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Ionospheric Data Report - December 1963

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IONOSPHERIC DATA: BANGKOK, THAILAND

Compiled by: VICHAI T. NIMIT

Prepared for:

U.S. ARMY ELECTRONICS LABORATORIES
FORT MONMOUTH, NEW JERSEY

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FOR THE
THAI-U.S. MILITARY RESEARCH AND DEVELOPMENT CENTER
SUPREME COMMAND HEADQUARTERS
BANGKOK, THAILAND



STANFORD RESEARCH INSTITUTE
MENLO PARK, CALIFORNIA

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I INTRODUCTION

Ionospheric observations are being carried out at the Laboratory of the Military Research and Development Center at Bangkok, Thailand, a joint United States-Thailand organization. A Model C-2 vertical-incidence sounder supplied and operated by the United States Army Radio Propagation Agency has been installed there. Table I gives pertinent information about the site.

Table I
VERTICAL-INCIDENCE SOUNDER SITE
AT BANGKOK, THAILAND

Geographic		Geomagnetic	
Latitude	Longitude	Latitude	Longitude
13.73°N	100.57°E	2.5°N	169.83°E

Dip angle: 10°N

Distance from dip equator: 450 km

Equipment:

Instrument: Type C2 (automatic)

PRF: 60 pps

Frequency sweep time: 30 sec

Frequency sweep range: 1 to 25 Mc

Pulse duration: 50 μ sec

Peak pulse power: approximately 10 kw.

The cooperation and participation of staff members of the Thailand Ministry of Defense and the support of the United States Advanced Research

Projects Agency, the United States Army Electronics Laboratories, and the United States Army Radio Propagation Agency made it possible for the data presented in this report to be accumulated.

II TERMINOLOGY AND SYMBOLS

The terminology and symbols used in this data report are in accordance with the conventions established by the World Wide Soundings Committee.¹

A. TERMINOLOGY

$\left. \begin{array}{l} f_o F_2 \\ f_o F_1 \\ f_o E \end{array} \right\}$ The ordinary wave critical frequency for the F₂ and F₁ layers and the E region, respectively.

$f_o E_s$ The ordinary wave top frequency corresponding to the highest frequency at which a mainly continuous E_s trace is observed.

$f_b E_s$ The blanketing frequency of an E_s layer, i.e., the lowest ordinary wave frequency at which the E_s layer begins to become transparent. (This is usually determined from the minimum frequency at which reflections from layers at greater heights are observed.)

f_{min} The frequency below which no echoes are observed.

$M(3000)F_2$ The maximum usable frequency factor for a path of 3000 km for transmission by the F₂ layer.

$h' F_2$ The minimum virtual height of the ordinary wave trace for the highest stable stratification in the F region.

$h' F$ The most significant F-region virtual height parameter, that for the lowest F-region stratification. (Thus $h' F$ is identical with the current $h' F_2$ when F-region stratification is absent, i.e., at night, and with current $h' F_1$ when F₁ stratification is present.)

¹W. R. Piggott and K. Rawer, URSI Handbook of Ionogram Interpretation and Reduction of the World Wide Sounding Committee (Elsevier Publishing Company, Amsterdam, London, New York, 1961).

B. DESCRIPTIVE LETTERS

Certain effects observed on ionograms may make it difficult or impossible to obtain accurate numerical values. The descriptive letters listed below, when used alone indicate, in general, the presence of a phenomenon that may have influenced the measurement. Qualifying letters (Sec. C) indicate the nature of the uncertainty.

- A A lower thin layer present, e.g., E_s
- B Absorption in the vicinity of f_{min}
- C Any non-ionospheric reason
- D The upper limit of the normal frequency range
- E The lower limit of the normal frequency range
- F Spread echoes present
- G Ionization density of the layer too small for measurement
- H Stratification present
- L No sufficiently definite cusp between layers of the trace
- M Ordinary and extraordinary components indistinguishable
- N Conditions such that the measurement cannot be interpreted
- O Measurement referring to the ordinary component
- R Attenuation in the vicinity of a critical frequency
- S Interference or atmospherics
- T Value determined by a sequence of observations, the actual observation being inconsistent or doubtful
- V Forked trace
- W Echo lying outside the height range recorded
- X Measurement referring to the extraordinary component
- Y Intermittent trace
- Z Third magneto-ionic component present.

C. QUALIFYING LETTERS

- D Greater than. . .
- E Less than. . .

- I An interpolated value
- J Ordinary component characteristic deduced from the extraordinary component
- O Extraordinary component characteristic deduced from the ordinary component
- T Value determined by a sequence of observations, the actual observation being inconsistent or doubtful
- U Uncertain numerical value
- Z Measurement deduced from the third magneto-ionic component.

D. DESCRIPTION OF STANDARD TYPES OF E_s

The eight standard types of E_s are identified by lower-case letters: f, l, c, h, q, r, a, and s. These letters suggest the corresponding names, flat, low, cusp, high, equatorial, retardation, auroral, and slant, respectively, but are not restrictive. The letter r is used to designate an E_s trace that does not correspond to one of the eight types. The classifications are:

- f An E_s trace showing no appreciable increase of height with frequency, usually relatively solid at most latitudes. (This classification may be used only at night; it appears that flat E_s traces observed in the daytime are classified according to their virtual height: h or l.)
- l A flat E_s trace at or below the normal E-region minimum virtual height in the day or below the E-region minimum virtual height at night.
- c An E_s trace showing a relatively symmetrical cusp at or below $f_o E$. (This is usually continuous with the normal E trace, although when the deviative absorption is large, part or all of the cusp may be missing—usually a daytime type.)
- h An E_s trace showing a discontinuity in height with the normal E-region trace at or above $f_o E$ and an asymmetrical cusp. (The low-frequency end of the E_s trace lies clearly above the high-frequency end of the normal E trace—usually a daytime type.)
- q An E_s trace that is diffuse and nonblanketing over a wide frequency range, the spread being most pronounced at the upper edge of the trace. (This type is common in daytime in the vicinity of the magnetic equator.)
- r An E_s trace that is nonblanketing over part or all of its frequency range, showing an increase in virtual height at the high-frequency

end similar to group retardation. (This is distinguished from the usual group retardation—as in the case of an occulting thick E region—by the lack of group retardation in the F traces at corresponding frequencies and the lack of complete blanketing.)

- a An E_s pattern having a well-defined flat or gradually rising lower edge with stratified and diffuse (spread) traces present above it. (These sometimes extend over several hundred kilometers of virtual height.)
- s A diffuse E_s trace that rises steadily with frequency, usually emerging from another type of E_s trace. (The rising trace alone is classified as s; the horizontal trace is classified separately. At high latitudes, the slant trace usually starts to rise from a horizontal E_s trace, such as l or f, at frequencies that greatly exceed the E-region critical frequency, e.g., about 6 Mc; whereas at low latitudes it usually rises from equatorial-type E_s , q, c, or h, at frequencies near the regular E critical frequency. Type s is never used to determine $f_o E$ unless echoes clearly identifiable as E_s echoes are seen.)
- n An E trace that cannot be classified as one of the standard types. (This must not be used for intermediate cases between any two classes. A choice should always be made whenever possible, even if it is doubtful.)

E. MULTIPLE REFLECTIONS FROM E_s

When the ionogram shows the presence of multiple reflections from E_s , the number of traces seen will be recorded with the letter indicating the type.

Characteristic: f_{min}

IONOSPHERIC DATA

Sweep: 1 Mc to 25 Mc in 0.5 minute

December 1963

Observed at:

Bangkok, Thailand

Lat. $13.73^{\circ}N$, Long. $100.57^{\circ}E$

$105^{\circ}E$ Mean Time (GMT + 7 hours)

