	Q	190	Z10	Q	Z00	Z00	Q	Q						
26						Q	Q	Z20	Z10	Z10	Z20	Z00	Z00	Z00	Z10	(Z10)C	Z00	Z00	Q	Q					
27						Q	Q	Q	Q	190	(180)A	170	Q	Z70	Q	A	A	Z20	Z30	Q					
28						300	Q	Q	Z40	C	Z00	190	190	Z00	Z00	Z00	Z20	A	Q						
29						Q	Q	Q	A	Q	Z00	190	190	A	AS	S	S	B	Q						
30						Q	Q	Q	Q	Z20	(Z20)A	Z20	B	A	A	Z00	Z10	Z30	Q	C					
31						(Z00)A	Q	A	B	C	C	C	C	C	C	C	C	C	C	C					
Mechan						-	Z20	Z20	Z00	Z00	Z00	190	190	Z00	Z10	Z10	Z20	Z10	Z10	-					
Count						4	12	11	15	17	18	16	18	17	17	16	20	16	9						

Sweep 1.0 sec. Mc to 17.0 Mc in 1.0 min Manual

Electrical Communication Laboratory, Japanese Ministry of Telecommunications  
(Denkitsu-shin Kenkyujo) Gotanda, Shinagawa-ku, Tokyo, Japan

# IONOSPHERIC DATA

f8

Lat. 35°42.4'N  
Long. 139°29.3'E

Kokubunji, Tokyo

135°E Mean Time

Day	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
1						A	A	A	3.0	A	3.0	B	B	4.0	B	A	3.0	3.0 F	2.6	(1.5) B				
2					(1.8) A	A	A	A	(3.7) A	3.0	A	4.1	A	A	A	A	A	A	A	A	A			
3					1.8	(2.7) A	A	A	A	A	A	B	A	A	A	(3.5) A	A	A	A	2.2	B			
4					2.4	A	A	A	3.0	A	A	3.9	A	B	A	A	A	A	A	B	B			
5					A	B	B	B	B	3.6	4.1	B	B	A	B	A	3.2	A	A	A	A			
6					A	2.0	2.7 A	A	A	A	A	A	A	3.0	3.0	A	A	A	A	A	A			
7					A	A	A	A	C	A	A	A	A	A	A	B	A	A	A	A	A			
8					A	A	A	A	A	A	A	A	3.0	3.0	B	A	3.0 J	2.7	A	B				
9					B	2.9	A	A	A	A	A	A	A	A	A	A	(3.4) A	2.0	(1.0) A					
10					B	A	A	A	A	A	A	A	3.5	B	B	B	3.0	A	A					
11					A	C	2.0	2.0	3.2	3.4	B	A	A	A	A	A	A	A	A	A	A			
12					A	2.4	3.6 A	A	A	A	A	A	A	A	A	A	A	2.0	A	A				
13					A	A	A	A	A	A	3.6	A	A	A	A	A	A	A	A	A	A			
14					A	A	A	A	A	A	A	B	B	B	B	B	3.6	3.0	A	A	A			
15					A	A	A	A	A	A	A	A	A	A	A	(3.6) J	(3.5)	2.9	A	B	B			
16					1.8	2.6	A	A	A	(3.6) A	A	A	A	A	A	A	A	A	A	A	A			
17					A	2.1 A	2.0 A	3.6	C	C	C	C	(3.6) B	3.9	B	B	3.4	A	A	A	A			
18					C	C	C	A	A	A	A	A	(4.2) J	(3.9) B	A	A	A	(2.0) A						
19					A	(2.5) A	A	A	A	A	A	A	A	4.2	(4.0) B	(3.6) A	3.4	2.0	2.0 A	A				
20					A	(2.5) A	3.1	3.5	3.5 A	A	A	A	A	A	A	A	3.0	A	A	A	B			
21					A	2.9	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A			
22					B	C	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A			
23					A	A	A	A	(3.3) J	3.7	3.9	4.2 F	B	C	A	A	A	3.0 F	(2.2) A	A				
24					2.1 A	2.1	A	B	B	B	B	B	B	B	B	B	B	2.9	B	C				
25					C	C	C	B	(3.2) J	A	A	C	B	B	B	(3.0) B	3.4	3.0 F	A	A				
26					1.8	2.5	A	(3.5) A	B	A	B	A	B	B	B	C	B	A	A	A	A			
27					B	2.7	A	A	A	A	B	B	B	B	A	A	A	A	A	A	A			
28					A	2.2	2.9	C	C	(3.7) B	3.0 B	B	B	3.7	3.7	3.5	A	A	A	B	B			
29					B	A	A	A	A	3.6 A	A	A	A	A	S	S	S	B	2.0	B				
30					B	A	A	A	A	(3.4) A	A	B	B	B	A	A	(2.0) A	A	A	C				
31					A	A	A	A	A	B	C	C	C	C	C	C	C	C	C	C				
Mean Value						1.8	2.5	2.9	3.5	3.6	-	3.9	-	3.9	3.7	3.5	3.4	2.9	2.2	-				
Count					6	13	7	7	9	9	4	5	4	7	5	9	12	14	8	1				

Sweep 1.0 Mc to 17.0 Mc in 1.5 min

Manual

Electrical Communication Laboratory, Japanese Ministry of Telecommunications  
 (Denki Tsushin Kenkyujo, Gotanda, Shinagawa-ku, Tokyo Japan)

# IONOSPHERIC DATA

Lat. 35 42.4 N  
 Long. 139 29.1 E  
 Kokubunji, Tokyo

h E

Day	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
1						A	A	A	110	100	A	100	D	110	B	(120)A	100	100	120	B				
2						(90)A	A	100	100	100	A	A	A	B	100	A	A	100	A	A				
3						100	(100)A	B	A	A	A	B	A	A	A	100	A	A	120	B				
4						100	A	A	100	A	A	100	A	(100)B	A	A	A	A	B	B				
5						A	B	B	B	100	100	B	B	A	100	A	100	A	A	A				
6						100	100	100	A	A	A	A	A	A	120	100	A	A	A	A				
7						A	A	A	C	A	A	A	A	A	A	A	B	90	A	90				
8						A	A	A	A	A	A	100	100	100	100	A	100	100	100	A				
9						B	100	100	110	110	110	A	A	A	A	100	100	90	100	B				
10						100	(100)C	100	100	100	100	A	A	A	A	A	100	100	100	100				
11						A	100	100	A	A	B	A	A	A	A	A	90	90	100	100				
12						A	A	A	A	A	A	100	A	A	A	A	A	A	A	A				
13						A	A	A	A	A	90	100	A	A	A	A	A	A	A	A				
14						A	A	100	A	A	B	100	100	100	(100)B	(100)B	100	100	100	A				
15						A	110	100	100	A	A	A	A	A	100	100	100	100	100	100				
16						(100)A	100	A	A	100	A	A	A	A	A	A	A	A	A	100	B			
17						A	90	100	100	C	C	C	(110)B	100	100	B	100	A	A	A				
18						C	C	C	A	A	A	100	90	90	100	A	A	A	100	100				
19						A	100	A	A	A	A	A	A	A	100	100	100	100	100	A				
20						A	A	110	100	110	A	A	A	A	A	A	110	A	A	A	B			
21						A	A	A	A	A	A	A	A	A	A	A	A	A	A	A				
22						(100)B	C	A	A	A	A	100	100	(100)A	100	A	100	90	100	A				
23						A	A	A	100	90	90	90	F	100	C	100	A	100	(100)B	B				
24						100	100	A	100	100	100	90	100	100	100	100	90	(100)A	100	C				
25						C	C	C	B	100	A	A	100	100	100	100	100	90	A	A				
26						100	100	A	100	A	100	B	100	100	(100)C	100	100	A	A	A				
27						B	100	A	A	A	B	B	B	A	A	A	A	A	A	A				
28						A	110	100	C	C	90	90	90	90	90	90	A	A	B	B				
29						B	A	A	A	100	A	A	A	A	S	S	S	P	110	B				
30						B	A	A	100	100	100	B	B	B	B	B	A	100	A	A	C			
31						A	A	A	A	A	B	C	C	C	C	C	C	C	C	C				
Median Value	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
Count	9	14	10	13	11	8	9	9	11	14	14	13	11	14	14	13	11	14	14	14	14	14	14	14

Sweep 1.0 Mc to 17.0 Mc in 1.5 min Manual

Electrical Communication Laboratory, Japanese Ministry of Telecommunications  
(Denki-tsushin Kenkyujo) Gotanda, Shinagawa-ku, Tokyo, Japan

# IONOSPHERIC DATA

fEs

Lat.: 35°42.4'N  
Long.: 139°29.3'E

Kokubunji, Tokyo

135°E Mean Time

Day	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
1	3.6F (5.7)Y	4.0F	5.5	4.6	3.5	4.7	3.7	5.6	6.2	7.0	B	4.8S	4.4	6.4	5.4	4.6	3.6Y	2.4	4	5.4	6.4	7.7	3.0	4.2
2	4.4	2.6	3.2	3.1	3.0	3.2	5.6	4.2Y	4.3Y	8.4	6.0	7.4	B	6.2	8.0	6.8	5.6	4.5	6.3	7.9	7.7	3.0	3.4	3.4
3	4.2	3.0	3.4	2.4	(7.4)Y	3.6	6.8	6.7F	6.8	6.6Y	5.6	4.8	5.7	5.0	3.8	4.2	3.8	3.0	B	3.0	4	3.8	3.2	3.2
4	2.4Y (2.4)Y	(3.4)Y	4.4	2.6	6.6	5.6	5.6	(5.6)Y	6.2	6.4	(4.0)Y	B	(4.2)Y	5.2	6.4	5.4	4.4	4.2	4.8	6.0	B	B	B	B
5	B	4	4	1.3	2.1	2.8	B	B	4.6	4	B	B	B	9.2	(4.4)Y	6.4	5.8	4.6	6.1	5.0	3.5	6.5	6.4	C
6	11.5	9.5	5.7	5.7	5.4	3.6	10.0	8.2	7.2	9.2	5.2	4.8	5.2	5.0	(4.8)Y	(4.6)Y	4.2	4.6	4.6	3.8Y	3.0	4	6.4	1.6B
7	2.0Y (3.2)Y	2.2	3.2	2.6	2.6	3.4	(7.2)Y	C	10.4	11.5	10.3B	7.2	5.6	6.4	7.2	4.2	3.4	3.8	5.8	7.8	3.8	6.2	6.2	6.0
8	5.0	5.0	3.6	4.2	3.6	6.2	7.0	7.2	5.0	4.8	4.6	3.8B	4	(5.2)Y	6.0	(4.8)Y	4	5.0	3.4	2.8	3.2	3.0	2.2	6.4
9	6.2	5.2	5.6	4.9	2.2	4	3.6	5.8	(7.2)F	9.4F	9.6	(9.4)F	5.8	4.2	4.7	6.4	6.4	5.8	4.4	4.2	2.2	4.6	6.0	6.8
10	4.0	3.0	1.6	2.4	2.5	2.6	6.2	6.4	8.0	7.2	4.0	5.2	4.3	8.6	9.4	9.4F	12.4F	D	11.5	11.0F	9.2Y	5.4F	3.5F	7.2
11	3.0	3.6F	3.1	4.0Y	2.8	3.8Y	C	7.3Y	6.6	7.2	5.8	13.0	(12.4)F	12.4	9.2	10.7	5.4	(7.2)Y	8.7	6.6	8.0	6.8	8.8	5.0
12	4.2	3.8	2.8	3.0	5.0	(3.0)F	(5.6)Y	4.4	6.5	9.2F	9.2S	8.4	8.6	6.8	5.2	4.0	(3.4)F	4.2	8.2Y	9.2	8.8	7.8	6.6	9.6
13	3.2	6.0	7.2	7.2	5.0	4.6	5.6F	5.2	4.8	5.7	6.3	7.2F	6.4	6.4	5.7	(8.7)Y	9.4	11.4	12.5	8.8	11.4	8.0	7.0	7.6
14	5.4	5.0	4.4	4.0	4.3	3.5	5.8	5.9	3.8	4.2	(4.0)Y	B	B	B	5.6	5.2	7.1	4.8	3.9	2.4	B	3.8	4.6	4.2
15	3.6	3.8	3.6	(4.1)Y	3.1	3.0	4.4	6.1	6.7	12.3	(12.8)F	(12.7)F	6.7	10.4	4	5.6	6.3	7.3	7.5	6.7	8.7	13.0	6.8	3.4
16	3.2F	3.6	4.8	3.0F	3.0	3.0	3.0	3.8	4.6	5.6	12.4	10.6	9.4	7.0	6.4	6.4	5.4F	3.8	3.0F	B	B	B	(6.4)Y	7.2F
17	3.8	3.6	4.8	C	C	C	C	C	6.4	6.4	5.4	4.8	C	C	5.7Y (8.4)Y	(7.2)Y	8.3	(6.2)Y	3.6	3.0	3.0	(3.8)Y	5.2	6.8
18	4.2	3.6	3.6	3.8	3.8	2.8	4.0	4.2	4.6	13.6B	1.44	11.6F	7.1	4	5.3	8.4	6.4	4.6	3.0F	3.8	3.0	7.1	5.8	4.0
19	4.2	4.0	4.8	3.0	3.2	3.8	(4.6)Y	5.0	(8.4)Y	(13.0)F	(1.8)F	6.6	7.2YF	5.6	5.4	4.2	4.2	(11.6)F	(12.2)B	9.0	8.4	C	7.8	6.8
20	3.4	3.6F	3.1	2.0	B	2.0	3.4	3.5	4.2	(8.8)Y	6.4	6.4	6.2	4.8	4.8	4.6	5.8	4.8	5.8	4.2	3.3	3.0	4	1.8
21	3.0	3.0	3.2	B	2.0	B	C	4.2	(6.4)Y	5.0	7.8	4.4	4.2	4.8	4.2	4.2	3.8	4.0	3.5	3.6	6.6	5.6	3.0	3.0
22	7.0	4.8	4.6	3.6	(3.6)S	4.8	4.4S	3.8	(4.3)Y	4.9	4	4	4	C	4	4	4.8	4.2	3.0	2.8	3.2	(2.0)B	B	B
23	B	3.0	B	B	B	3.0	3.0	3.6	4.0	B	B	4	B	4	4	4	3.8	3.7	4	C	C	C	C	C
24	C	C	C	C	C	C	C	3.0	4	4.5	4.4	C	B	(4.6)F	4	4	3.8	4.9	4.4	3.1	2.5	2.2	5.7	4.0
25	3.5	3.1	1.3	1.6	1.4	3.0	3.0F	3.9	4.2	B	3.8	B	B	B	B	C	B	4.0	3.0	4.0	3.0	3.6	3.0Y	2.8
26	1.8	1.4	B	3.0	B	B	3.2	3.4	4.0	4.9Y	4.3	4.4	4.2	5.6	7.0	6.0	5.5	3.8	4.0	3.7	3.3	3.2	2.2	6.6
27	3.6	4.0	2.2	2.0	2.4	2.2	(3.0)Y	3.2	C	C	4.3	4.3	4.2	4.2	3.8	3.8	5.2	3.5	4.2	3.0	3.4	4.4	3.4	3.4
28	3.0	2.2	2.0	2.2	2.2	2.8	3.0	4.6	4.4	4.8	5.4	5.8	4.1	4.1	6.7	S	S	B	1.8	3.0	4	3.4	5.0	4.0
29	3.2	3.0	3.0Y	4	2.6	3.0	3.8	3.8	4.6	6.2	7.0	7.6	7.8	4.6	4.8	3.4	3.4	2.8	C	3.2	3.0	2.6	2.0	2.0
30	3.1	4	3.1	4	5.0	4.4	4.0	3.9	5.2	B	C	C	C	C	C	C	C	C	C	C	C	C	C	C
Mean Value	3.9	3.6	3.2	3.2	2.9	3.0	3.7	4.6	4.7	6.0	6.0	6.0	5.8	5.6	5.2	6.0	5.4	4.6	4.1	4.2	3.5	4.0	4.6	4.2
Count	2.8	2.9	2.7	2.7	2.6	2.7	2.6	2.9	2.8	2.6	2.8	2.5	2.3	2.6	2.9	2.8	2.8	2.9	3.0	2.6	2.7	2.6	2.7	2.6

Sweep 1.0 Mc to 17.0 Mc in 1.5 min

Manual

# IONOSPHERIC DATA

F<sub>2</sub>-M3000

Kokubunji, Tokyo

Lat. 35°42.4'N  
Long. 139°29.3'E

135°E Mean Time

Day	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	25
1	3.0	J S (3.3)S	3.0	3.1	3.0	3.1	3.0	3.1	3.0	3.1	3.0	3.1	3.0	3.1	3.0	3.1	3.0	3.1	3.0	3.1	3.0	3.1	3.0	3.1	3.0
2	J F	3.0	J	3.4	3.4	3.5	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4
3	2.8	3.0	J	2.9	2.9	2.9	2.9	2.9	2.9	2.9	2.9	2.9	2.9	2.9	2.9	2.9	2.9	2.9	2.9	2.9	2.9	2.9	2.9	2.9	2.9
4	3.2	3.5	B	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7
5	J	2.6	3.0	2.9	3.2	3.4	3.1	3.4	3.2	3.2	3.3	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4
6	3.0	2.9	F	(2.7)F	F	3.3	3.0	3.3	3.2	3.2	3.2	3.2	3.2	3.2	3.2	3.2	3.2	3.2	3.2	3.2	3.2	3.2	3.2	3.2	3.2
7	2.9	3.0	3.0	3.1	3.3	3.3	3.5	3.6	C	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A
8	F	F	F	F	(3.0)F	F	3.6	3.3	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5
9	A	3.3	3.0	3.1	B	B	F	F	B	A	2.7	3.2	3.1	A	A	A	A	A	A	A	A	A	A	A	A
10	3.0	2.9	2.9	F	J F	J F	2.6	B	3.1	3.1	S	A	3.3	A	J	A	3.5	A	A	A	3.1	A	A	A	A
11	3.0	3.1	2.9	2.9	(2.9)F	(2.9)F	(3.1)C	3.3	3.1	3.1	S	A	3.3	A	J	A	3.5	A	A	A	3.1	A	A	A	A
12	3.1	3.1	2.9	2.9	3.0	3.1	S	3.7	3.6	3.7	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4
13	S	S	S	S	2.9	2.9	S	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4
14	B	J F	J F	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3
15	2.8	2.7	3.0	3.5	3.0	2.6	3.1	3.0	3.0	(3.1)A	3.1	2.8	3.1	3.2	3.1	J	3.3	3.2	3.5	3.4	J	3.1	3.0	3.0	3.0
16	2.9	2.9	2.9	3.0	3.1	3.2	3.4	3.5	3.7	C	C	C	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4
17	3.0	2.9	2.9	3.0	3.1	3.2	3.4	3.5	3.7	C	C	C	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4
18	3.0	2.9	2.9	3.0	3.1	3.2	3.4	3.5	3.7	C	C	C	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4
19	3.0	2.9	2.9	3.0	3.1	3.2	3.4	3.5	3.7	C	C	C	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4
20	2.7	2.6	2.7	2.7	2.6	2.8	3.0	3.1	3.0	2.9	2.9	2.9	2.9	2.9	2.9	2.9	2.9	2.9	2.9	2.9	2.9	2.9	2.9	2.9	2.9
21	2.8	2.9	3.1	3.3	3.4	3.4	3.6	3.5	3.2	2.9	3.2	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
22	2.9	3.0	2.9	3.1	2.9	3.0	C	S	3.3	3.0	2.8	C	S	2.9	2.9	2.9	2.9	2.9	2.9	2.9	2.9	2.9	2.9	2.9	2.9
23	S	3.1	3.0	(3.2)C	3.4	3.3	3.7	3.6	3.5	3.2	3.1	C	3.3	3.2	3.1	C	3.3	3.2	3.1	3.4	3.0	3.0	3.0	3.0	3.0
24	3.1	J	3.1	3.3	3.2	3.4	3.5	3.4	3.5	3.0	3.0	3.0	3.0	2.9	2.9	2.9	2.9	2.9	2.9	2.9	2.9	2.9	2.9	2.9	2.9
25	C	C	C	C	C	C	C	3.1	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4
26	3.1	3.1	3.1	3.0	3.0	3.1	2.9	3.3	3.3	3.0	3.0	2.7	2.7	2.6	C	C	3.2	3.4	S	S	3.1	3.2	3.0	3.1	3.1
27	3.0	2.9	3.2	3.4	3.2	3.0	S	3.3	3.3	3.3	3.2	3.3	2.9	2.9	2.9	2.9	2.9	2.9	2.9	2.9	2.9	2.9	2.9	2.9	2.9
28	3.0	2.8	2.9	2.8	2.7	F	3.2	3.2	C	C	3.0	3.0	2.9	2.9	2.9	2.9	2.9	2.9	2.9	2.9	2.9	2.9	2.9	2.9	2.9
29	2.7	2.7	2.8	3.0	3.0	3.1	3.3	3.5	3.3	3.3	3.2	3.0	3.1	3.2	3.2	3.1	3.3	3.2	(3.3)B	3.3	3.2	2.9	3.0	2.8	2.8
30	3.0	3.0	2.7	2.7	2.7	2.7	3.0	3.1	3.2	3.0	3.0	2.9	3.0	2.9	2.9	3.0	3.2	3.2	3.2	C	J	2.7	2.7	2.8	2.8
31	2.6	2.8	2.9	3.1	2.8	2.9	(3.4)S	3.3	3.5	3.2	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C
Median MUF	3.0	2.9	2.9	3.0	3.0	3.1	3.2	3.3	3.3	3.0	3.0	2.7	2.6	2.6	2.6	2.6	2.6	2.6	2.6	2.6	2.6	2.6	2.6	2.6	2.6
Count	22	24	23	24	23	23	23	26	25	25	24	23	26	26	26	25	23	23	25	23	24	23	21	21	21

Swamp 1.0 Mc to 1.5 Mc in 1.5 min

Manual

Electrical Communication Laboratory, Japanese Ministry of Telecommunications  
(Denkikatsushin Kenkyujo) Gotanda, Shinagawa-ku, Tokyo, Japan