Hour Date	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14
1	E015S	013*	012	E013S	E017S	S	E017S	E029S	E027S	E028S	E026S	E027S	034	036	0
2	E015S	014	E	E011S	E017S	C	C	C	E028S	027	024	035	036	029	0
3	018	E015S	022	017	018	E016S	E018S	E018S	E025S	E027S	E027S	E026S	E031S	E029S	E0
4	017	E013S	015	E	E014S	E016S	E017S	E023S	E028S	E028S	E028S	E027S	E028S	E029S	E0
5	E017S	E014S	013	011	E016S	S	E019S	E021S	E019S	E020S	E026S	E030S	E029S	E026S	E0
6	E016S	015	013	018	E017S	E017S	E018S	E028S	E027S	E028S	E030S	E034S	E029S	034	0
7	E017S	E020C	013	013	017	E016S	E018S	E024S	E029S	E029S	E029S	E029S	E029S	E029S	0
8	E015S	014	012	016	E016S	E017S	E018S	E025S	E027S	E030S	E030S	E032S	E033S	E034S	0
9	E016S	E016S	012	012	013	E016S	E017S	E027S	E021S	E021S	E021S	E026S	E026S	E028S	0
10	016	E013S	E011S	011	012	E016S	E017S	E017S	E017S	021	E023S	E023S	E023S	E020S	0
11	C	C	C	C	C	C	C	C	C	C	E026S	E028S	E035S	E035S	E0
12	E015S	015	E013S	E013S	E012S	E015S	E027S	S	E030S	S	C	E029S	E030S	E029S	E0
13	019	011	E	E012S	E016S	E022S	S	E027S	E019S	044	E022S	E027S	E029S	E031S	0
14	E016S	020	020	E014S	E018S	E016S	E018S	E027S	E020S	E021S	E023S	E030S	E029S	E026S	0
15	020	018	016	018	E016S	E019S	E018S	E028S	E029S	E019S	E025S	E030S	E030S	E029S	0
16	016	019	019	E012S	E011S	S	E018S	E018S	E018S	E026S	E025S	C	E030S	E029S	0
17	E017S	019	017	017	E016S	E017S	E018S	E025S	C	E023S	E026S	E028S	E026S	E029S	E0
18	E017S	E015S	E018C	C	E020S	C	C	E026C	E032C	E020S	E022S	E027S	E028S	E030S	E0
19	E016S	019	011	011	E012S	E017S	S	E028S	E026S	E020S	E024S	E034S	E034S	E032S	E0
20	018	016	023	019	C	C	025	030	030	E023S	029	E030S	E029S	E029S	E0
21	E015S	E013S	E014S	015	018	B	E018S	E017S	E027S	030	030	E039S	E029S	E029S	E0
22	E016S	017	017	E015S	E014S	E018S	E018S	E019S	E027S	E027S	E024S	E029S	E028S	E029S	E0
23	E015S	E014S	E013S	020	E016S	E017S	E019S	E026S	037	033	E024S	E027S	E027S	E027S	E0
24	E015S	016	E014S	E015S	E016S	E017S	S	E017S	E019S	E023S	E025S	E027S	E030S	E032S	0
25	E016S	E014S	E015S	018	E016S	E016S	S	E026S	E017S	E026S	E023S	E029S	E029S	E028S	E0
26	017	016	017	018	014	019	E018S	E024S	E027S	E029S	E024S	E027S	E034S	029	E0
27	E014S	014	016	E013S	E014S	S	E019S	E025S	E021S	E023S	E024S	E027S	E028S	E027S	E0
28	E017S	E	011	015	E016S	S	S	E017S	E018S	E024S	E022S	E027S	E029S	E032S	E0
29	E016S	E016S	018	018	018	018	E018S	E017S	E027S	030	E027S	E028S	E028S	E027S	E0
30	018	019	019	E016S	021	017	E017S	E022S	028	E023S	E026S	E024S	E027S	E029S	E0
31	E015S	E018S	019	E016S	E018S	E015S	S	020	019	E025S	033	E039S	E033S	E032S	E0
Median	016	015	015	015	016	017	018	025	027	026	025	028	029	029	02
Count	30	29	28	28	29	21	22	28	29	29	30	30	31	31	3
UQ	017	018	018	017	017	017	019	027	028	028	027	030	031	032	0
LQ	015	014	013	013	014	016	018	019	019	022	024	027	028	028	0
QR	2	4	5	4	3	1	1	8	9	6	3	3	3	4	7

* Tabulation of 013 = 1.3 Mc.

IONOSPHERIC DATA

cep: 1 Mc to 25 Mc in 0.5 minute

December 1963

09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
E028S	E026S	E027S	034	036	036	025	027	E022S	E023S	019	E017S	E017S	E017S	E017S
027	024	035	036	029	040	022	038	E026S	E019S	019	019	E017S	E017S	020
E027S	E027S	E026S	E031S	E029S	E029S	034	028	E023S	E023S	E018S	019	E017S	020	022
E028S	E028S	E027S	E028S	E029S	E028S	E026S	023	020	024	E018S	021	018	E018S	E017S
E020S	E026S	E030S	E029S	E026S	E018S	E023S	E025S	E020S	019	E023S	E017S	E017S	019	E018S
E028S	E030S	E034S	E029S	034	031	E029S	E022S	E019S	E017S	E017S	E017S	E017S	E018S	E017S
E029S	E029S	E029S	E029S	E030S	029	E029S	E020S	E023S	E018S	E017S	E017S	E017S	E022C	E017S
E030S	E030S	E032S	E033S	E034S	034	E023S	E020S	E019S	E017S	E017S	020	E017S	E017S	E017S
E021S	E021S	E026S	E026S	E028S	032	024	019	E016S	E016S	E016S	E016S	E017S	021	020
021	E023S	E023S	E023S	E020S	026	022	020	E017S	E016S	E017S	E017S	020	019	C
C	E026S	E028S	E035S	E035S	E033S	E027S	E024S	E023S	E018S	020	E018S	019	E017S	E017S
S	C	E029S	E030S	E029S	E030S	E022S	E021S	E019S	E024S	E022S	E022S	E022S	018	C
044	E022S	E027S	E029S	E031S	035	026	030	E023S	E022S	E021S	018	020	018	021
E021S	E023S	E030S	E029S	E026S	020	034	021	020	E018S	019	020	E017S	020	E017S
E019S	E025S	E030S	E029S	E029S	035	025	027	E021S	E017S	E017S	E017S	E024S	019	020
E026S	E025S	C	E030S	E029S	024	032	020	E018S	E018S	E017S	021	E023S	019	022
E023S	E026S	E028S	E026S	E029S	E032C	E039C	E035C	E026S	E018S	C	E024S	C	E026C	E017S
E020S	E022S	E027S	E028S	E030S	E025S	E025S	E018S	E018S	E021S	E018S	021	E020S	E019S	E018S
E020S	E024S	E034S	E034S	E032S	E026S	E022S	031	E025S	E018S	027	E023S	020	E017S	E017S
E023S	029	E030S	E029S	E029S	E024S	E021S	E026S	E025S	E017S	019	E017S	020	E020S	E017S
030	030	E039S	E029S	E029S	E028S	E026S	E025S	E017S	E017S	E018S	E020S	E018S	E018S	018
E027S	E024S	E029S	E028S	E029S	E024S	E021S	023	E017S	E018S	E019S	E018S	E019S	E018S	E017S
033	E024S	E027S	E027S	E027S	E021S	E019S	E017S	E019S	E017S	E018S	E019S	E018S	E016S	E017S
E023S	E025S	E027S	E030S	E032S	029	027	E028S	E026S	E017S	E019S	E017S	E021S	E018S	E017S
E026S	E023S	E029S	E029S	E028S	E027S	E022S	E023S	E021S	E017S	E018S	017	E018S	E018S	018
E029S	E024S	E027S	E034S	029	E027S	E024S	E022S	E019S	E017S	E017S	E017S	E017S	E017S	E017S
E023S	E024S	E027S	E028S	E027S	E027S	E025S	019	E017S	E018S	E017S	E017S	E017S	020	E017S
E024S	E022S	E027S	E029S	E032S	E032S	E025S	E029S	E032S	E028S	E018S	E023S	E026S	E017S	018
030	E027S	E028S	E028S	E027S	E028S	025	E022S	E032S	E024S	E029S	E028S	E022S	E022S	E022S
E023S	E026S	E024S	E027S	E029S	E020S	021	023	E018S	E025S	024	E022S	E023S	E023S	E022S
E025S	033	E039S	E033S	E032S	E025S	E022S	E018S	E018S	E018S	E017S	E018S	E018S	E019S	E018S
026	025	028	029	029	028	025	023	020	018	018	018	018	018	017
29	30	30	31	31	31	31	31	31	31	30	31	30	31	29
028	027	030	031	032	032	027	027	023	022	019	021	021	020	020
022	024	027	028	028	025	022	020	018	017	017	017	017	017	017
6	3	3	3	4	7	5	7	5	5	2	4	4	3	3

Characteristic: foF2

IONOSPHERIC DATA
Sweep: 1 Mc to 25 Mc in 0.5 m
December, 1963

Observed at:
Bangkok, Thailand
Lat. 13.73°N, Long. 100.57°E
105°E Mean Time (GMT + 7 hours)