IONOSPHERIC DATA

f<sub>min</sub>

Kokubunji, Tokyo

Lat. 35°42.4'N  
Long. 139°29.3'E

135°E Mean Time

Day	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
1	1.3	A	1.2	1.2	(1.2)A	A	A	A	4.0	A	A	A	6.0	S	B	A	4.4	3.2	2.5	1.8	2.6	1.6	2.0	A
2	1.3	1.1	1.2	1.2	2.4	2.4	3.2A	3.8	3.8	3.9	A	5.0A	A	6.0	A	4.6	3.6	3.0	3.3	2.0	A	A	1.6	1.8
3	1.4	2.0	1.6	1.6	1.8	A	A	A	A	A	A	4.6	(4.6)A	(4.1)A	3.7	2.8	2.0	2.0	A	2.2	A	1.5	1.4	1.8
4	1.1	1.2	1.2	1.2	AS	A	(2.4)A	3.0	A	3.9	A	4.6	4.2	4.2	A	A	3.6A	3.0	2.6	A	2.0	2.0	2.4	2.2
5	2.0	E	E	E	E	1.6	2.3	2.5	3.8B	4.1	4.0	4.2	5.7	A	(5.8)B	A	A	3.4	A	A	2.2	A	2.4	C
6	A	A	AF	AF	AF	2.0	2.4	3.0	A	A	A	A	4.4	A	A	A	3.6	3.0	A	1.8	1.5	E	1.6	1.3
7	1.2	1.2	1.6	1.2	1.6	1.9	2.6S	A	C	A	A	A	A	A	A	3.6	3.6	3.3	A	A	AF	AF	2.0	A
8	A	A	E	E	1.2	A	A	A	3.6	3.6	4.3	4.5	4.2	4.5	4.6	3.8	3.4	3.2	1.8	1.8	2.2	1.8	1.8	A
9	A	2.4	1.8	1.8	1.6	1.8	2.8	A	A	A	A	A	4.2	4.3	4.2	4.0A	A	A	A	A	1.4	A	A	A
10	1.8	1.6	E	E	2.0	1.8	1.5	A	A	4.0	3.9	A	4.3	A	A	A	3.9	AF	AF	AF	AF	AF	2.0	1.5
11	1.6	1.2	1.3	E	1.3	1.7	C	A	3.8	A	A	A	A	A	A	A	A	A	A	A	A	(2.4)A	A	1.4
12	A	1.8	E	1.4	2.0	1.4	2.4	3.6	2.6	A	A	4.4A	4.2	A	4.4F	3.7	3.4	(3.0)A	2.6	A	A	A	2.6	1.9
13	A	(1.4)A	E	E	1.6	1.5	A	A	3.5	A	A	A	A	A	A	A	A	A	A	A	A	A	2.0	2.6
14	A	A	A	A	1.7	1.4	2.6	A	(3.8)S	3.8	(4.0)B	4.6	4.8	6.2	A	A	3.7	A	2.2	1.6	2.9	A	A	2.0
15	1.9	A	1.9	1.7	1.4	1.8	2.7A	AS	A	A	A	A	A	A	4.4	A	A	A	A	A	A	A	A	A
16	1.2	1.5	1.3	1.1	1.3	1.8	A	3.6F	4.2	4.4	A	4.6	A	A	4.4	4.6	4.2	3.6	2.2	2.1	1.6	1.6	1.6	A
17	2.0	1.6	1.6	1.2	2.0	2.0	2.4	3.3	3.6	C	C	C	4.3B	(4.2)A	A	4.6	3.7	3.6	2.7	A	1.8	A	A	A
18	1.2	C	C	C	C	C	C	C	A	A	(4.2)A	4.4	4.8	4.6	4.5	A	A	2.8	2.0	1.8	2.0	A	A	AF
19	1.7	1.1	1.6A	A	1.6	1.5	A	3.2	3.6	A	A	A	4.8	A	A	A	3.7	A	A	AF	AF	C	2.0	A
20	A	1.4	AF	1.1	A	A	AF	3.5	4.2	A	A	A	4.8	A	A	4.4	3.6	3.0	AF	AF	1.4	1.9	1.2	1.9
21	1.8	1.8	1.3	1.1	E	1.8	2.8	A	(3.3)A	3.8	4.2	4.6	A	4.6	4.2	4.0	A	A	3.6	A	A	A	1.8	1.8
22	2.0	2.0	2.0	2.0	2.0	1.8	(3.0)C	4.2F	AF	4.0	A	(4.4)A	4.2	4.2	4.2	4.2	3.6	3.3	2.8	1.8	2.2	2.0	1.6	1.8
23	A	A	2.6	2.6	2.2	A	AS	A	3.9	4.2	4.2	4.4	4.2	(4.1)C	3.9	4.2	3.9	3.3	2.6	1.8	2.0	1.8	1.8	1.8
24	1.8	1.8	1.8	2.0	1.8	2.1	2.1	3.0	3.6	4.5	4.2	4.2	4.2	4.3	4.2	3.8	3.6	3.0	2.6	C	C	C	C	C
25	C	C	C	C	C	C	C	2.8	3.6	4.2	4.2	(4.3)C	4.3	4.6	4.2	3.8	3.5	3.1	2.9	2.1	1.3	1.4	2.1	1.8
26	1.8	1.4	1.2	1.1	1.1	1.9	2.5	A	3.6	4.2	3.0	4.8	4.3	4.4	4.0	(3.9)C	3.8	3.4	2.2	AF	2.4	AF	1.8	A
27	1.4	1.8	(1.6)B	E	1.8	1.4	2.8	3.4	A	A	4.2	5.2	A	5.2	A	A	3.8	3.2	(2.2)A	2.6F	1.8	1.2	1.2	A
28	A	AF	1.8	1.2	E	1.8	2.8	3.8	C	C	4.3	4.3	4.1	4.2	4.0	3.8	4.2	A	A	1.6	AF	1.8	1.8	1.8
29	2.0	1.6	1.6	1.1	1.8	1.8	A	A	3.6	4.3	4.3	4.5	4.2	A	AS	S	6.1	4.2	2.0	2.0	1.8	2.0	2.2	A
30	2.8	1.7	2.0	1.1	1.4	1.8	2.4	2.6	3.6	4.6	8.0	A	A	4.2	4.0	4.0	3.4	2.8	2.4	(2.3)C	2.1	A	A	A
31	1.1	1.1	E	E	A	2.7	A	A	B	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C
Mean Value	1.7	1.6	1.5	1.2	1.6	1.8	2.6	3.5	3.6	4.0	4.2	4.5	4.3	4.4	4.2	4.0	3.7	3.2	2.6	1.9	2.0	1.8	1.8	1.8
Count	21	22	26	24	25	24	18	14	19	14	14	18	18	18	17	16	23	21	18	16	17	15	23	15

Sweep 1.0 - Mc to 17.0 Mc in 1.5 min

Manual

Electrical Communication Laboratory, Japanese Ministry of Telecommunications  
(Denki-tsushin Kenkyujo) Gotanda, Shinagawa-ku Tokyo, Japan

IONOSPHERIC DATA

Kokubunji, Tokyo  
Lat. 35°42.4'N  
Long. 139°29.3'E

135°E Mean Time

fE min

Day	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	
1	1.1	1.1	1.1	E	E	1.1	1.4	2.0	2.6	2.4	3.6	B	B	3.6	3.0	3.3	2.6	2.0	1.6	1.4	1.4	1.6	1.6	1.6	
2	E	E	E	E	1.4	1.6	2.2	2.1	2.5	2.4	2.5	2.5	2.5	B	3.3	2.3	1.5	1.5	1.3	1.2	1.3	1.3	1.2	1.2	
3	E	E	E	E	E	E	1.6	1.3	1.6	1.6	2.1	4.0	3.4	2.6	1.9	1.8	1.5	1.5	1.5	B	1.3	1.3	1.3	1.2	
4	1.1	1.2	E	2.4	1.1	1.2	2.0	1.6	1.5	1.5	1.0	1.0	2.0	3.4	2.2	2.6	2.3	2.0	2.2	1.5	1.6	1.6	1.5	1.5	
5	B	G	G	E	E	1.2	B	0	2.2	2.2	2.4	2.4	2.4	2.2	2.5	2.3	1.8	1.8	2.0	1.5	1.2	1.2	1.2	1.2	
6	E	E	E	E	E	E	1.1	1.1	1.5	2.0	2.2	2.3	2.4	3.4	2.4	2.0	1.5	1.5	1.6	1.3	1.5	1.5	1.5	1.3	
7	1.2	1.2	1.2	1.2	1.2	1.2	1.6	1.5	1.5	1.5	3.5	3.1	3.0	3.1	3.1	3.0	2.3	1.7	1.5	1.3	1.6	1.6	1.6	1.2	
8	E	E	E	E	E	E	1.3	1.0	1.7	2.0	3.4	3.1	2.5	2.4	2.3	2.2	2.4	2.0	1.6	1.8	1.8	2.4	2.0	1.6	
9	1.2	1.2	E	1.5	1.6	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.9	1.9	1.8	1.8	1.5	1.3	1.2	1.2	1.2	1.3	1.2	1.2	
10	1.2	E	E	1.5	1.4	1.4	1.4	1.4	1.5	1.9	2.1	1.8	2.1	2.4	2.8	2.3	1.7	1.6	1.3	1.3	1.3	1.3	1.2	1.2	
11	1.1	1.1	E	E	E	E	1.1	1.3	2.0	2.0	2.4	2.0	2.2	2.2	2.2	1.6	2.0	1.6	1.4	1.6	1.4	1.4	1.6	1.2	
12	1.2	E	E	E	E	E	1.5	1.3	1.5	1.5	1.5	1.5	2.1	2.1	2.0	1.9	1.6	1.6	1.4	1.6	1.6	1.6	2.0	1.2	
13	1.1	1.1	E	E	E	E	1.2	1.2	1.3	1.3	1.3	1.3	1.8	2.1	1.7	1.6	1.8	1.8	2.0	1.6	2.2	2.2	1.6	1.6	
14	1.2	1.1	1.1	1.1	1.2	1.2	1.2	1.6	2.2	2.2	2.0	2.0	2.0	2.4	0	2.7	1.9	1.7	1.9	1.3	1.3	1.3	1.7	1.2	
15	1.5	E	E	E	1.4	1.4	1.3	1.6	1.7	1.5	1.5	1.9	2.0	2.2	2.3	2.0	1.6	1.3	1.3	1.2	1.3	1.2	1.5	1.2	
16	E	E	E	E	1.2	1.2	1.1	1.3	1.6	2.0	2.2	2.2	2.4	2.0	2.4	2.0	1.0	1.8	1.5	1.5	1.3	1.2	1.2	1.4	
17	1.2	1.2	E	E	E	E	1.4	1.4	1.5	1.5	1.5	1.5	1.5	2.1	3.0	1.9	2.4	1.2	1.2	1.2	1.5	1.6	1.6	1.2	
18	1.2	C	C	C	C	C	C	C	1.5	1.5	1.5	1.5	1.5	2.5	1.9	1.8	1.2	1.6	1.6	1.6	1.6	1.6	1.6	1.2	
19	1.2	1.1	E	E	1.6	1.5	1.8	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.8	1.8	1.7	1.8	1.7	1.4	1.5	1.5	1.2	1.1	
20	1.4	1.1	E	E	1.1	1.2	1.2	1.8	1.5	2.2	2.4	3.2	3.1	2.4	3.0	2.3	1.5	1.5	1.7	1.6	2.5	1.5	1.5	1.1	
21	1.2	1.1	E	E	B	1.1	(1.2)B	1.5	1.8	1.8	3.0	3.6	(3.6)B	3.2	2.4	1.8	1.8	1.9	1.7	1.6	1.2	1.2	1.4	1.6	
22	1.1	1.2	1.4	E	B	1.6	B	2.0	1.8	1.9	1.8	2.4	2.4	2.2	2.6	2.4	1.8	1.9	1.9	1.7	1.5	1.2	1.4	2.0	
23	E	E	1.2	1.1	1.2	1.1	1.5	1.5	1.5	2.1	2.2	2.2	2.4	(2.2)C	2.0	1.8	1.8	(1.1)B	1.8	1.5	1.2	1.4	2.0	1.6	
24	B	1.0	B	B	B	1.0	1.8	1.0	2.1	2.2	2.6	2.7	2.7	2.0	2.5	1.8	2.0	2.0	1.8	1.3	1.1	1.1	1.1	1.1	
25	C	C	C	C	C	C	C	2.0	2.5	2.3	2.0	(2.0)C	2.0	2.3	2.5	1.8	1.8	1.3	1.2	1.1	1.1	1.1	1.1	1.1	
26	E	E	E	1.1	1.1	1.1	1.2	1.4	1.9	B	2.0	2.0	B	2.0	2.4	1.8	2.4	2.0	1.6	1.4	1.5	1.4	1.5	1.6	
27	1.6	E	B	E	B	B	1.8	1.8	2.0	2.4	3.0	5.2	4.2	3.2	3.2	2.4	1.8	1.7	1.5	1.2	1.2	1.2	1.2	1.2	
28	E	E	E	E	E	1.2	1.5	1.5	C	C	1.8	1.8	2.0	1.8	1.8	1.8	2.0	2.0	2.0	2.2	1.8	1.8	1.6	1.8	
29	1.4	1.1	1.2	1.1	1.0	1.0	1.0	2.0	1.5	1.8	1.9	2.4	2.5	2.6	4.0	S	(2.0)S	B	1.8	1.8	1.8	1.8	1.8	1.8	
30	1.3	E	E	1.1	1.5	1.6	1.5	1.5	1.5	1.5	2.5	6.2	4.2	3.0	3.5	1.8	2.0	1.6	1.4	1.4	1.4	1.4	1.4	1.1	
31	G	G	2.0	G	E	E	1.3	1.4	3.2	B	C	C	C	C	C	C	C	C	C	C	C	C	C	C	
Median Value	1.2	E	E	E	1.1	1.2	1.4	1.5	1.8	2.0	2.2	2.4	2.5	2.4	2.4	2.0	1.8	1.7	1.6	1.4	1.5	1.4	1.5	1.2	
Count	28	29	27	27	26	27	27	29	29	27	29	29	28	29	28	29	30	29	30	29	26	26	26	27	26