Hour Date	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14
1	031*	026	029	020	020	S	029	053	067	077	087	092	D092S	100	D090S
2	036	A	D033S	023	018	-	-	-	S	D068S	D062S	075	075	078	075
3	047	052	045	030	D031S	029	034	055	075	D087S	D088S	088	089	085	087
4	048	041	037	030	028	D022S	D033R	U052S	070	077	069	072	072	075	082
5	036	039	045	036	022	S	D021S	U053S	073	087	085	079	D080R	075	071
6	052	061	055	031	D026S	023	030	057	072	084	D087S	108	D093S	088	088
7	026	025	027	D027S	F	F	F	055	D071R	077	075	075	U072S	076	072
8	D040S	037	029	026	020	018	028	056	067	085	081	089	080	077	081
9	030	031	025	023	018	020	030	059	D072S	085	078	077	077	080	082
10	D035S	033	030	027	023	F	D029S	056	071	090	095	D094S	086	082	080
11	-	-	-	-	-	-	-	-	-	-	072	072	075	078	085
12	021	020	020	020	D022S	D019R	0'2	S	089	S	C	087	085	082	090
13	D024R	021	025	020	A	S	J	S055S	067	D080R	D085S	D090S	D077S	086	086
14	025	022	D026R	017	D 019W	D018R	D021S	052	D062S	082	073	D070S	072	073	077
15	056	053	034	021	018	D022S	D023S	060	077	D070S	D075R	070	069	U070S	077
16	030	029	D030S	018	D012S	S	030	058	073	082	078	C	D069S	082	083
17	030	031	032	021	019	D022S	023	052	C	D090S	D071S	068	D065S	066	D066S
18	030	030	030	C	F	C	C	046	D062S	080	D077S	D057S	D057S	J060S	D065W
19	031	031	023	017	D015S	D018R	S	D045S	065	J073S	063	057	055	J059S	066
20	025	D023R	D025R	D025R	C	C	D028R	052	071	D089S	A	D066S	J063S	D062S	D067S
21	D037S	034	029	026	D021R	B	028	055	D069S	D086R	D075R	066	D069S	D070S	077
22	030	U027F	D027R	028	029	023	D029S	D055S	076	D087S	076	068	067	070	074
23	029	026	026	023	024	019	041	058	D076R	D085R	087	066	063	060	063
24	029	022	022	U020F	F	F	S	051	065	076	080	D069S	070H	057	062
25	021	022	022	026	024	021	S	050	075	D087S	D070R	065	057	D056C	059
26	028	023	026	026	019	020	028	055	071	077	085	D069S	D062R	065	066
27	043	035	034	032	020	S	034	058	J070S	081	D085S	D070R	D068S	D062S	070
28	027	024	025	024	019	S	S	D045S	063	J078S	D082R	070	066	067	063
29	042	036	032	020	D020R	019	020	J050S	056	J072S	085	077	075	081	080
30	F	A	U041F	F	F	F	F	053	074	084	080	073	073	J073S	D067S
31	U038S	034	027	A	A	A	S	048	066	075	D070C	080	070	070	058
Median	030	030	029	024	020	020	029	054	071	082	078	072	072	073	075
Count	24	28	30	27	23	15	20	28	28	29	29	30	31	31	31
UQ	035	035	033	027	024	022	031	056	073	086	085	080	077	081	082
LQ	027	024	025	020	019	019	026	052	067	077	073	068	066	065	066
QR	8	11	8	7	5	3	5	4	6	9	12	12	11	16	16

* Tabulation of 031 = 3.1 Mc.

A

Sweep: 1 Mc to 25 Mc in 0.5 minute

	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
	077	087	092	D092S	100	D090S	D092S	D087S	D085R	086	080	U071S	067	060	043
	D068S	D062S	075	075	078	075	075	077	090	088	072	066	057	D046S	045
	D087S	D088S	088	089	085	087	086	090	083	D090S	078	077	063	D057S	065
	077	069	072	072	075	082	083	087	D090S	087	080	075	072	052	045
	087	085	079	D087R	075	071	U081S	089	D087S	D090S	089	072	067	058	D046S
	084	D087S	108	D093S	088	088	D090S	087	D089S	D088S	086	078	064	052	037
	077	075	075	U072S	076	072	075	077	080	080	078	071	062	052	044
	085	081	089	080	077	081	083	D088S	D088S	D088S	077	D067S	064	056	043
	085	078	077	077	080	082	085	087	D089S	D090S	077	067	D057S	053	050
	090	095	D094S	086	082	080	082	079	089	D090S	085	069	063	056	C
	-	072	072	075	078	085	081	085	080	077	U068S	056	034	S	
	S	C	087	085	082	090	082	085	085	083	068	D052S	045	027	C
	D080R	D085S	D090S	D077S	086	086	D087S	D090S	D087S	086	078	079	058	043	030
	082	073	D070S	072	073	077	080	085	088	D090S	075	065	059	059	055
	D070S	D075R	070	079	U070S	077	075	080	085	082	075	063	U047S	044	023
	082	078	C	D069S	082	086	089	D087S	085	085	U072S	D057S	054	045	035
	D090S	D071S	068	D065S	066	D066S	085	079	081	D065S	C	065	C	041	030
	080	D077S	D057S	D057S	J060S	D065W	D072S	085	084	071	D055S	D064R	J053S	042	034
	J073S	063	057	055	J059S	066	080	080	076	072	060	055	D045S	J040S	027
	D089S	A	D066S	J063S	D062S	D067S	D075S	082	088	074	U070S	065	U059S	051	D037S
	D086R	D075R	066	D069S	D070S	077	075	081	087	071	065	U056S	052	J040S	035
	D087S	076	068	067	070	074	073	077	082	068	062	057	055	044	035
	D085R	087	066	060	063	070	080	085	080	066	053	D045S	U035S	027	
	076	080	D069S	070H	057	062	068	070	078	085	077	056	D045S	028	021
	D087S	D070R	065	057	D056C	059	065	067	068	073	062	059	053	035	029
	077	085	D069S	D062R	065	066	068	078	080	070	066	057	U046F	050	045
	081	D085S	D070R	D068S	D062S	070	D065S	067	073	072	D055R	U062F	F	J070S	042
	J078S	D082R	070	066	067	063	063	D062R	065	067	062	055	060	057	050
	J072S	085	077	075	081	080	081	082	D090S	D087S	D060S	F	F	F	F
	084	080	073	073	J073S	D067S	070	J068S	D070C	072	066	063	068	F	

Characteristic: M(3000)F2

IONOSPHERIC DATA
Sweep: 1 Mc to 25 Mc in 0.5 minute
December 1963

Observed at:
Bangkok, Thailand
Lat. 13.73°N, Long. 100.57°E
105°E Mean Time (GMT + 7 hours)

Hour Date	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14
1	365*	395	320	350	310	S	325	320	290	310	310	320	S	310	S
2	355	A	S	370	370	-	-	-	S	S	S	270	300	270	280
3	350	370	355	320	S	315	340	320	325	S	S	290	285	285	285
4	360	355	370	350	340	S	R	S	295	280	300	270	285	260	270
5	360	350	375	370	415	S	S	S	340	330	300	275	R	250	280
6	325	360	375	350	S	300	335	350	355	355	S	335	S	285	300
7	355	355	360	S	F	F	F	330	R	280	285	270	U280S	250	265
8	S	360	355	350	350	340	335	360	370	365	335	285	285	270	280
9	350	340	360	350	325	320	330	330	S	285	300	270	270	265	280
10	S	350	355	360	340	F	S	370	350	350	340	S	285	270	285
11	-	-	-	-	-	-	-	-	-	-	295	280	290	290	285
12	350	340	335	340	S	R	340	S	325	S	C	300	295	300	310
13	R	320	350	365	A	S	S	S	365	R	S	S	S	300	310
14	335	370	R	380	N	R	S	325	S	290	295	S	275	280	300
15	335	355	375	360	340	S	S	340	300	S	R	280	270	U260S	280
16	320	320	S	350	S	S	335	350	315	295	285	C	S	275	290
17	335	330	350	350	345	S	320	350	C	S	S	275	S	260	S
18	330	330	345	C	F	C	C	380	S	310	S	S	S	J265S	N
19	350	360	380	380	S	R	S	S	305	J265S	280	270	280	J275S	270
20	295	R	R	R	C	C	R	350	330	S	A	S	J280S	S	S
21	S	345	345	350	R	B	330	350	S	R	R	260	S	S	250
22	290	U290F	R	350	370	350	S	S	320	S	260	250	260	265	290
23	345	340	350	320	320	400	360	360	R	R	280	260	260	260	290
24	300	310	300	U300F	F	F	S	370	375	360	310	S	240H	280	300
25	330	330	330	320	340	315	S	345	345	S	R	250	300	C	285
26	330	310	340	360	350	315	330	365	375	355	315	S	R	270	290
27	330	320	350	370	360	S	350	370	J355S	360	S	R	S	S	270
28	360	335	330	380	390	S	S	S	350	J345S	R	280	280	250	270
29	330	310	360	350	R	320	320	J370S	360	J360S	330	280	280	290	300
30	F	A	F	F	F	F	F	330	330	315	315	270	265	J260S	S
31	U355S	370	385	A	A	A	S	340	310	300	C	280	300	255	270
Median	335	340	352	350	345	320	335	350	335	315	300	275	280	270	285
Count	25	27	24	25	15	9	13	22	22	19	17	22	21	27	20
UQ	355	360	365	370	370	345	340	365	355	355	315	280	287	285	295
LQ	330	320	343	350	340	315	330	330	315	290	285	270	270	260	270
QR	25	40	22	20	30	30	10	35	40	65	30	10	17	25	25

* Tabulation of 365 = factor of 3.65.

IONOSPHERIC DATA

Sweep: 1 Mc to 25 Mc in 0.5 minute

December 1963

	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
	310	310	320	S	310	S	S	S	R	305	335	U330S	350	370	370
	S	S	270	300	270	280	275	295	315	325	345	340	330	S	330
	S	S	290	285	285	285	280	305	305	S	330	320	325	S	375
	280	300	270	285	260	270	290	305	S	315	315	315	345	365	355
	330	300	275	R	250	280	U300S	300	S	S	355	350	285	340	S
	355	S	335	S	285	300	S	315	S	S	345	345	355	355	340
	280	285	270	U280S	250	265	270	280	290	310	325	320	330	325	355
	365	335	285	285	270	280	285	S	S	S	305	S	305	335	365
	285	300	270	270	265	280	300	315	S	S	330	330	S	350	350
	350	340	S	285	270	285	295	305	305	S	355	335	335	360	C
	-	295	280	290	290	285	300	310	320	310	330	U295S	360	370	S
	S	C	300	295	300	315	300	300	320	335	350	S	370	375	C
	R	S	S	S	300	315	S	S	S	305	330	330	365	360	370
	290	295	S	275	280	300	305	325	340	S	350	325	325	315	300
	S	R	280	270	U260S	280	285	285	330	350	350	340	U350S	355	355
	295	285	C	S	275	290	300	S	335	340	U360S	S	350	370	350
	S	S	275	S	260	S	315	335	350	S	C	370	C	355	335
	310	S	S	S	J265S	N	S	325	335	350	S	R	S	350	370
	J265S	280	270	280	J275S	270	300	335	325	350	370	335	S	J335S	345
	S	A	S	J280S	S	S	S	330	340	350	U360S	330	U355S	350	S
	R	R	260	S	S	250	300	320	350	350	350	350	U355S	360	J365S
	S	260	250	260	265	290	315	310	340	360	380	345	350	355	365
	R	280	260	260	260	295	280	290	330	360	365	375	S	U350S	360
	360	310	S	240H	280	300	285	285	310	340	380	380	S	360	335
	S	R	250	300	C	285	270	285	310	340	310	345	360	360	350
	355	315	S	R	270	290	285	300	350	355	310	320	U380F	365	350
	360	S	R	S	S	270	S	295	300	330	R	F	F	J380S	355
	J345S	R	280	280	250	270	275	R	300	320	330	310	320	335	360
	J360S	330	280	280	290	305	325	310	S	S	3	F	F	F	F
	315	315	270	265	J260S	S	285	J275S	C	350	360	330	350	F	S
	300	C	280	300	255	270	U270S	295	330	340	370	370	355	370	370
	315	300	275	280	270	285	290	305	328	340	350	335	350	355	355
	19	17	22	21	27	26	25	26	22	22	27	25	23	27	24
	355	315	280	287	285	295	300	315	340	350	360	347	360	365	365
	290	285	270	270	260	270	280	295	310	320	330	322	330	350	350
	65	30	10	17	25	25	20	20	30	30	30	25	30	15	15

Characteristic: h'F₂

IONOSPHERIC DATA
Sweep: 1 Mc to 25 Mc in 0.5 minutes
December 1963

Observed at:
Bangkok, Thailand
Lat. 13.73°N, Long. 100.57°E
105°E Mean Time (GMT + 7 hours)

Hour Date	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14
1	-	-	-	-	-	-	-	-	-	-	-	270*	290	280	27
2	-	-	-	-	-	-	-	-	S	285	305	325	300	320	31
3	-	-	-	-	-	-	-	-	-	285	280	305	310	320	31
4	-	-	-	-	-	-	-	-	-	-	305	355	315	315	31
5	-	-	-	-	-	-	-	-	-	-	300	310	325	320	31
6	-	-	-	-	-	-	-	-	-	-	280	280	285	315	31
7	-	-	-	-	-	-	-	-	-	-	320	330	320	315	31
8	-	-	-	-	-	-	-	-	-	-	290	300	310	290	30
9	-	-	-	-	-	-	-	-	-	275	290	-	325	-	30
10	-	-	-	-	-	-	-	-	-	-	300	290	-	300	30
11	-	-	-	-	-	-	-	-	-	-	320	330	315	330	30
12	-	-	-	-	-	-	-	-	270	-	-	305	300	320	29
13	-	-	-	-	-	-	-	-	-	-	-	300	310	300	30
14	-	-	-	-	-	-	-	-	-	300	330	300	305	-	30
15	-	-	-	-	-	-	-	-	-	300	315	320	310	340	30
16	-	-	-	-	-	-	-	-	-	310	310	C	315	330	30
17	-	-	-	-	-	-	-	-	C	290	L	375	370	370	32
18	-	-	-	-	-	-	-	-	-	300	325	-	E450S	E420S	31
19	-	-	-	-	-	-	-	-	-	320	330	370	-	-	33
20	-	-	-	-	-	-	-	-	-	270	A	-	350	360	30
21	-	-	-	-	-	-	-	-	-	290	340	320	330	340	32
22	-	-	-	-	-	-	-	-	-	300	-	-	-	340	30
23	-	-	-	-	-	-	-	-	-	280	320	320	385	-	32
24	-	-	-	-	-	-	-	-	-	-	285	300	330	350	33
25	-	-	-	-	-	-	-	-	-	265	250	-	350	340	31
26	-	-	-	-	-	-	-	-	-	260	310	310	360	360	31
27	-	-	-	-	-	-	-	-	-	270	-	315	325	350	31
28	-	-	-	-	-	-	-	-	-	270	280	300	320	E370S	E370S
29	-	-	-	-	-	-	-	-	-	265	285	300	310	320	31
30	-	-	-	-	-	-	-	-	-	260	280	310	340	350	33
31	-	-	-	-	-	-	-	-	-	270	-	-	310	-	33
Median Count	-	-	-	-	-	-	-	-	270 1	283 20	305 23	310 24	312 28	330 26	31
UQ	-	-	-	-	-	-	-	-	-	300	320	320	335	350	32
LQ	-	-	-	-	-	-	-	-	-	270	285	300	310	315	30
QR	-	-	-	-	-	-	-	-	-	30	35	20	25	35	31

* Tabulation of 270 = 270 km.

IONOSPHERIC DATA

Sweep: 1 Mc to 25 Mc in 0.5 minutes

December 1963

08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
-	-	-	270*	290	280	275	-	-	-	-	-	-	-	-	-
S	285	305	325	300	320	-	-	-	-	-	-	-	-	-	-
-	285	280	305	310	320	310	-	-	-	-	-	-	-	-	-
-	-	305	355	315	315	310	290	-	-	-	-	-	-	-	-
-	-	300	310	325	320	310	-	-	-	-	-	-	-	-	-
-	-	280	280	285	315	-	-	-	-	-	-	-	-	-	-
-	-	320	330	320	315	-	-	-	-	-	-	-	-	-	-
-	-	290	300	310	290	300	-	-	-	-	-	-	-	-	-
-	275	290	-	325	-	-	-	-	-	-	-	-	-	-	-
-	-	300	290	-	300	-	300	-	-	-	-	-	-	-	-
-	-	320	330	315	330	300	-	-	-	-	-	-	-	-	-
70	-	-	305	300	320	290	L	-	-	-	-	-	-	-	-
-	-	-	300	310	300	305	-	-	-	-	-	-	-	-	-
-	300	330	300	305	-	300	-	-	-	-	-	-	-	-	-
-	300	315	320	310	340	305	-	-	-	-	-	-	-	-	-
-	310	310	C	315	330	-	-	-	-	-	-	-	-	-	-
C	290	L	375	370	370	325	290	L	-	-	-	-	-	-	-
-	300	325	-	E450S	E420S	350	310	265	-	-	-	-	-	-	-
-	320	330	370	-	-	335	-	-	-	-	-	-	-	-	-
-	270	A	-	350	360	300	-	-	-	-	-	-	-	-	-
-	290	340	320	330	340	320	-	-	-	-	-	-	-	-	-
-	300	-	-	-	340	300	-	-	-	-	-	-	-	-	-
-	280	320	320	385	-	320	315	-	-	-	-	-	-	-	-
-	-	285	300	330	350	330	-	-	-	-	-	-	-	-	-
-	265	250	-	350	340	360	310	-	-	-	-	-	-	-	-
-	260	310	310	360	360	310	-	-	-	-	-	-	-	-	-
-	270	-	315	325	350	330	325	-	-	-	-	-	-	-	-
-	270	280	300	320	E370S	E370S	340	-	-	-	-	-	-	-	-
-	265	285	300	310	320	310	280	-	-	-	-	-	-	-	-
-	260	280	310	340	350	330	320	-	-	-	-	-	-	-	-
-	270	-	-	310	-	330	-	-	-	-	-	-	-	-	-
70	283	305	310	312	330	310	310	265	-	-	-	-	-	-	-
1	20	23	24	28	26	25	10	1	-	-	-	-	-	-	-
-	300	320	320	335	350	330	320	-	-	-	-	-	-	-	-
-	270	285	300	310	315	300	290	-	-	-	-	-	-	-	-
-	30	35	20	25	35	30	30	-	-	-	-	-	-	-	-

Characteristic: h'F

IONOSPHERIC DATA

Sweep: 1 Mc to 25 Mc in 0.5 minute

December 1963

Observed at:

Bangkok, Thailand

Lat. 13.73°N, Long. 100.57°E

105°E Mean Time (GMT + 7 hours)