Sweep 1.0 Mc to 17.0 Mc in 1.5 min

Manual



IONOSPHERIC DATA

Zd

135° E Mean Time  
Kokubunji, Tokyo  
Lat. 35 42.4 N  
Long. 139 29.1 E

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	70	S	(40)S	90	150	(50)S	SH	B	150	50B	130	100	B	70	80	S	B	60	100	100	90	(90)S	90
2	F	60	90	80	110	80	70	170	180	160P	120	150	110	110	120	90	120	110	160	120	130	100	90
3	90	90	S	140	90	120	160	100	110	100	110	80	110	110	90	80	100	B	70	80	90	90	80
4	80	70	B	AS	100	80	110	80	30	80	90	70	90P	50	90	S	80	60H	150	90	100	B	B
5	B	100	90	140	90	50	60	B	130	90	80	70	B	100	80	50	80	70	90	B	90	120	C
6	100	60P	F	F	100	110	50	70	AF	110	120	50	S	70	70	50	80	70	80	130	120	100	100
7	100	90	80	70	50	60	80	C	A	A	A	A	120	100P	90	80	110P	80P	110P	120	F	F	SF
8	F	F	F	F	F	F	F	180	80	120	100	100	70	110	80	70	80	S	70	120	50	90	A
9	A	50	80F	50	B	F	B	B	A	A	A	100	A	A	A	S	A	70	60	70	100	B	A
10	110	70	80F	F	F	120	B	A	A	80	A	100	A	A	A	A	70	50	120	S	100	70	70F
11	70	50F	120F	F	(40)F	(120)C	90	140	A	S	A	100	A	A	A	80	AF	AS	AS	110P	90	80	80F
12	60F	F	90F	70F	150	110	S	70	90	40	100	110	130	100	(100)S	90	80	110	A	A	SF	SF	150
13	SF	SF	SF	SF	160F	SF	SF	60F	90	90	60S	90	100	60	30	A	A	40	A	AS	140	110F	AF
14	BF	F	F	120	70	70F	100	70	60	110	140	90	B	90	70	90	80	70	110	50	40	70	170
15	70	80	60	50	100	110	120	80	140	(10)A	80	A	120	90	80	E	110	80	100	A	A	F	90F
16	90F	90F	90	100	100	140	60	120	B	A	70	A	90	80	B	B	110S	60	90	100	100	90	110P
17	90	80	120	100P	90	70	90	90	C	C	C	50	80	80	160	90	110	100	110	120	S	SF	SF
18	SF	C	C	C	C	C	C	120	140	70	120	70	100	100	80	100	100	70	(100)S	110	90R	100	90
19	80	80	70	80	90	100	100	S	110	110	A	110	90	110	80	70	A	A	120	130	(110)C	80	90
20	120	110	70	100F	100	110	100	120	160P	120	A	70	120P	90	70	120	100	100	100	150	60	90	100
21	120	100	60	100F	140F	120F	80	70	140	100	130	120	60	70	150	90	S	S	A	120	70	S	80
22	130	70	80	90	80	70	C	S	70	100	120	C	S	80	20	B	100	90P	120	S	S	(60)S	B
23	S	100F	80	(100)C	110	80	50	80	90	80	80	110	(90)C	60	90	70	80	60	120	100	70	90	70
24	120	S	70	70	100	80	90	100	140	130	80	100	150	130	70	90	80	90	C	C	C	C	C
25	C	C	C	C	C	C	C	80	100	50H	(90)C	120	110	110	120	110	100	100	90	110	100	100	140
26	90	50	80	50	70	80	100	70	80	150	80	140	110	C	C	100	110	S	S	B	100	100P	70
27	70	100	80	60	120	100	S	70	110	100P	80	120	110	130	120	110	90	80	100	S	100	100P	70
28	90	100	100	90	90	F	110	90	C	C	40	50	30	100	B	60	60	170	130	90	70	80	80
29	140P	100	80	100	110	80	70	50	100	120	130	90	80	100	120	60	70	(70)B	60	80	90	70	10L
30	90	80	100	100	100	130	120	70	90	100	100	110	90	90	90	90	110	100	C	B	90	140	70
31	70	70	110	90	120	110	(100)S	110S	70	80	C	C	C	C	C	C	C	C	C	C	C	C	C

Manual

Sweep 1.0 Mc to 17.0 Mc in 1.5 min

Median Value Count

Yamagawa  
 Lat 31°25'N  
 Long 130°47'E

Electrical Communication Laboratory, Japanese Ministry of Telecommunications  
 (Denkirisushin Kenkyujo) Gotanda, Shinagawa ku Tokyo, Japan

IONOSPHERIC DATA

f<sub>o</sub>F<sub>2</sub>

Day	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	25
1	9.6	9.1	8.2	8.8	7.8	5.9	6.5	6.3	8.9	8.0	8.2	9.2	10.1	11.1	11.7	11.5	11.5	11.8	9.9	10.1	9.6	(9.1)S	8.6	8.3
2	8.3	8.2	7.6	7.5	7.4	8.4	6.8	7.7	7.5	9.3	9.6	10.3	11.4	9.8	9.8	(10.1)C	10.3	8.4	8.0	8.3	8.1	(7.8)S	6.6	(6.5)S
3	C	C	C	C	C	C	C	C	C	9.3	9.6	10.3	11.4	9.8	9.8	(10.1)C	10.3	8.4	8.0	8.3	8.1	(7.8)S	6.6	(6.5)S
4	(6.8)P	6.4	6.3	5.5	5.4	4.7	5.4	8.5	8.1	8.0	8.2	8.6	10.3	9.8	10.5	11.1	10.6	10.0	9.3	10.1	8.5	7.0	6.6	6.2
5	6.5	7.3	6.3	6.6	6.3	4.8	6.3	7.1	8.8	9.7	9.8	9.0	9.7	10.2	(10.4)P	10.6	11.0	10.9	(10.0)C	9.1	8.6	8.7	8.8	9.0
6	9.0	8.8	7.3	7.8	7.4	7.4	8.1	8.6	7.8	6.8	6.4	7.4	8.0	8.8	9.7	9.8	10.0	11.1	10.3	9.7	6.9	6.8	6.2	6.2
7	6.4	6.6	6.2	6.4	6.2	5.7	6.8	5.7	6.7	7.1	7.7	7.1	9.1	9.7	10.1	10.5	10.8	10.3	11.1	11.3	10.6	7.3	8.1	7.1
8	7.1	7.1	5.2	F	F	6.6	7.8	8.3	7.1	6.8	7.1	8.3	T	11.3	12.0	12.7	13.4	13.1	9.8	8.2	7.5	7.4	7.0	6.7
9	6.5	6.8	6.8	6.2	4.4	3.2	5.4	8.7	7.4	7.4	7.9	B	S	12.8	A	A	A	8.1	8.0	7.9	7.4	F	F	6.8
10	6.1	6.4	5.7	5.1	5.0	4.3	4.6	(6.0)R	6.7	7.2	7.5	(7.7)A	7.9	8.9	9.4	10.7	10.0	10.1	9.8	B	A	A	A	(7.2)V
11	7.0	6.8	5.7	5.8	5.7	6.1	6.0	7.8	7.7	(7.2)F	8.1	9.1	10.0	A	5	(10.9)S	10.1	8.1	A	A	7.8	7.6	7.3	6.6
12	6.2	7.7	F	F	C	C	7.9	F	C	C	C	C	10.0	11.3	9.9	11.2	10.6	10.4	S	(9.2)J	8.3	8.3	7.5	F
13	F	F	F	F	F	6.6	6.4	6.6	8.0	6.8	7.5	7.6	8.1	9.0	S	C	10.0	A	A	A	5	8.0	6.6	7.7
14	7.9	7.3	7.4	7.1	5.9	(4.3)F	7.5	8.7	7.0	7.8	8.0	8.6	B	B	B	B	10.7	10.0	8.8	8.0	7.8	7.7	7.6	7.2
15	(5.9)C	6.6	7.0	5.8	4.4	4.0	5.0	7.9	8.1	8.8	8.4	10.6	(4.1)C	11.5	12.1	12.5	S	S	S	C	C	C	C	C
16	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C
17	(5.8)C	6.6	6.2	5.6	5.2	6.0	6.4	T	8.2	7.2	8.1	(8.6)C	9.2	10.5	11.2	C	C	C	C	C	C	C	C	(7.0)S
18	6.7	F	7.5	7.1	5.7	5.2	6.5	T	8.4	9.3	C	C	C	C	C	C	C	(10.0)J	9.4	8.0	5.5	5.2	5.4	
19	6.3	7.5	7.6	7.8	6.0	5.4	6.8	8.4	8.3	C	10.0	11.4	11.4	11.3	11.8	11.6	11.8	10.4	9.3	8.8	8.1	7.0	6.9	(7.2)S
20	7.5	7.3	C	C	C	7.2	8.3	8.1	7.6	7.9	8.0	9.4	10.5	11.2	12.0	11.6	10.7	10.7	11.0	11.2	10.4	7.9	C	C
21	7.9	7.8	7.4	6.7	6.4	5.4	6.3	7.5	8.2	8.8	9.5	9.3	10.4	10.0	10.4	10.7	10.2	11.5	10.6	8.8	8.6	9.0	8.2	8.5
22	7.9	(7.3)C	6.7	5.7	5.6	5.8	C	C	C	C	C	C	C	C	C	C	C	C	C	C	7.2	8.4	8.6	8.9
23	8.8	8.5	8.2	C	C	5.9	6.5	7.3	7.6	8.2	(9.5)P	10.4	T	C	T	C	C	C	T	10.2	9.4	8.9	8.4	8.4
24	8.4	8.7	8.8	7.9	6.9	6.4	6.9	8.7	9.4	10.1	8.9	9.6	9.6	11.6	12.0	(12.3)P	12.6	11.6	10.5	10.1	8.8	8.5	8.4	8.7
25	8.9	8.8	8.8	7.8	6.4	6.2	7.8	8.3	9.4	(8.9)C	8.3	9.0	9.7	10.8	10.7	10.6	10.4	11.0	10.6	9.8	8.9	9.3	8.8	8.1
26	8.3	7.5	8.0	8.2	7.0	6.9	11.4	(11.2)B	8.9	9.1	8.8	10.4	11.3	13.0	13.3	(12.2)S	(12.2)S	(11.0)S	10.0	9.4	8.9	8.7	7.3	7.7
27	7.0	5.6	4.5	9.4	7.0	6.3	7.6	9.0	9.2	10.2	10.3	11.3	11.3	11.8	11.7	12.9	12.5	S	9.8	9.5	9.0	9.4	8.2	7.8
28	7.1	6.8	6.7	6.2	6.2	5.9	6.2	9.3	8.3	8.3	8.7	9.8	8.8	9.5	9.7	9.4	9.0	8.8	8.0	7.4	6.8	6.8	6.9	6.5
29	6.1	5.5	5.8	6.0	4.9	5.2	6.4	(8.1)C	9.7	9.3	9.9	(10.2)P	10.4	10.0	10.1	10.8	11.0	10.8	10.5	10.5	8.6	8.5	5.7	6.9
30	C	C	C	C	5.8	6.0	6.3	9.5	10.6	10.1	10.5	9.5	10.5	10.6	11.6	11.8	11.5	10.8	10.8	10.8	8.6	8.1	8.3	8.0
31	7.9	7.8	6.9	7.0	7.0	5.6	6.7	7.8	C	9.2	10.8	(10.3)C	9.8	10.0	10.2	10.1	10.1	10.3	9.7	9.1	6.9	6.6	7.2	7.7
Median Value	7.1	7.3	7.0	6.9	6.2	5.9	6.6	8.2	8.2	8.2	8.3	9.2	10.1	10.6	10.6	10.8	10.7	10.4	9.8	9.4	8.2	8.0	7.4	7.2
Count	27	26	25	24	25	28	28	26	25	25	25	25	23	23	22	23	22	25	25	24	26	25	26	27

Electrical Communication Laboratory, Japanese Ministry of Telecommunications  
(Denkotsushin Kenkyujo) Gotanda Shinagawa-ku Tokyo, Japan

# IONOSPHERIC DATA

Yamagawa  
 135° E      31.12.53 N  
 139°      1.49.47 E

hp F.