Hour Date	00	01	02	03	04	05	06	07	08	09	10	11	12	13
1	220*	E300A	E350A	240	E300S	S	260	E230S	E210B	210	210	200	190	185
2	215	A	E200A	220	E250S	-	-	-	210	210	190	E280B	190	180
3	E220S	220	212	E260B	E260S	265	245	E230S	E210A	200	190	180	190	180
4	200	E220A	205	220	E245S	E310S	E440S	E230S	E210S	E190S	200	200	200	185
5	E220S	220	205	E195S	E190S	S	E400S	E235S	220	210	E240A	19C	190	190
6	E245S	215	215	E215S	E210S	E280S	E240S	235	E215S	215	E210A	200	185	185
7	E240S	230	225	E230S	E240S	260	E270S	230	E215S	E210S	190	185	180	180
8	210	215	E215S	E225S	250	E300S	250	225	210	E205S	185	180	175	175
9	D230S	E230S	230	225	E260B	E280S	E250S	E230S	215	200	190	180	180	190
10	225	225	215	E240S	E260A	E250S	E300A	220	210	185	195	185	E315A	180
11	-	-	-	-	-	-	-	-	-	-	180	185	180	E180S
12	E280S	E270S	E270S	270	E250S	E220S	210	S	E180B	S	C	180	185	180
13	E280B	270	245	E260A	A	S	S	220	210	260	190	180	190	190
14	E230S	E265B	E260B	E225S	E440S	E350S	E310S	E220S	E210S	200	E180B	180	180	E290A
15	230	210	200	E220S	E226S	E300S	E260S	E230S	215	190	E190A	190	180	180
16	250	E275S	230	230	E300S	S	250	E230S	210	205	190	C	190	A
17	E235A	240	220	E250B	E250S	E350A	E280S	E220S	C	E200B	180	175	170	170
18	E250S	E260S	E250C	C	260	C	C	U220C	E230C	200	180	E315A	E190A	160
19	E230S	235	210	200	E225S	E310S	S	E230S	E215S	200	E200A	E220A	E330A	E380S
20	E230B	E300B	E300B	E240B	C	C	E300B	235	E220B	205	A	180	180	170
21	E240S	230	215	230	280	B	E250S	E230S	210	200	180	E180S	170	170
22	E280S	E300S	260	E220S	220	E230S	E230S	E220S	E210S	E200A	E220A	E200A	170	E220A
23	225	E250S	E240S	E260S	E260S	E230S	220	E220S	200	E200B	180	185	180	E320A
24	E300A	E300S	E300S	E325S	270	270	S	215	205	E210A	E200A	E180A	E200A	E200A
25	E260S	E260S	E260S	240	E250S	E300S	S	E220S	205	200	E390A	E370A	E210A	170
26	E240S	E280S	240	230	E240S	E360B	E250S	E230S	210	200	185	175	180	170
27	230	E265S	240	220	E250S	S	E230S	210	205	190	270	E180A	170	E170A
28	E210S	230	260	215	E200S	S	S	225	210	190	175	175	170	170
29	210	260	230	E260S	E400B	E320B	E330S	215	210	190	180	180	175	180
30	290	A	270	250	250	250	E280S	220	210	E210A	205	200	190	180
31	210	215	210	A	A	A	S	220	210	200	E200B	180	E210A	E180B
Median	230	245	230	230	250	290	255	225	210	200	190	182	185	180
Count	30	28	30	28	27	20	22	28	29	29	30	31	30	31
UQ	250	270	260	250	260	315	300	230	215	210	208	200	190	190
LQ	220	222	215	220	240	255	245	220	210	200	185	180	180	170
QR	30	48	45	30	20	60	55	10	5	10	23	20	10	20

* Tabulation of 220 = 220 km.

IONOSPHERIC DATA

Sweep: 1 Mc to 25 Mc in 0.5 minute

December 1963

	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
OB	210	210	200	190	185	E230B	210	E215B	230	230	200	210	210	200	E220A
O	210	190	E280B	190	180	E170B	E200A	E230A	230	220	215	205	215	230	230
OA	200	190	180	190	180	165	210	E215S	E230S	225	215	220	230	230	215
OS	E190S	200	200	200	185	E200A	185	175	225	230	220	220	215	205	E215S
O	210	E240A	190	190	190	E190A	180	215	230	230	200	200	219	235	E235S
SS	215	E210A	200	185	185	170	210	E215A	240	215	220	210	200	200	220
S	E210S	190	185	180	180	180	205	215	220	225	215	215	215	225	225
O	E205S	185	180	175	175	E180B	180	215	230	230	235	260	E230S	220	215
O	200	190	180	180	190	190	215	205	225	225	225	200	E200S	225	E220S
O	185	195	185	E315A	180	E325A	175	210	220	220	210	210	210	210	C
O	-	180	185	180	E180S	180	160H	205	E225S	220	220	200	220	E230A	E250A
OB	S	C	180	185	180	190	180	205	E235A	215	200	200	E225S	215	C
O	260	190	180	190	190	E200B	180	220	E225S	235	211	205	205	210	E215S
OS	200	E180B	180	180	E290A	E170A	200	E210A	240	215	E220A	210	E230S	E250S	275
S	190	E190A	190	180	180	E170B	240	205	230	210	205	205	E225S	220	E230S
O	205	190	C	190	A	165	170	E225A	220	215	210	210	210	E215A	E225S
DC	E200B	180	175	170	170	200	E240C	E230C	E220S	300	C	200	C	U200C	E240S
SS	200	180	E315A	E190A	160	160	225	219	E215S	210	215	200	220	E235A	220
OB	200	E200A	E220A	E330A	E380S	E220A	300	275	230	E220A	E225A	200	210	215	235
O	205	A	180	180	170	170	205	215	220	215	205	210	200	210	235
O	200	180	E180S	170	170	210	200	E200S	220	200	E200S	205	210	E200S	210
OS	E200A	E220A	E200A	170	E220A	185	200	210	220	215	200	205	210	210	220
O	E200B	180	185	180	E320A	E210A	200	200	E210A	205	200	190	200	205	220
S	E210A	E200A	E180A	E200A	E200A	175	210	200	215	220	200	180	201	215	E260S
S	200	E390A	E370A	E210A	170	160	190	210	E230S	215	200	210	205	E210S	E235S
O	200	185	175	180	170	170	E220A	E200A	230	215	220	225	235	230	215
S	190	270	E180A	170	E170A	170	180	210	E230S	240	E250S	250	240	200	200
O	190	175	175	170	170	170	160	210	E240S	230	215	E250A	E260A	230	215
O	190	180	180	175	180	180	E230A	E230A	E230A	E240S	250	230	220	215	290
O	E210A	205	200	190	180	E180A	E220A	200	220	230	220	215	200	210	205
O	200	E200B	180	E210A	E180B	170	E170A	210	E230A	210	210	200	210	205	220
O	200	190	182	185	180	180	200	210	225	220	215	210	210	215	220
9	29	30	31	30	31	31	31	31	31	31	30	31	30	31	29
S	210	208	200	190	190	200	215	215	230	230	220	215	225	230	235
O	200	185	180	180	170	170	180	205	220	215	200	200	205	205	215
O	10	23	20	10	20	30	35	10	10	15	20	15	20	25	20

Characteristic: foF1

IONOSPHERIC DATA
Sweep: 1 Mc to 25 Mc in 0.5 minute
December 1963

Observed at:
Bangkok, Thailand
Lat. 13.73°N, Long. 100.57°E
105°E Mean Time (GMT + 7 hours)

Hour Date	00	01	02	03	04	05	06	07	08	09	10	11	12	13
1	-	-	-	-	-	-	-	-	L	L	L	044*	044	048
2	-	-	-	-	-	-	-	-	D045S	043	044	046	045	044
3	-	-	-	-	-	-	-	-	L	U043L	044	044	044	046
4	-	-	-	-	-	-	-	-	L	L	043	047	044	043
5	-	-	-	-	-	-	-	-	L	L	043	044	045	045
6	-	-	-	-	-	-	-	-	L	L	043	044	044	043
7	-	-	-	-	-	-	-	-	L	L	045	043	045	044
8	-	-	-	-	-	-	-	-	L	L	045	045	046	043
9	-	-	-	-	-	-	-	-	L	043	044	L	045	L
10	-	-	-	-	-	-	-	-	L	L	045	045	A	044
11	-	-	-	-	-	-	-	L	-	-	046	045	044	045
12	-	-	-	-	-	-	L	-	043	S	C	046	045	045
13	-	-	-	-	-	-	-	-	L	-	L	045	044	045
14	-	-	-	-	-	-	-	-	L	U042L	046	045	045	A
15	-	-	-	-	-	-	-	-	L	U042L	044	046	045	U045L
16	-	-	-	-	-	-	-	L	L	043	044	C	045	A
17	-	-	-	-	-	-	-	-	C	043	L	045	045	046
18	-	-	-	-	-	-	-	-	-	042	044	A	045	U045S
19	-	-	-	-	-	-	-	-	L	043	043	045	L	A
20	-	-	-	-	-	-	-	-	L	042	A	046	049	043
21	-	-	-	-	-	-	-	L	L	043	045	042	044	043
22	-	-	-	-	-	-	-	-	L	043	L	L	U046S	045
23	-	-	-	-	-	-	-	L	L	U041L	045	043	045	L
24	-	-	-	-	-	-	-	-	L	L	043	045	044	043
25	-	-	-	-	-	-	-	-	L	043	042	A	043	042
26	-	-	-	-	-	-	-	L	L	042	043	043	043	043
27	-	-	-	-	-	-	-	L	L	041	A	046	045	044
28	-	-	-	-	-	-	-	L	L	040	042	042	043	S
29	-	-	-	-	-	-	-	L	-	041	043	043	043	043
30	-	-	-	-	-	-	-	-	L	041	043	043	044	042
31	-	-	-	-	-	-	-	-	L	040	L	042	045	L
Median	-	-	-	-	-	-	-	-	044	042	043	045	045	044
Count	-	-	-	-	-	-	-	-	1	20	23	26	29	23
UQ	-	-	-	-	-	-	-	-	-	043	044	045	045	045
LQ	-	-	-	-	-	-	-	-	-	041	043	043	044	043
QR	-	-	-	-	-	-	-	-	-	2	1	2	1	2

* Tabulation of 044 = 4.4 Mc.

IONOSPHERIC DATA

Sp: 1 Mc to 25 Mc in 0.5 minute

December 1963

9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
L	L	044*	044	048	042	L	L	-	-	-	-	-	-	-
043	044	046	045	044	L	L	L	L	-	-	-	-	-	-
043L	044	044	044	046	045	L	L	L	-	-	-	-	-	-
L	043	047	044	043	044	043	L	-	-	-	-	-	-	-
L	043	044	045	045	044	L	L	L	-	-	-	-	-	-
L	043	044	044	043	L	L	L	-	-	-	-	-	-	-
L	045	043	045	044	L	L	L	-	-	-	-	-	-	-
L	045	045	046	043	044	L	L	L	-	-	-	-	-	-
043	044	L	045	L	L	L	L	-	-	-	-	-	-	-
L	045	045	A	044	A	U043L	L	L	-	-	-	-	-	-
-	046	045	044	045	043	L	L	L	-	-	-	-	-	-
S	C	046	045	045	044	U042L	L	-	-	-	-	-	-	-
-	L	045	044	045	044	L	L	-	-	-	-	-	-	-
042L	046	045	045	A	U043L	L	L	-	-	-	-	-	-	-
042L	044	046	045	U045L	044	L	L	-	-	-	-	-	-	-
043	044	C	045	A	L	L	L	L	-	-	-	-	-	-
043	L	045	045	046	045	043	L	L	-	-	-	-	-	-
042	044	A	045	U045S	045	043	040	L	-	-	-	-	-	-
043	043	045	L	A	U044L	A	-	-	-	-	-	-	-	-
042	A	046	049	043	043	L	L	-	-	-	-	-	-	-
043	045	042	044	043	043	L	L	-	-	-	-	-	-	-
043	L	L	U046S	045	042	L	L	-	-	-	-	-	-	-
041L	045	043	045	L	043	042	L	-	-	-	-	-	-	-
L	043	045	044	043	043	L	L	-	-	-	-	-	-	-
043	042	A	043	042	045	041	L	L	-	-	-	-	-	-
042	043	043	043	043	042	L	L	-	-	-	-	-	-	-
041	A	046	045	044	043	042	L	L	-	-	-	-	-	-
040	042	042	043	S	S	042	L	-	-	-	-	-	-	-
041	043	043	043	043	044	042	L	L	-	-	-	-	-	-
041	043	043	044	042	045	042	L	L	-	-	-	-	-	-
040	L	042	045	L	042	L	L	L	-	-	-	-	-	-
042	043	045	045	044	044	042	040	-	-	-	-	-	-	-
20	23	26	29	23	24	11	1	-	-	-	-	-	-	-
043	044	045	045	045	044	043	-	-	-	-	-	-	-	-
041	043	043	044	043	043	042	-	-	-	-	-	-	-	-
2	1	2	1	2	1	1	-	-	-	-	-	-	-	-

Characteristic: M(3000)F1

IONOSPHERIC DATA
Sweep: 1 Mc to 25 Mc in 0.5 minute
December 1963

Observed at:
Bangkok, Thailand
Lat. 13.73°N, Long. 100.57°E
105°E Mean Time (GMT + 7 hours)

Hour Date	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14
1	-	-	-	-	-	-	-	-	L	L	L	410*	410	390	390
2	-	-	-	-	-	-	-	-	S	390	405	395	410	410	390
3	-	-	-	-	-	-	-	-	L	U380L	390	410	425	400	380
4	-	-	-	-	-	-	-	-	L	L	395	390	410	415	380
5	-	-	-	-	-	-	-	-	L	L	385	390	390	400	380
6	-	-	-	-	-	-	-	-	L	L	390	405	415	415	L
7	-	-	-	-	-	-	-	-	L	L	380	410	400	400	L
8	-	-	-	-	-	-	-	-	L	L	390	400	410	400	390
9	-	-	-	-	-	-	-	-	L	390	390	L	390	L	L
10	-	-	-	-	-	-	-	L	L	L	390	400	A	410	A
11	-	-	-	-	-	-	-	-	-	-	375	400	420	410	410
12	-	-	-	-	-	-	L	-	400	S	C	410	420	400	400
13	-	-	-	-	-	-	-	-	L	-	L	400	410	395	380
14	-	-	-	-	-	-	-	-	L	U375L	380	400	410	A	U390
15	-	-	-	-	-	-	-	-	L	U380L	385	405	415	U385L	390
16	-	-	-	-	-	-	-	L	L	380	400	C	405	A	L
17	-	-	-	-	-	-	-	-	C	370	L	415	400	405	400
18	-	-	-	-	-	-	-	-	-	370	380	A	400	U410S	410
19	-	-	-	-	-	-	-	-	L	375	405	435	L	A	U380
20	-	-	-	-	-	-	-	-	L	390	A	410	420	410	390
21	-	-	-	-	-	-	-	L	L	380	400	430	400	395	380
22	-	-	-	-	-	-	-	-	L	380	L	L	U390S	395	375
23	-	-	-	-	-	-	-	L	L	U380L	380	400	410	L	390
24	-	-	-	-	-	-	-	-	L	L	400	410	410	410	390
25	-	-	-	-	-	-	-	-	L	390	380	A	420	410	370
26	-	-	-	-	-	-	-	L	L	390	400	420	420	415	390
27	-	-	-	-	-	-	-	L	L	390	A	385	430	420	400
28	-	-	-	-	-	-	-	L	L	400	430	425	415	S	S
29	-	-	-	-	-	-	-	-	-	390	400	410	420	410	370
30	-	-	-	-	-	-	-	-	L	395	380	405	400	425	370
31	-	-	-	-	-	-	-	-	L	395	L	375	400	L	420
Median	-	-	-	-	-	-	-	-	400	385	390	405	410	410	390
Count	-	-	-	-	-	-	-	-	1	20	23	26	29	24	24
UQ	-	-	-	-	-	-	-	-	-	390	400	410	420	410	395
LQ	-	-	-	-	-	-	-	-	-	380	380	400	400	400	380
QR	-	-	-	-	-	-	-	-	-	10	20	10	20	10	15

* Tabulation of 410 = factor of 4.1.

A

IONOSPHERIC DATA

weep: 1 Mc to 25 Mc in 0.5 minute

December 1963

09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
L	L	410*	410	390	390	L	L	-	-	-	-	-	-	-
390	405	395	410	410	L	L	L	L	-	-	-	-	-	-
U380L	390	410	425	400	380	L	L	L	-	-	-	-	-	-
L	395	390	410	415	380	370	L	-	-	-	-	-	-	-
L	385	390	390	400	380	L	L	L	-	-	-	-	-	-
L	390	405	415	415	L	L	L	-	-	-	-	-	-	-
L	380	410	400	400	L	L	L	-	-	-	-	-	-	-
L	390	400	410	400	330	L	L	L	-	-	-	-	-	-
390	390	L	390	L	L	L	L	-	-	-	-	-	-	-
L	390	400	A	410	A	L	L	L	-	-	-	-	-	-
-	375	400	420	410	410	L	L	L	-	-	-	-	-	-
S	C	410	420	400	400	L	L	-	-	-	-	-	-	-
-	L	400	410	395	380	L	L	-	-	-	-	-	-	-
U375L	380	400	410	A	U390L	L	L	-	-	-	-	-	-	-
U380L	385	405	415	U385L	390	L	L	-	-	-	-	-	-	-
380	400	C	405	A	L	L	L	L	-	-	-	-	-	-
370	L	415	400	405	400	385	L	L	-	-	-	-	-	-
370	380	A	400	U410S	410	380	390	L	-	-	-	-	-	-
375	405	435	L	A	U380L	A	-	-	-	-	-	-	-	-
390	A	410	420	410	390	L	L	-	-	-	-	-	-	-
380	400	430	400	395	380	L	L	-	-	-	-	-	-	-
380	L	L	U390S	395	375	L	L	-	-	-	-	-	-	-
U380L	380	400	410	L	390	380	L	-	-	-	-	-	-	-
L	400	410	410	410	390	L	L	-	-	-	-	-	-	-
390	380	A	420	410	375	360	L	L	-	-	-	-	-	-
390	400	420	420	415	390	L	L	-	-	-	-	-	-	-
390	A	385	430	420	400	370	L	L	-	-	-	-	-	-
400	430	425	415	S	S	360	L	-	-	-	-	-	-	-
390	400	410	420	410	370	370	L	L	-	-	-	-	-	-
395	380	405	400	425	370	375	L	L	-	-	-	-	-	-
395	L	375	400	L	420	L	L	L	-	-	-	-	-	-
385	390	405	410	410	390	370	390	-	-	-	-	-	-	-
20	23	26	29	24	24	9	1	-	-	-	-	-	-	-
390	400	410	420	410	395	380	-	-	-	-	-	-	-	-
380	380	400	400	400	380	365	-	-	-	-	-	-	-	-
10	20	10	20	10	15	15	-	-	-	-	-	-	-	-