135° E      Mean Time

Day	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
1	370	340	360	340	B	420	340	290	320	350	370	450	350	370	390	370	370	330	320	330	320	370	420	420
2	330	340	360	360	310	340	310	310	290	C	C	C	C	C	C	C	C	C	C	C	C	A	C	C
3	C	C	C	C	C	C	C	C	C	400	350	380	380	380	440	390	340	310	440	330	350	360	440	410
4	(380)	370	380	380	360	330	320	310	300	300	300	390	340	410	390	360	350	370	340	310	370	390	S	400
5	S	500	450	380	320	350	310	250	280	330	340	430	430	360	360	360	320	340	330	320	390	410	390	370
6	350	300	320	360	370	330	310	A	290	310	310	390	400	360	330	330	370	310	300	290	290	400	380	S
7	410	390	370	390	330	310	270	260	B	330	320	390	360	350	340	320	330	310	B	310	310	300	290	270
8	260	370	360	F	F	380	380	320	270	330	400	410	T	410	380	370	340	290	260	280	380	340	380	400
9	360	320	340	310	400	340	290	460	340	280	370	B	S	B	A	A	290	300	320	340	F	F	340	400
10	400	420	370	400	410	390	360	A	B	A	A	A	A	B	440	410	360	B	330	B	A	A	A	400
11	390	380	390	370	370	360	330	300	290	F	360	370	370	370	370	370	320	A	A	A	A	A	B	340
12	300	400	F5	(390)	C	C	290	C	C	C	C	C	370	340	A	360	350	320	S	S	310	320	340	F
13	F5	F5	FA	F5	380	A	360	270	250	320	330	A	390	S	C	350	A	340	A	A	S	290	310	400
14	400	400	330	290	B	320	280	320	270	290	380	340	B	B	B	B	310	300	300	320	330	380	370	370
15	(370)	370	360	250	350	420	320	300	340	310	A	380	C	250	290	400	S	S	C	C	C	C	C	C
16	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C
17	(290)	410	340	330	330	300	290	T	230	360	350	(340)	320	370	350	C	C	330	S	280	S	S	370	B
18	B	F	360	330	320	290	320	290	290	310	C	C	C	C	C	C	C	C	B	S	B	B	B	340
19	310	390	360	290	B	340	320	280	310	C	C	320	370	380	370	350	310	300	320	310	330	A	390	S
20	390	370	C	C	C	320	280	260	260	310	330	350	390	390	370	360	360	340	330	300	320	C	C	C
21	370	360	340	270	330	300	270	290	280	310	310	370	380	390	370	380	360	330	300	300	350	360	360	360
22	370	(350)	330	300	C	300	270	250	250	330	(340)	330	T	C	C	C	T	T	310	300	(390)	350	370	340
23	360	350	340	C	C	300	290	280	260	270	340	320	300	350	B	S	340	320	300	310	330	S	370	350
24	390	390	300	280	300	290	280	260	260	260	C	360	340	S	400	370	340	(340)	320	320	340	350	370	400
25	330	340	330	300	290	350	300	280	260	C	C	C	C	C	C	C	C	C	C	C	T	380	360	350
26	370	330	370	350	(340)	340	330	270	B	270	350	360	400	410	390	380	S	(320)	310	280	270	290	260	260
27	290	300	330	290	310	340	330	270	280	330	360	360	380	380	360	360	350	S	300	310	320	320	320	320
28	B	B	370	390	400	390	370	270	300	310	330	330	420	370	350	350	320	300	290	310	350	380	350	360
29	380	390	370	310	370	350	310	(300)	290	290	S	C	360	370	340	370	340	350	310	300	310	400	340	390
30	C	C	C	C	400	370	340	S	S	340	320	340	380	380	390	390	380	350	300	290	320	420	420	400
31	430	430	350	B	B	290	300	270	C	C	330	360	(370)	360	350	350	350	340	290	290	330	410	430	390

Median Value  
Count

Sweep 1.2 - Mc to 13.5 Mc in 1.5 min

Manual

Y 2

Electrical Communication Laboratory, Japanese Ministry of Telecommunications  
(Denki-tsushin Kenkyujo) Gotanda, Shinagawa-ku, Tokyo, Japan

IONOSPHERIC DATA

Lat 31 12.5 N  
Long 139 37.7 E

Yamagawa

h.F.

135° E Mean Time

Day	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
1	280	280	260	270	250	250	280	240	300	330	(340) <sup>A</sup>	(350) <sup>A</sup>	350	330	350	330	330	300	270	250	250	220	280	280
2	300	280	280	260	250	250	270	270	240	C	C	C	C	C	C	C	C	C	C	C	C	A	C	C
3	C	C	C	C	C	C	C	C	C	370	300	350	(360) <sup>A</sup>	360	420	(380) <sup>C</sup>	330	300	400	(300) <sup>A</sup>	280	290	350	340
4	300	300	300	300	280	290	290	270	280	300	300	380	340	400	370	310	330	320	320	280	220	220	A	A
5	A	A	(340) <sup>A</sup>	300	240	290	260	230	260	290	220	350	330	320	320	360	310	300	(300) <sup>C</sup>	290	310	310	300	290
6	290	270	280	300	270	300	250	(270) <sup>A</sup>	290	300	(220) <sup>N</sup>	400	400	350	350	320	340	300	290	250	240	A	A	280
7	310	290	290	270	270	250	260	250	B	330	310	390	360	340	340	300	310	300	220	260	290	280	260	250
8	250	A	330 <sup>F</sup>	340 <sup>F</sup>	300	310	300	A	240	(220) <sup>A</sup>	400	400	410	380	340	330	310	260	250	250	280	280	280	290
9	270	250	250	220	260	260	260	240	240	280	380	(370) <sup>N</sup>	350	A	A	A	A	280	270	250	250	290	320	320
10	320	350 <sup>F</sup>	300 <sup>A</sup>	280	300 <sup>F</sup>	310	340	A	300 <sup>F</sup>	290	280	A	370	A	A	A	(330) <sup>A</sup>	300	300	300	A	A	A	430
11	310	280	300 <sup>A</sup>	300 <sup>A</sup>	300 <sup>A</sup>	280	280	270	290	410	360	350	350	A5	(340) <sup>A</sup>	300	300	290	A	A	A	A	290	290
12	260	340 <sup>A</sup>	290	280	C	C	250	C	C	C	C	C	350	320	A	310	300	300	260	280	250	240	270	320
13	290 <sup>F</sup>	260 <sup>A</sup>	(270) <sup>A</sup>	270	(300) <sup>A</sup>	(300) <sup>A</sup>	(300) <sup>A</sup>	250	230	300	310	(260) <sup>A</sup>	360	350	220	350	A	310	A	A	A	A	250	270
14	A	280	270	250	230	290	270	220	220	290	360	300	380	350	360	310	300	290	250	280	240	280	260	300
15	310 <sup>A</sup>	300	280	220	250	320	260	260	220	300	A	B	C	310	320	A	310	320	C	C	C	C	C	C
16	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	A	(310) <sup>A</sup>	A	A	A	A	280
17	330	320	260	250	250	270	260	250	220	250	340	(330) <sup>A</sup>	310	360	320	310	(310) <sup>C</sup>	300	270	220	240	300	300	300
18	230	300 <sup>A</sup>	290	300	270	260	290	280	280	310	C	C	C	C	C	C	C	300	300	280	320	(330) <sup>A</sup>	320	(300) <sup>A</sup>
19	260	260	290	250	250	280	260	240	230	C	C	300	350	320	330	340	300	280	240	250	260	A	A	250
20	330	320	C	C	C	270	250	250	250	250	240	350	370	350	340	340	320	300	290	250	220	270	300	(300) <sup>C</sup>
21	290	290	280	220	230	(260) <sup>A</sup>	240	250	250	290	300	320	360	370	340	360	330	360	270	240	260	310	(300) <sup>A</sup>	300
22	300	(300) <sup>C</sup>	300	270	260	270	C	C	C	C	C	C	C	C	C	C	C	C	C	C	(300) <sup>A</sup>	310	270	270
23	270	300	270	C	C	210	230	230	210	260	300	300	320	(320) <sup>C</sup>	310	C	T	290	230	260	270	250	260	250
24	270	280	240	240	230	240	250	200	240	300	280	280	320	340	350	320	310	270	250	250	250	250	250	260
25	260	260	270	240	230	240	270	250	250	(290) <sup>C</sup>	320	330	370	370	340	350	320	290	290	300	260	290	280	300
26	300 <sup>A</sup>	300	270	270	240	270	270	240	250	230	270	350	370	340	360	320	300	270	260	270	260	270	260	250
27	280	280	270	240	230	250	280	240	250	300	280	320	320	340	350	320	300	270	250	260	260	240	240	270
28	300	300	300	300	310	320	300	230	290	280	290	310	400	360	350	340	300	300	270	260	270	270	280	320
29	290	320	310	270	250	300	260	(250) <sup>C</sup>	230	270	280	(310) <sup>C</sup>	340	360	340	330	310	300	260	250	220	240	280	320
30	C	C	C	C	310	290	290	240	240	250	280	300 <sup>B</sup>	370	380	360	300	260	300	290	260	240	290	320	310
31	320	330	320	(320) <sup>A</sup>	320	280	260	260	C	C	270	330	(330) <sup>C</sup>	330	350	330	300	260	280	250	250	250	360	320
Median Value	290	300	280	270	260	280	270	250	250	290	300	330	350	350	340	330	310	300	270	260	260	280	280	300
Count	26	26	27	26	26	28	25	25	25	24	24	24	25	25	24	22	24	28	26	25	25	24	29	27

Suono I.Z. Mc to 18.5 Mc in 1.5 min

Manual

Lat 31.125N  
Lon 139.377E

Yamagawa

IONOSPHERIC DATA

f<sub>o</sub>F<sub>1</sub>

135°E Mean Time

Day	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	
1						Q	L	Q		Q	E	B	A	5.8	A	A	5.2	L	L	Q					
2						Q	L	L		C	C	C	C	C	C	C	C	C	C	C	C				
3						C	C	C		C	L	Q	A	5.6	5.4	(5.3) <sup>C</sup>	(5.2) <sup>S</sup>	L	L	Q					
4						Q	A	L		L	(5.2) <sup>L</sup>	5.8	5.3	5.6	5.5	L	L	L	A	Q					
5						L	Q	Q		4.1	4.4	4.6	4.7	4.8	5.1	5.5	L	L	Q	C	A				
6						Q	Q	A		L	A	B	5.2	5.2	5.3	A	4.8	L	L	Q					
7						Q	Q	L		4.8	(5.1) <sup>L</sup>	5.4	5.2	5.3	5.4	5.2	Q	L	Q	Q					
8						Q	Q	A		L	A	5.4	5.5	5.6	5.4	5.2	4.8	(4.5) <sup>L</sup>	Q	Q					
9						Q	Q	Q		L	(5.0) <sup>L</sup>	A	A	A	A	A	A	L	4.2	Q					
10						Q	L	3.6		L	Q	A	A	A	A	A	A	A	A	A					
11						Q	Q	A		L	B	A	B	A	A	A	L	A	A	A					
12						C	Q	C		C	C	C	A	5.2	A	A	A	A	A	Q					
13						A	A	B		L	L	A	5.7	5.4	5.0	L	A	5.0	A	A					
14						A	L	Q		A	5.6	A	L	5.2	5.1	A	A	A	A	L					
15						Q	Q	L		Q	A	B	C	A	A	A	A	A	B	C					
16						C	C	C		C	C	C	C	C	C	C	C	C	C	C					
17						Q	Q	L		Q	L	L	L	5.6	5.4	5.2	(5.0) <sup>C</sup>	4.8	A	Q					
18						Q	Q	L		L	C	C	C	C	C	C	C	L	Q	Q					
19						Q	Q	Q		L	C	C	(5.8) <sup>L</sup>	6.2	B	A	5.8	L	5.6	Q	Q				
20						Q	Q	L		L	A	6.0	6.2	5.7	L	L	(5.6) <sup>L</sup>	A	A	A					
21						A	Q	L		L	L	B	L	L	L	L	5.6	L	L	L	Q				
22						Q	C	C		C	C	C	C	C	C	C	C	C	C	C					
23						Q	Q	Q		A	L	L	5.6	6.0	C	5.6	C	T	Q	Q	L				
24						Q	Q	A		3.8	4.6	L	L	5.3	L	5.6	L	5.4	A	L	Q				
25						Q	Q	Q		Q	C	L	L	6.0	6.0	5.8	5.4	L	L	A	Q				
26						Q	Q	Q		Q	L	L	L	5.8	(5.7) <sup>B</sup>	5.5	L	Q	Q	Q					
27						Q	L	Q		L	L	L	L	L	L	L	L	L	L	L	Q				
28						Q	Q	Q		Q	4.6	4.8	A	6.0	(6.0) <sup>B</sup>	5.4	5.5	L	L	A	Q				
29						Q	Q	C		Q	L	L	L	L	L	L	L	L	L	Q	Q				
30						Q	Q	Q		Q	5.2	B	B	L	A	L	L	Q	A	A	Q				
31						A	A	A		C	L	L	L	L	L	L	L	L	Q	L	Q				
Median Value										4.7	5.2	5.6	5.7	5.6	5.4	5.4	5.2	5.0							
Count						2	1	1		8	7	11	16	14	9	7	5	5							

Sweep 1-2 Mc to 18.5 Mc in 1.5 min

Manual

Electrical Communication Laboratory, Japanese Ministry of Telecommunications  
(Denki-tsushin Kenkyujo) Gotanda, Shinagawa-ku, Tokyo, Japan

IONOSPHERIC DATA

Yamagawa  
Lat. 31°12.5'N  
Long. 130°37.7'E

h'p<sub>1</sub>

135°E Mean Time

Day	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	
1	Q	220	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	
2	Q	250	240	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	
3	C	C	C	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	
4	Q	A	220	A	220	210	200	230	A	300	A	A	A	A	A	A	A	A	A	A	A	A	A	A	
5	250	Q	Q	(200) <sup>B</sup>	(200) <sup>B</sup>	(200) <sup>B</sup>	(200) <sup>B</sup>	(200) <sup>B</sup>	(200) <sup>B</sup>	(200) <sup>B</sup>	(200) <sup>B</sup>	(200) <sup>B</sup>	(200) <sup>B</sup>	(200) <sup>B</sup>	(200) <sup>B</sup>	(200) <sup>B</sup>	(200) <sup>B</sup>	(200) <sup>B</sup>	(200) <sup>B</sup>	(200) <sup>B</sup>	(200) <sup>B</sup>	(200) <sup>B</sup>	(200) <sup>B</sup>	(200) <sup>B</sup>	
6	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	
7	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	
8	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	
9	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	
10	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	
11	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	
12	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	
13	A	A	200	A	250	200	A	230 <sup>A</sup>	A	270 <sup>S</sup>	A	A	A	A	A	A	A	A	A	A	A	A	A	A	
14	A	250	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	
15	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	
16	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	
17	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	
18	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	
19	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	
20	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	
21	A	Q	230	240	240	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200	
22	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	
23	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	
24	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	
25	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	
26	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	
27	Q	250	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	
28	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	
29	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	
30	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	
31	A	A	230	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	
Mean Value	-	250	230	220	220	220	220	210	220	230	220	230	220	230	240	250	230	240	250	230	-	-	-	-	-
Count	1	5	10	12	16	16	16	13	14	14	14	14	14	14	10	10	5	10	10	5	1	1	1	1	1

Sweep 1.2 - Mc to 18.5 Mc in 15 min Manual

Y 5

Lat. 31°12'5N  
Long. 139°37'E

Yamagawa

135° E Mean Time

IONOSPHERIC DATA

fe

Day	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
1						B	B	A	3.0 <sup>A</sup>	(3.4) <sup>B</sup>	(4.1) <sup>B</sup>	(4.4) <sup>B</sup>	(4.3) <sup>A</sup>	B	A	A	A	A	2.8	A				
2						B	2.2 <sup>A</sup>	(3.0) <sup>A</sup>	A	C	C	C	C	C	C	C	C	C	C	C	C			
3						C	C	C	A	(4.0) <sup>A</sup>	A	B	A	A	A	C	A	A	A	B				
4						A	A	A	A	A	A	B	4.2 <sup>B</sup>	A	4.2	(3.8) <sup>B</sup>	A	A	A	B				
5						B	(2.2) <sup>B</sup>	(3.0) <sup>B</sup>	B	B	B	B	B	A	A	B	A	3.6	C	A				
6						B	A	A	A	A	A	B	A	A	A	A	3.8	A	A	A				
7						B	A	2.8	B	(3.6) <sup>J</sup>	3.8	(4.1) <sup>B</sup>	B	A	A	B	A	A	A	A				
8						A	A	A	A	A	A	A	B	(3.8) <sup>A</sup>	B	A	A	A	A	A				
9						B	2.1 <sup>A</sup>	2.7	(3.1) <sup>A</sup>	3.4	A	A	A	A	A	A	A	3.2 <sup>A</sup>	2.5	(1.9) <sup>A</sup>				
10						B	A	(3.2) <sup>A</sup>	A	B	A	A	A	A	A	A	A	A	A	A				
11						A	A	A	2.9	A	A	A	A	A	A	A	(3.6) <sup>J</sup>	A	A	A				
12						C	A	C	C	C	C	C	A	A	A	A	3.5 <sup>A</sup>	A	(2.3) <sup>A</sup>	A				
13						A	A	A	3.2	A	A	A	A	A	A	A	A	A	A	2.4	A			
14						C	C	C	C	3.6	C	C	C	C	C	C	(3.4) <sup>A</sup>	3.2	A	A				
15						B	A	2.6	A	A	A	A	A	A	A	A	A	A	C	C				
16						C	C	C	C	C	C	C	C	C	C	C	C	C	A	A				
17						B	A	2.6	A	B	A	C	A	B	B	3.7	C	A	A	A	B			
18						A	A	A	A	C	C	C	C	C	C	C	C	C	A	(2.7) <sup>A</sup>	A			
19						A	(1.6) <sup>B</sup>	(2.7) <sup>J</sup>	A	C	C	A	A	A	A	A	(3.6) <sup>A</sup>	3.0	2.3	A				
20						B	B	2.3 <sup>A</sup>	3.4	A	A	A	B	A	A	A	A	A	A	A				
21						A	2.0 <sup>H</sup>	A	A	A	A	A	A	B	B	A	A	A	A	A				
22						A	C	C	C	C	C	C	C	C	C	C	C	C	C	C				
23						A	A	2.7	A	A	A	A	A	C	3.4	A	A	A	A	A				
24						B	A	A	B	A	B	B	B	B	B	A	A	A	3.2	A	A			
25						B	1.8	2.4	3.2	C	B	B	B	B	B	A	A	A	3.2	2.7	A			
26						B	1.7	2.8	A	A	3.7	A	A	4.0	A	A	A	A	A	A				
27						B	A	2.8	3.2	3.4	3.7	A	A	A	A	A	3.6	A	A	A				
28						B	A	2.6	A	3.8	(4.0) <sup>J</sup>	B	B	A	A	3.7	B	A	A	A				
29						B	A	C	A	A	A	A	A	A	3.8	3.4	3.4	3.1	A	A				
30						A	A	2.6	3.2	3.6	(3.6) <sup>B</sup>	B	B	B	A	B	A	A	A	A				
31						A	A	A	C	C	A	A	4.2	A	A	A	3.5 <sup>A</sup>	A	A	A				
Mean Value						2.0	2.7	3.2	3.4	(3.7)	-	-	-	-	-	-	3.6	3.2	2.5	-				
Count						7	15	8	5	8	2	4	2	3	4	8	7	7	7	1				

Sweep 1.2 Mc in 1.5 min

Manual

Electrical Communication Laboratory, Japanese Ministry of Telecommunications  
 (Denki-tsushin/Kensyujo) Gotanda, Shinagawa-ku, Tokyo, Japan

# IONOSPHERIC DATA

h<sub>p</sub>E Yamagawa Lat. 31°12.5'N Long. 130°37.7'E

135°E Mean Time

Day	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	
1																									
2																									
3																									
4																									
5																									
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28																									
29																									
30																									
31																									
Median Value																									
Count																									



Electrical Communication Laboratory, Japanese Ministry of Telecommunications  
(Denkitsu-shin Kenkyujo), Gotanda, Shinagawa-ku, Tokyo, Japan

IONOSPHERIC DATA

165

Yamagawa

Lat 31.2°N  
Long 139.31°E

135°E Mean Time

Day	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	
1	2.2	G	3.0	4.2	4.0	3.0	G	3.0	3.2	B	B	5.0	7.4	B	8.4	8.6	3.8	5.6	3.6	C	3.6	4.8	4.4	4.2	
2	3.2	G	G	G	G	3.6	2.6	3.6	3.9	C	C	C	C	C	C	C	C	C	C	C	C	9.0	C	C	
3	C	C	C	C	C	C	C	C	C	5.0	7.6	6.8	10.2	5.2	4.8	C	5.2	5.4	4.2	3.2	3.6	G	G	G	
4	2.8	3.2	G	G	2.9	1.8	2.7	2.8	5.6	8.6	5.0	G	G	4.7	5.4	5.6	5.0	4.6	5.0	3.8	2.4	4.3	4.2	4.2	
5	4.4	4.0	2.4	3.0	G	G	G	G	B	B	B	B	B	B	5.0	4.4	6.4	4.4	C	6.7	7.3	6.4	3.8	6.4	
6	3.8	4.7	3.4	2.4	2.8	2.2	5.2	12.2	4.4	4.6	4.6	5.4	4.4	4.8	4.6	6.4	4.8	4.8	3.8	3.8	4.7	4.5	3.0	G	
7	G	G	2.2	2.8	3.2	B	4.2	2.8	B	5.4	(7.8)	5.0	7.2	4.8	4.2	4.8	4.0	5.2	5.6	6.5	5.0	3.0	4.7	4.7	
8	5.4	4.8	4.8	4.2	3.2	3.8	5.8	6.6	4.4	6.2	4.4	5.0	(5.4)	4.2	4.3	4.8	4.8	5.2	5.8	8.3	4.2	3.0	3.4	2.8	
9	G	G	G	2.2	G	B	2.8	4.2	4.0	5.0	5.6	1.02	7.6	13.0	13.8	15.2	1.48	4.6	4.2	3.4	3.4	3.8	5.0	7.2	
10	4.8	6.8	4.2	2.6	G	B	2.8	6.4	2.0	4.2	4.8	1.02	8.6	5.4	7.2	8.0	6.8	1.02	8.8	7.2	9.4	13.8	9.0	5.2	
11	(4.2)	3.2	2.8	4.6	3.8	3.6	(3.8)	3.8	4.3	5.2	6.2	6.5	4.8	11.0	10.0	6.2	5.4	(4.6)	5	11.0	7.8	8.0	6.9	2.2	
12	G	3.8	3.2	G	C	C	4.6	C	C	C	C	C	6.8	8.8	9.8	9.2	6.2	5.4	5.4	5.2	4.2	3.4	(5.2)	3.8	
13	3.5	7.4	7.8	4.8	5.2	5.6	4.8	3.8	5.2	4.6	4.6	6.8	6.8	5.2	6.2	7.8	9.6	5.8	11.0	9.4	5.2	5.0	3.2	4.2	
14	5.2	4.4	3.6	4.4	3.4	4.2	4.6	3.6	4.2	6.4	5.0	4.8	4.4	5.3	4.6	7.4	6.0	7.6	5.4	4.8	3.2	4.8	3.2	3.8	
15	3.2	2.5	G	G	G	2.4	3.2	3.6	4.2	6.0	7.8	5.8	6.8	6.5	8.2	6.2	4.0	C	C	C	C	C	C	C	
16	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	
17	2.2	2.4	2.8	G	B	B	3.6	3.0	4.6	B	4.4	C	(5.2)	B	B	G	C	4.7	3.8	3.6	3.0	2.2	3.4	3.6	
18	3.0	3.8	3.2	4.2	3.4	3.4	2.8	3.5	6.6	4.2	C	C	C	C	C	C	C	5.0	4.2	4.2	4.6	4.4	3.8	3.8	
19	5.0	I	7.2	B	4.2	Y	(5.0)	2.8	3.4	F	C	4.2	5.8	5.0	6.0	4.4	4.2	5.0	4.2	3.8	3.8	6.8	5.0	3.8	
20	3.0	3.8	C	C	C	2.0	B	3.2	4.4	4.2	5.0	(4.4)	5.3	G	4.2	4.2	4.9	6.4	5.0	5.2	2.6	2.2	2.4	C	
21	3.2	4.2	G	G	G	2.8	3.0	3.2	4.2	4.4	5.0	4.2	4.2	B	B	5.0	4.8	5.4	3.4	3.2	2.6	4.6	4.2	3.8	
22	G	C	3.1	2.5	2.6	2.8	C	C	C	C	C	C	C	C	C	C	C	C	C	C	4.6	3.2	4.2	3.0	
23	2.8	7.2	Y	3.8	C	2.3	2.4	3.2	4.2	4.6	4.6	4.6	6.1	C	4.5	C	5.2	4.8	4.4	4.8	3.8	4.0	3.0	(4.2)	
24	3.0	2.4	G	G	G	B	2.6	3.8	3.0	4.0	G	G	G	B	4.2	4.6	4.8	3.8	4.4	3.8	2.2	G	G	G	
25	G	G	G	G	G	B	G	3.2	4.8	C	B	4.4	B	B	3.6	4.4	4.2	4.7	4.8	3.0	3.0	3.8	3.8	B	
26	6.2	3.4	2.4	G	2.3	B	2.3	3.6	4.6	3.8	5.2	4.6	4.8	4.8	4.4	4.2	4.8	4.2	4.2	3.6	3.8	3.8	4.4	2.6	
27	3.8	2.2	G	G	G	B	2.4	4.0	4.4	5.4	5.0	4.6	5.2	4.3	5.4	4.4	4.4	5.6	3.4	4.2	4.2	3.4	4.0	3.2	
28	3.0	2.2	3.4	3.2	2.0	B	2.6	3.6	3.6	G	4.3	5.9	5.2	Y	5.0	4.3	4.4	B	4.0	4.8	3.4	3.8	4	2.6	
29	G	2.2	2.2	3.6	G	B	2.4	C	4.6	4.2	4.2	C	5.4	5.0	4.2	4.6	3.8	3.8	3.8	3.2	4.2	3.6	3.8	3.8	
30	C	C	C	C	4.2	3.2	2.2	G	4.2	4.0	G	B	B	5.6	6.8	5.0	4.4	6.0	6.0	4.1	6.2	4.5	4.4	3.6	
31	3.0	(3.0)	B	5.3	4.9	4.2	3.3	3.8	C	C	7.0	5.8	5.4	5.4	5.2	4.4	5.4	3.6	3.2	3.4	5.8	4.2	4.2	3.8	
Median Value	3.0	3.2	2.8	2.5	2.6	3.1	2.8	3.6	4.4	4.6	5.0	5.0	5.4	5.1	5.0	4.8	4.8	5.1	4.4	4.0	4.2	4.4	3.8	3.8	
Count	28	26	27	25	25	18	27	26	24	21	22	22	24	20	25	25	25	25	28	27	28	29	30	29	27