Characteristic: f_oE

IONOSPHERIC DATA
Sweep: 1 Mc to 25 Mc in 0.5 minute
December 1963

Observed at:
Bangkok, Thailand
Lat. 13.73°N, Long. 100.57°E
105°E Mean Time (GMT + 7 hours)

Hour Date	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14
1	-	-	-	-	-	-	-	-	D250R	320H	340H	A	A	B	B
2	-	-	-	-	-	-	-	-	310*	320H	330	B	B	A	B
3	-	-	-	-	-	-	-	-	S	A	A	A	D330S	325	A
4	-	-	-	-	-	-	-	-	S	S	315	D300S	D300S	D310S	D300
5	-	-	-	-	-	-	-	-	S	A	D280R	D300A	D310A	350	37
6	-	-	-	-	-	-	-	-	S	S	A	S	S	B	B
7	-	-	-	-	-	-	-	-	S	S	315	315	330	330	R
8	-	-	-	-	-	-	-	-	S	S	S	S	S	S	B
9	-	-	-	-	-	-	-	-	S	D290A	D300A	D320A	330	360	B
10	-	-	-	-	-	-	-	220	270	290	D290A	320	A	A	A
11	-	-	-	-	-	-	-	-	-	-	320	S	S	S	S
12	-	-	-	-	-	-	S	S	D280A	S	C	035	A	A	31
13	-	-	-	-	-	-	-	-	275	B	A	A	A	325	B
14	-	-	-	-	-	-	-	-	S	R	R	330	A	A	A
15	-	-	-	-	-	-	-	-	-	A	A	U340S	U345S	345	B
16	-	-	-	-	-	-	-	S	280	A	A	C	-	A	31
17	-	-	-	-	-	-	-	-	C	D300R	320	D325A	D320A	350	35
18	-	-	-	-	-	-	-	-	-	A	-	A	A	A	30
19	-	-	-	-	-	-	-	-	S	A	A	S	S	S	A
20	-	-	-	-	-	-	-	-	-	A	A	A	A	A	31
21	-	-	-	-	-	-	-	S	S	B	B	S	-	320	A
22	-	-	-	-	-	-	-	-	S	A	A	-	A	A	30
23	-	-	-	-	-	-	-	S	B	B	S	A	A	A	A
24	-	-	-	-	-	-	-	S	S	A	A	A	A	A	R
25	-	-	-	-	-	-	-	-	265	A	A	A	A	A	A
26	-	-	-	-	-	-	-	-	U290R	A	A	A	S	A	A
27	-	-	-	-	-	-	-	S	A	A	A	A	355	A	A
28	-	-	-	-	-	-	-	200	250	A	300	A	A	S	S
29	-	-	-	-	-	-	-	210	S	B	300	345	350	345	A
30	-	-	-	-	-	-	-	-	B	A	A	A	A	A	A
31	-	-	-	-	-	-	-	-	S	300	B	320	A	R	A
Median	-	-	-	-	-	-	-	210	275	300	315	320	330	350	310
Count	-	-	-	-	-	-	-	3	9	6	11	11	9	10	8
UQ	-	-	-	-	-	-	-	215	285	320	320	330	347	338	330
LQ	-	-	-	-	-	-	-	205	257	290	300	300	315	325	305
QR	-	-	-	-	-	-	-	10	28	30	20	30	32	13	25

* Tabulation of 310 = 3.1 Mc.

A

IONOSPHERIC DATA

weep: 1 Mc to 25 Mc in 0.5 minute

December 1963

09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
320H	340H	A	A	B	B	A	B	-	-	-	-	-	-	-
320H	330	B	B	A	B	A	B	S	-	-	-	-	-	-
A	A	A	D330S	325	A	320H	S	S	-	-	-	-	-	-
S	315	D300S	D300S	D310S	D300A	D290R	A	-	-	-	-	-	-	-
A	D280R	D300A	D310A	350	370A	U280A	280H	D270S	-	-	-	-	-	-
S	A	S	S	B	B	A	A	-	-	-	-	-	-	-
S	315	315	330	330	R	315	U285S	-	-	-	-	-	-	-
S	S	S	S	S	B	290	270	S	-	-	-	-	-	-
D290A	D300A	D320A	330	360	B	340H	265	-	-	-	-	-	-	-
290	D290A	320	A	A	A	280	250	A	-	-	-	-	-	-
-	320	S	S	S	S	295	285	S	-	-	-	-	-	-
S	C	035	A	A	310	D290R	280	-	-	-	-	-	-	-
B	A	A	A	325	B	R	280H	-	-	-	-	-	-	-
R	R	330	A	A	A	305H	D270A	-	-	-	-	-	-	-
A	A	U340S	U345S	345	B	320H	B	-	-	-	-	-	-	-
A	A	C	-	A	310	B	A	S	-	-	-	-	-	-
D300R	320	D325A	D320A	350	350	C	C	C	-	-	-	-	-	-
A	-	A	A	A	305	335H	A	S	-	-	-	-	-	-
A	A	S	S	S	A	A	-	-	-	-	-	-	-	-
A	A	A	A	A	310	320M	S	-	-	-	-	-	-	-
B	B	S	-	320	A	290	S	-	-	-	-	-	-	-
A	A	-	A	A	305	310H	A	-	-	-	-	-	-	-
B	S	A	A	A	A	310	280H	A	-	-	-	-	-	-
A	A	A	A	A	R	320H	265H	-	-	-	-	-	-	-
A	A	A	A	A	A	A	260	-	-	-	-	-	-	-
A	A	A	S	A	A	A	A	A	-	-	-	-	-	-
A	A	A	A	A	A	290	280	S	-	-	-	-	-	-
A	300	A	355	A	S	290	S	-	-	-	-	-	-	-
B	300	345	350	345	A	A	A	S	-	-	-	-	-	-
A	A	A	A	A	A	A	260	A	-	-	-	-	-	-
300	B	320	A	R	A	A	A	A	-	-	-	-	-	-
300	6	11	9	10	8	19	14	1	-	-	-	-	-	-
320	320	330	347	338	330	320	280	-	-	-	-	-	-	-
290	300	300	315	325	305	290	265	-	-	-	-	-	-	-
30	20	30	32	13	25	30	15	-	-	-	-	-	-	-

Characteristic: h'E

IONOSPHERIC DATA
Sweep: 1 Mc to 25 Mc in 0.5 minute

December 1963

Observed at:

Bangkok, Thailand

Lat. 13.73°N, Long. 100.57°E

105°E Mean Time (GMT + 7 hours)

Hour Date	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14
1	-	-	-	-	-	-	-	-	105*	E160S	110	110	110	B	B
2	-	-	-	-	-	-	-	-	E190S	E175A	105	B	B	B	B
3	-	-	-	-	-	-	-	-	S	115	110	105	100	105	S
4	-	-	-	-	-	-	-	-	S	S	105	100	100	E115S	110
5	-	-	-	-	-	-	-	-	110	A	110	115	100	A	A
6	-	-	-	-	-	-	-	-	S	S	105	S	S	B	B
7	-	-	-	-	-	-	-	-	S	S	E115S	110	110	105	105
8	-	-	-	-	-	-	-	-	S	S	S	S	S	S	B
9	-	-	-	-	-	-	-	-	110	105	100	100	100	105	B
10	-	-	-	-	-	-	-	110	110	100	100	100	A	A	A
11	-	-	-	-	-	-	-	-	-	-	110	108	S	S	S
12	-	-	-	-	-	-	S	S	100	S	C	-	A	A	E120S
13	-	-	-	-	-	-	-	-	110	B	A	A	S	100	B
14	-	-	-	-	-	-	-	-	110	105	105	E105S	A	A	-
15	-	-	-	-	-	-	-	-	-	100	A	100	100	100	B
16	-	-	-	-	-	-	-	S	103	A	A	C	-	105	100
17	-	-	-	-	-	-	-	-	C	102	102	101	100	100	E150C
18	-	-	-	-	-	-	-	-	-	105	-	A	A	A	105
19	-	-	-	-	-	-	-	-	S	A	110	S	S	S	100
20	-	-	-	-	-	-	-	-	-	A	A	A	A	A	101
21	-	-	-	-	-	-	-	115	S	B	B	S	-	100	A
22	-	-	-	-	-	-	-	-	U105S	S	105	E110S	105	A	105
23	-	-	-	-	-	-	-	S	B	B	100	A	A	A	A
24	-	-	-	-	-	-	-	110	100	A	A	A	A	A	110
25	-	-	-	-	-	-	-	-	100	E120S	100	E110S	110	110	105
26	-	-	-	-	-	-	-	-	E140S	E130S	A	A	S	B	105
27	-	-	-	-	-	-	-	S	103	100	-	100	100	101	100
28	-	-	-	-	-	-	-	130	100	100	100	100	E105S	S	S
29	-	-	-	-	-	-	-	129	S	B	E115S	102	105	100	110
30	-	-	-	-	-	-	-	-	B	100	A	A	A	S	A
31	-	-	-	-	-	-	-	-	100	103	B	100	A	100	A
Median	-	-	-	-	-	-	-	115	105	105	105	108	100	101	105
Count	-	-	-	-	-	-	-	5	16	15	18	17	13	13	14
UQ	-	-	-	-	-	-	-	129	110	120	110	110	107	105	110
LQ	-	-	-	-	-	-	-	110	100	100	100	100	100	100	100
QR	-	-	-	-	-	-	-	19	10	20	10	10	7	5	10

* Tabulation of 105 = 105 km.