Sweep 1.2 - Mc to 18.5 Mc in 1.5 min

Manual

Y 8

Electrical Communication Laboratory, Japanese Ministry of Telecommunications  
Denkitsu-shin Kenkyujo, Gotanda, Shinagawa-ku, Tokyo, Japan

# IONOSPHERIC DATA

F<sub>2</sub>-M3000

Yamagawa

LOT 30°12.5'N  
LONG 139°37.7'E

135°E Mean Time

Day	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	25		
1	2.7	2.7	2.8	2.8	J	2.6	2.8	3.1	3.1	2.9	2.7	2.5	2.9	2.6	2.7	2.8	2.8	2.9	3.0	2.9	2.9	[2.7] <sup>S</sup>	2.6	2.6	2.6	V	
2	2.6	2.9	2.8	2.7	3.0	2.9	3.0	3.0	3.1	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	
3	C	C	C	C	C	C	C	C	C	2.6	2.8	2.7	2.6	2.6	2.4	[2.6] <sup>C</sup>	2.8	3.1	2.6	3.0	2.9	(2.8) <sup>S</sup>	2.4	[2.5] <sup>S</sup>	[2.5] <sup>S</sup>	S	
4	(2.7) <sup>P</sup>	2.7	2.7	2.7	2.8	2.9	3.0	3.0	3.1	3.0	3.1	2.7	3.0	2.6	2.6	2.8	2.8	2.7	3.0	2.8	2.7	2.6	2.7	2.6	2.7	2.5	P
5	J	2.3	2.4	2.7	3.0	2.8	3.1	3.4	3.5	2.9	2.5	2.5	2.5	2.8	[2.8] <sup>C</sup>	2.8	3.0	2.9	(2.8) <sup>C</sup>	2.7	2.7	2.6	2.7	2.6	2.7	2.8	
6	2.8	3.0	2.7	2.8	2.8	2.7	3.0	2.5	3.0	3.0	3.1	2.8	2.7	2.8	2.8	3.0	2.9	3.0	3.0	3.1	P	3.1	2.6	2.6	P	J	
7	2.6	2.7	2.8	2.7	2.9	3.0	3.4	3.5	B	3.0	3.0	2.6	2.8	2.9	2.9	3.0	3.0	3.2	J	3.1	3.1	3.2	3.2	3.2	3.2	3.2	
8	3.6	2.7	2.8	F	F	2.7	2.8	3.0	3.4	2.9	2.7	2.7	J	2.6	2.8	3.1	2.9	3.2	3.3	3.3	2.7	2.6	2.7	P	3.0		
9	2.7	3.0	2.9	2.9	2.5	2.8	3.1	3.4	2.9	3.4	B	S	J	A	A	A	3.2	3.1	3.0	2.9	P	F	F	F	2.8		
10	2.7	2.6	F	2.4	2.3	2.4	2.9	A	J	J	A	2.8	J	2.5	2.6	2.8	2.8	J	2.8	B	A	A	A	A	(2.6) <sup>V</sup>		
11	2.7	2.7	2.7	2.8	2.8	2.7	2.9	3.2	3.2	3.2	2.7	2.7	2.7	2.7	2.7	2.8	J	2.9	A	A	J	2.8	F	I	(2.8) <sup>B</sup>		
12	3.1	2.7	F	2.8	F	C	C	C	C	C	C	C	2.7	2.9	2.8	2.9	2.8	3.2	S	J	3.1	2.9	P	2.9	F		
13	F	F	F	F	F	J	3.0	3.3	3.3	2.9	3.0	(2.9) <sup>A</sup>	2.7	S	C	2.8	A	2.9	A	A	S	3.3	3.0	2.6	2.6		
14	2.6	2.6	2.9	F	3.2	J	3.0	3.2	3.4	3.3	2.8	2.9	B	B	B	B	2.9	3.1	3.1	2.9	2.9	2.7	2.7	2.7	2.7		
15	(2.7) <sup>C</sup>	2.7	2.8	3.4	S	2.7	2.5	2.9	3.1	2.8	3.0	P	[2.8] <sup>C</sup>	2.9	2.7	2.7	S	S	C	C	C	C	C	C	C		
16	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	A	3.0	P	A	A	B	2.8	(2.9) <sup>S</sup>		
17	[2.7] <sup>C</sup>	2.6	2.9	3.0	P	(2.9) <sup>P</sup>	3.1	3.0	T	3.7	3.3	2.9	[2.9] <sup>C</sup>	2.9	2.8	2.8	C	C	3.0	3.2	2.7	J	2.8	J	J		
18	J	F	J	J	J	J	J	J	3.1	2.9	3.1	C	C	C	C	C	C	J	S	J	J	J	J	J	J		
19	3.1	2.7	2.8	3.1	C	J	2.8	3.0	3.2	3.0	P	C	3.0	2.8	2.7	2.9	3.1	3.1	3.0	3.1	2.9	A	2.7	[2.7] <sup>S</sup>			
20	2.7	2.7	C	C	C	3.1	3.2	3.3	3.3	3.1	3.0	2.8	2.6	2.7	2.8	2.8	2.8	2.9	2.9	3.1	2.9	C	C	C	C		
21	2.7	2.8	2.9	3.3	3.0	3.1	3.4	3.1	3.0	3.0	3.0	2.8	2.7	2.7	S	B	(2.9) <sup>B</sup>	3.0	3.0	3.0	2.8	2.8	2.9	2.8			
22	2.9	[3.0] <sup>C</sup>	3.1	3.3	3.3	3.2	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C		
23	2.8	2.9	3.0	C	C	3.2	3.3	3.3	3.4	3.0	(2.9) <sup>S</sup>	2.9	T	C	T	C	T	T	3.0	3.0	2.7	2.8	2.7	2.8	2.8		
24	2.7	2.6	3.0	P	3.2	3.1	3.2	3.4	3.4	2.9	3.0	3.2	2.9	2.9	J	S	3.0	3.0	3.0	3.0	2.9	[2.9] <sup>S</sup>	2.9	2.9			
25	2.9	2.8	2.9	3.2	3.1	2.8	3.2	3.4	3.4	[3.1] <sup>C</sup>	2.8	2.8	2.6	2.7	2.8	2.8	2.8	2.8	3.0	3.0	3.0	2.8	2.8	2.8	2.8		
26	2.8	3.0	2.8	2.8	3.1	2.9	2.9	3.3	B	3.3	3.2	2.9	2.6	2.7	2.7	2.8	2.8	3.0	3.2	3.2	3.2	3.2	3.2	3.2	3.4		
27	3.4	3.1	3.0	3.3	3.1	2.7	2.9	3.3	3.2	3.0	2.8	2.8	2.8	2.8	2.8	2.8	2.8	3.0	3.1	3.0	3.0	3.0	2.9	2.9	3.1		
28	J	J	2.8	2.7	2.7	2.8	3.2	3.4	3.2	3.2	3.0	2.7	2.7	2.7	2.8	2.8	3.1	3.2	3.2	2.9	2.8	2.8	2.9	2.9	2.9		
29	2.8	2.8	2.9	3.2	3.0	3.0	3.1	[3.1] <sup>C</sup>	3.2	3.2	J	C	2.8	3.0	2.8	2.8	2.8	2.7	3.1	3.1	3.0	2.5	2.9	2.6	2.6		
30	C	C	C	C	2.6	2.7	2.8	J	J	2.9	3.0	(2.8) <sup>S</sup>	2.6	2.8	2.7	2.8	2.8	2.8	3.2	3.2	2.9	2.5	2.6	2.7	2.7		
31	2.5	2.5	2.9	J	J	3.3	3.1	2.7	C	C	2.9	2.9	[2.8] <sup>C</sup>	2.8	2.8	(3.0) <sup>S</sup>	2.9	3.0	3.2	3.1	2.9	2.6	2.5	2.6	2.6		
Max. Value	2.7	2.7	2.8	2.8	2.9	2.8	3.0	3.2	3.2	3.0	2.9	2.8	2.7	2.8	2.8	2.8	2.8	3.0	3.0	3.0	2.9	2.8	2.8	2.8	2.8		
Count	24	25	24	22	21	26	27	24	22	23	23	23	22	21	20	20	20	20	23	22	22	24	22	23	24		

Swamp 1.2-Mc to 1.8.5-Mc in 1.5-min Manual

Electrical Communication Laboratory, Japanese Ministry of Telecommunications  
(Denki-tsushin Kenkyujo) Gotanda, Shinagawa-ku, Tokyo, Japan

IONOSPHERIC DATA

fE min

135° E Mean Time Yamagata Lat. 31°12.5' N Long. 130°37.7' E

Day	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
1	1.5	1.6	1.8	2.0	2.0	2.0	2.0	2.8	3.0	3.9	4.5	A	A	4.2	A	A	A	A	3.1	A	1.8	2.0	2.2	1.8
2	1.6	1.6	1.4	1.4	1.6	1.6	2.2	3.0	A	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C
3	C	C	C	C	C	C	C	C	C	4.1	4.5	A	4.8	4.2	C	A	A	A	A	2.0	2.0	1.6	1.6	1.5
4	2.0	1.8	1.8	1.7	A	A	2.3	A	2.6	A	4.0	4.2	4.2	4.3	4.6	A	A	A	A	1.8	A	A	A	A
5	A	2.4	2.2	1.5	1.3	1.5	2.4	3.0	3.6	4.0	4.4	4.5	4.6	4.7	A	4.2	A	A	C	A	A	2.0	A	1.6
6	A	1.8	1.8	A	1.6	1.8	2.0	A	3.6	4.2	4.2	6.0	4.2	4.6	5.0	A	4.2	4.0	3.6	2.4	A	A	A	1.5
7	1.5	1.6	1.8	1.6	1.6	2.2	2.0	2.8	5.2	A	4.1	4.5	A	4.6	4.2	A	4.5	A	2.8	2.9	A	A	2.3	1.9
8	A	A	A	2.0	2.2	2.2	2.4	A	A	4.6	4.6	5.8	A	4.4	4.4	A	4.2	3.6	2.6	A	A	A	2.0	1.5
9	1.4	1.6	1.4	1.4	1.4	1.4	2.1	2.8	3.4	A	4.2	A	A	A	A	A	A	3.3	2.6	2.0	2.4	2.2	2.2	2.0
10	2.0	A	2.0	1.4	1.4	1.4	1.6	A	2.4	3.6	A	A	A	A	A	8.7	A	A	A	A	A	A	A	A
11	2.0	1.6	2.0	1.8	A	1.6	1.8	2.6	3.1	4.4	A	A	4.2	A	A	A	4.2	3.2	A	A	A	A	2.2	2.6
12	1.6	2.3	1.4	1.3	C	C	1.8	C	C	C	C	C	A	A	A	A	A	A	A	A	2.0	2.0	4.5	A
13	1.6	A	A	A	A	A	A	2.8	A	4.1	A	A	A	4.8	A	A	A	A	A	A	A	A	A	A
14	A	2.4	2.4	A	A	A	A	3.0	3.2	A	4.2	A	4.4	A	4.6	A	A	A	A	A	2.0	2.2	2.0	1.7
15	2.0	1.6	1.4	1.6	1.6	1.5	2.0	2.8	2.6	A	7.4	C	A	A	A	A	A	C	C	C	C	C	C	C
16	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C
17	1.6	1.4	1.8	1.5	1.4	1.5	2.2	2.8	A	4.0	4.0	C	A	4.4	4.2	4.1	C	A	A	2.0	2.0	2.0	2.0	2.0
18	A	2.6	A	A	A	2.2	A	A	3.8	C	C	C	C	C	C	C	C	C	C	C	2.2	2.4	2.0	1.8
19	2.2	1.6	2.0	1.4	1.6	1.6	1.6	2.8	A	C	C	A	A	A	A	4.2	A	A	2.8	A	2.6	2.0	2.2	2.0
20	A	A	C	C	C	2.0	2.6	A	2.8	3.8	4.4	A	4.8	4.4	4.4	4.2	4.1	A	A	A	1.5	1.5	1.6	1.6
21	1.5	2.0	1.4	1.4	1.4	A	2.0	2.9	3.3	4.2	4.2	4.2	4.2	4.8	4.4	4.2	3.0	3.4	2.0	2.0	1.6	A	A	A
22	2.0	C	A	A	A	2.4	C	C	C	C	C	C	C	C	C	C	C	C	C	C	2.2	2.4	2.0	1.8
23	1.8	A	A	A	C	1.6	A	2.8	3.8	4.4	4.2	4.2	A	C	A	C	A	A	2.8	A	A	1.6	1.5	2.0
24	1.6	1.8	1.6	1.5	1.6	1.4	1.8	2.0	3.2	3.8	T	T	A	C	A	4.0	A	3.8	A	2.4	1.6	1.5	1.6	1.6
25	1.4	1.4	1.5	1.5	1.4	1.5	1.8	2.4	3.5	4.0	4.5	4.5	4.6	4.6	4.2	A	A	A	A	2.2	A	A	A	3.8
26	A	A	1.4	1.4	1.5	1.5	1.7	2.8	3.6	3.4	4.3	4.6	4.6	4.6	4.4	A	A	A	A	A	A	A	A	A
27	2.6	1.4	1.4	1.4	1.4	1.5	1.8	2.8	3.4	4.2	4.2	4.6	4.6	4.2	A	4.2	4.2	3.8	3.0	2.6	1.6	2.0	1.8	1.9
28	1.6	1.6	1.8	1.8	2.0	1.6	2.2	2.6	3.4	4.3	4.6	4.6	4.6	A	4.3	4.2	4.2	3.4	2.8	2.4	A	1.6	2.0	1.4
29	1.5	1.5	1.6	2.0	1.4	1.5	A	C	A	A	4.0	4.4	4.8	4.8	4.8	4.0	4.2	3.2	A	2.6	A	2.0	1.5	2.0
30	C	C	C	C	2.0	1.5	1.6	3.0	3.4	4.0	4.2	5.8	6.0	A	A	4.2	4.0	A	A	A	A	2.4	2.1	2.2
31	1.9	2.0	1.9	A	A	A	A	2.4	C	C	4.2	4.8	5.0	4.8	4.6	4.2	4.2	A	2.6	2.6	2.2	2.2	A	2.2
Median Value	1.6	1.6	1.8	1.5	1.6	1.6	2.0	2.8	3.4	4.0	4.2	4.6	4.6	4.6	4.4	4.2	4.2	(3.4)	2.8	2.4	2.0	2.0	2.0	1.9
Count	21	21	22	20	19	23	22	20	19	17	21	15	15	16	15	13	11	9	12	12	14	17	18	22

Sweep 1.2 Mc to 1.8 Mc in 15 min

Manual

Electrical Communication Laboratory, Japanese Ministry of Telecommunications  
(Denki-tsushin Kenkyujo) Gotanda, Shinagawa-ku, Tokyo, Japan

# IONOSPHERIC DATA

Lat. 31°12.5'N  
Long. 139°37.7'E

f<sub>F</sub> min

Yamagawa

135°E Mean Time

Day	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
1	2.0	G	1.6	1.6	1.6	1.8	B	2.0	2.4	B	B	4.2	3.8	B	2.8	2.2	2.2	2.0	2.1	1.6	1.4	1.6	1.6	1.4
2	1.4	G	G	G	G	1.6	1.6	2.1	2.1	C	C	C	C	C	C	(2.6) <sup>C</sup>	2.2	2.0	C	C	1.8	1.5	1.6	1.6
3	C	C	C	C	C	C	C	2.0	2.1	2.0	2.1	4.2	4.2	3.6	3.0	(2.6) <sup>C</sup>	2.2	2.0	1.4	1.7	1.8	1.5	1.6	1.6
4	1.6	1.4	G	G	1.3	E	1.5	2.0	1.7	1.7	2.0	2.0	2.4	2.4	2.8	2.1	4.1	2.3	2.4	2.1	1.5	1.6	1.7	1.6
5	1.7	1.6	1.3	2.2	G	G	1.6	2.2	B	B	B	B	B	B	3.0	2.3	2.2	2.2	11.9 <sup>C</sup>	1.5	1.5	1.5	1.5	
6	1.4	1.4	1.4	1.4	1.6	2.0	1.8	1.4	1.8	2.1	2.4	4.4	3.0	2.8	3.3	3.2	2.2	2.0	2.0	1.8	1.5	1.5	1.4	G
7	G	G	1.8	1.4	1.4	1.4	1.4	1.5	B	3.2	2.4	2.0	3.1	2.8	2.4	4.0	2.6	2.6	2.6	2.3	2.0	1.8	1.7	1.5
8	1.5	1.8	1.6	1.6	1.4	1.5	1.6	1.4	1.6	2.2	3.2	4.0	2.2	2.2	4.1	2.5	2.4	2.2	1.5	1.4	1.5	1.6	1.6	2.2
9	G	G	G	E	G	B	1.4	1.4	1.7	2.0	2.2	2.6	2.5	3.2	2.4	2.2	2.2	2.2	1.5	1.4	1.5	1.6	1.6	1.5
10	1.4	1.4	1.4	1.4	G	B	1.4	1.5	1.7	3.6	2.0	2.0	2.4	2.8	3.0	3.0	3.2	2.0	1.6	1.6	1.4	1.5	1.4	1.4
11	1.4	1.4	1.4	1.6	1.4	1.5	1.5	1.5	1.7	1.8	2.1	2.2	2.4	2.1	2.2	2.2	2.0	1.4	1.6	1.6	1.8	1.6	1.6	2.0
12	G	1.4	1.3	G	C	C	1.4	C	C	C	C	C	2.4	2.6	2.5	2.2	2.1	1.8	1.6	1.6	1.4	1.4	1.4	1.4
13	1.4	1.5	1.5	1.4	1.6	1.4	1.6	1.6	1.4	1.6	2.0	2.2	2.2	2.2	2.2	2.2	2.1	1.8	1.8	1.5	1.6	2.6	1.6	1.6
14	1.8	1.8	1.6	1.4	E	E	F	2.0	2.0	1.9	2.2	2.2	2.2	2.2	2.4	4.0	2.0	2.0	1.7	1.5	1.5	1.5	1.4	1.4
15	1.5	1.5	G	G	G	1.5	1.6	1.6	1.8	2.7	2.0	2.6	(2.7) <sup>C</sup>	2.8	3.5	4.0	2.2	1.8	C	C	C	C	C	C
16	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	1.7	1.6	1.7	1.6	1.6	1.4	G
17	1.6	1.4	1.4	G	B	B	1.5	1.6	2.0	2.7	2.2	(2.4) <sup>C</sup>	2.6	3.0	2.2	2.2	(2.2) <sup>C</sup>	2.2	2.0	2.0	1.8	1.8	1.5	1.6
18	2.0	1.6	1.4	E	E	E	1.4	1.8	1.6	1.9	C	C	C	C	C	C	C	1.6	1.6	1.8	1.5	1.5	1.6	1.4
19	1.4	1.4	1.4	B	1.4	1.6	2.0	1.4	1.8	C	C	2.1	2.0	2.0	2.2	2.0	2.0	1.6	1.5	1.5	1.5	1.7	1.5	1.4
20	1.4	1.5	C	C	C	1.4	1.5	1.5	1.9	2.0	2.0	2.0	2.2	2.1	2.2	2.0	2.0	1.8	1.5	1.5	1.5	1.8	1.6	(1.5) <sup>C</sup>
21	1.3	1.5	G	G	G	G	1.4	1.5	1.6	1.8	2.2	2.2	2.0	2.2	2.6	2.2	1.6	1.6	1.6	1.6	1.6	1.5	1.4	1.4
22	G	C	2.0	1.4	1.3	1.6	C	C	C	C	C	C	C	C	C	C	C	C	C	C	1.6	1.5	1.8	1.6
23	1.6	1.6	1.4	C	C	1.6	1.6	1.5	1.6	1.8	2.2	2.2	2.0	(2.0) <sup>C</sup>	2.0	1.9	2.2	1.8	1.8	1.5	1.4	1.6	1.5	2.0
24	2.0	1.8	G	G	G	B	1.6	1.7	2.0	2.2	2.0	2.1	2.4	B	2.8	3.0	2.2	2.0	1.4	1.6	2.0	1.4	1.6	G
25	G	G	G	G	G	B	1.5	1.8	1.8	C	B	3.8	2.2	1.6	2.6	3.0	2.4	2.0	1.8	1.5	1.5	1.5	1.5	B
26	1.4	1.4	E	G	G	B	1.5	1.5	1.8	2.2	2.2	2.2	2.4	2.8	3.2	2.2	2.6	2.4	1.5	2.0	1.6	1.8	1.4	E
27	1.8	1.4	4	G	G	B	1.5	1.5	1.4	2.2	2.3	2.2	3.2	2.4	2.6	2.4	2.0	1.8	1.6	1.6	2.0	1.6	1.8	1.6
28	1.6	1.6	1.4	1.6	1.5	B	1.8	1.6	2.0	2.6	2.9	2.7	2.7	2.6	2.6	2.2	B	1.8	1.8	1.5	1.6	1.6	1.6	G
29	G	1.8	1.6	1.6	G	B	1.8	(1.7) <sup>C</sup>	1.5	2.0	2.0	(2.6) <sup>C</sup>	3.2	3.2	2.2	2.0	2.2	1.8	1.8	1.4	1.5	1.6	1.5	F
30	C	C	C	C	1.5	1.5	1.6	1.8	1.8	2.0	2.0	B	B	4.2	3.4	4.2	2.4	1.6	1.6	1.5	1.6	1.5	1.5	1.4
31	1.4	1.3	1.3	1.3	E	1.6	E	1.4	C	C	2.2	2.5	2.6	2.4	2.1	2.0	2.1	2.2	2.0	1.8	1.8	1.4	1.6	1.5
Median Value	1.4	1.4	1.4	1.3	1.3	1.5	1.5	1.6	1.8	2.0	2.2	2.3	2.4	2.5	2.6	2.2	2.2	1.8	1.7	1.6	1.5	1.5	1.5	1.4
Count	28	27	27	25	24	1.8	27	27	24	22	22	24	24	24	27	27	27	26	29	28	29	30	29	28

Spec. 1.2, Mc to 18.5, Mc to 1.5, m30

Manual

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