IONOSPHERIC DATA

Sweep: 1 Mc to 25 Mc in 0.5 minute

December 1963

09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
E160S	110	110	110	B	B	120	B	-	-	-	-	-	-	-
E175A	105	B	B	B	B	105	B	S	-	-	-	-	-	-
115	110	105	100	105	S	E165S	105	S	-	-	-	-	-	-
S	105	100	100	E115S	110	115	A	-	-	-	-	-	-	-
A	110	115	100	A	A	110	E170S	E130S	-	-	-	-	-	-
S	105	S	S	B	B	E165S	115	-	-	-	-	-	-	-
S	E115S	110	110	105	105	E170S	105	-	-	-	-	-	-	-
S	S	S	S	S	B	110	115	120	-	-	-	-	-	-
105	100	100	100	105	B	105	109	-	-	-	-	-	-	-
100	100	100	A	A	A	100	110	110	-	-	-	-	-	-
-	110	108	S	S	S	E120S	115	S	-	-	-	-	-	-
S	C	-	A	A	E120S	109	110	-	-	-	-	-	-	-
B	A	A	S	100	B	105	103	-	-	-	-	-	-	-
105	105	E105S	A	A	-	100	110	-	-	-	-	-	-	-
100	A	100	100	100	B	100	B	-	-	-	-	-	-	-
A	A	C	-	105	100	B	A	E120S	-	-	-	-	-	-
102	102	101	100	100	E150C	C	C	C	-	-	-	-	-	-
103	-	A	A	A	105	E160S	105	E130S	-	-	-	-	-	-
A	110	S	S	S	100	105	-	-	-	-	-	-	-	-
A	A	A	A	A	101	100	S	-	-	-	-	-	-	-
B	B	S	-	100	A	E110S	S	-	-	-	-	-	-	-
S	105	E110S	105	A	105	105H	A	-	-	-	-	-	-	-
B	100	A	A	A	A	A	100	A	-	-	-	-	-	-
A	A	A	A	A	110	100	100	-	-	-	-	-	-	-
E120S	100	E110S	110	110	105	100	110	-	-	-	-	-	-	-
E130S	A	A	S	B	105	A	A	115	-	-	-	-	-	-
100	-	100	100	101	100	100	100	S	-	-	-	-	-	-
100	100	100	E105S	S	S	110	S	-	-	-	-	-	-	-
B	E115S	102	105	100	110	103	E105S	S	-	-	-	-	-	-
100	A	A	A	S	A	A	110	A	-	-	-	-	-	-
103	B	100	A	100	A	A	A	A	-	-	-	-	-	-
105	105	108	100	101	105	105	110	120	-	-	-	-	-	-
15	18	17	13	13	14	25	18	6	-	-	-	-	-	-
120	110	110	107	105	110	117	110	130	-	-	-	-	-	-
100	100	100	100	100	100	100	105	115	-	-	-	-	-	-
20	10	10	7	5	10	17	5	15	-	-	-	-	-	-

Characteristic: fbEs

IONOSPHERIC DATA
Sweep: 1 Mc to 25 Mc in 0.5 minute
December 1963

Observed at:
Bangkok, Thailand
Lat. 13.73°N, Long. 100.57°E
105°E Mean Time (GMT + 7 hours)

Hour Date	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14
1	020M	M	M	-	-	S	S	S	S	M	S	036	B	B	B
2	018*	-	020	014	S	-	-	-	S	029	G	B	B	037	B
3	B	S	B	B	B	S	S	025	028	031	033	033	S	S	031
4	B	015M	B	011	-	-	025M	S	S	-	G	G	S	S	033
5	S	S	-	B	-	S	S	S	028	030	034	034	033M	M	-
6	S	B	B	B	S	S	S	S	S	S	035	036	S	B	B
7	019M	M	-	017M	B	-	S	S	S	S	S	S	G	S	B
8	S	B	B	B	S	S	S	S	S	S	-	S	S	S	B
9	S	S	B	B	-	S	S	S	S	030M	031M	034M	G	-	B
10	023M	-	-	018	019	M	026M	-	-	G	031	-	055	M	047
11	-	-	-	-	-	-	-	-	-	-	S	S	S	3	S
12	019M	-	-	M	M	S	S	S	S	S	C	S	035M	036M	S
13	B	015M	015	018	M	-	S	S	S	B	032M	033	039M	S	B
14	S	B	B	S	S	S	M	S	S	S	S	S	036M	049M	034
15	B	B	B	B	S	S	S	S	S	030M	035	S	S	S	B
16	B	B	B	S	S	S	S	S	M	032M	032	C	035	045	G
17	019	B	B	B	S	020	S	M	C	S	M	034M	035	-	C
18	S	S	C	C	C	C	C	C	C	030M	032	043M	040	034M	S
19	S	B	B	-	S	S	S	S	-	031	-	-	042S	048	037
20	B	B	B	B	C	C	B	B	032	034M	090A	037	039	035	-
21	S	S	S	B	B	B	S	S	028	B	034	S	033	S	034
22	S	B	B	S	016	-	S	-	028	033	037M	040	037	037	-
23	S	S	S	B	S	S	S	S	B	B	S	035M	035M	043M	038
24	022	M	S	M	S	S	S	S	S	M	036	035M	040M	038	G
25	S	S	S	B	S	S	S	S	S	033	041	047M	037	034	032
26	B	B	B	B	B	B	S	S	S	034	036	035	034M	034	031
27	018	015	B	S	S	S	S	-	028	030	042M	036M	M	037	035
28	S	B	B	B	S	S	S	S	S	031	S	031	034M	M	S
29	S	S	B	B	B	B	S	S	S	B	-	-	S	S	031
30	024M	M	023	021	B	019M	S	S	B	-	032	034	035	036	035
31	M	M	B	M	M	-	S	B	G	S	B	S	040	S	032
Median Count	019 9	015 3	020 3	018 6	018 2	020 2	026 2	025 1	028 6	031 14	034 17	035 17	035 18	037 14	034 13
UQ	022	015	022	018	-	-	-	-	028	033	036	036	039	043	036
LQ	019	015	018	014	-	-	-	-	028	030	032	034	035	035	031
QR	3	0	4	4	-	-	-	-	0	3	4	2	4	8	5

* Tabulation of 018 = 1.8 Mc.

IONOSPHERIC DATA

Sweep: 1 Mc to 25 Mc in 0.5 minute

December 1963

09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
M	S	036	B	B	B	031	B	S	S	B	S	022	M	028
029	G	B	B	037	B	033	B	S	S	B	B	020M	S	B
031	033	033	S	S	031	B	B	S	S	025	B	020M	B	B
-	G	G	S	S	033	S	028	023	B	S	B	021	S	S
030	034	034	033M	M	-	030	S	S	B	S	020	M	B	-
S	035	026	S	B	B	032	028	028M	S	S	020M	02CM	M	-
S	S	S	G	S	B	S	S	S	S	S	S	S	C	S
S	-	S	S	S	B	S	S	025M	S	-	B	024	019	S
030M	031M	034M	G	-	B	G	G	022	-	-	-	M	022	-
G	031	-	055	M	047M	-	028	021	S	S	019M	B	B	C
-	S	S	S	S	S	S	S	S	S	B	-	M	025M	022
S	C	S	035M	036M	S	S	S	028M	-	-	S	S	B	C
B	032M	033	039M	S	B	B	B	S	S	S	028M	B	B	-
S	S	S	036M	049M	034	B	028	025	035M	042M	B	S	B	S
030M	035	S	S	S	B	B	B	S	-	S	019M	S	B	B
032M	032	C	035	045	G	B	030	S	025M	023	027M	M	022	B
S	M	034M	035	-	C	C	C	C	C	C	C	C	C	S
030M	032	043M	040	034M	S	M	030	026	S	021M	-	S	026M	S
031	-	-	042S	048	037	047M	045	032M	040	040M	S	B	S	S
034M	090A	037	039	035	-	S	S	S	S	-	S	B	S	S
B	034	S	033	S	034	S	-	029	023	S	S	S	S	B
033	037M	040	037	037	-	S	025	026M	S	S	S	S	S	S
B	S	035M	035M	043M	039M	029M	S	024M	020	-	S	-	019	-
M	036	035M	040M	038	G	G	S	S	-	S	S	S	S	S
033	041	047M	037	034	032M	029	S	S	S	S	026	026M	-	B
034	036	035	034M	034	031	034M	024M	019	021	S	M	M	018M	019
030	042M	036M	M	037	035	S	G	026M	-	M	S	-	B	S
031	S	031	034M	M	S	S	S	S	S	S	028M	034M	019M	-
B	-	-	S	S	031	036	033	S	M	S	S	S	M	-
-	032	034	035	036	035	035M	G	024M	S	B	S	-	S	-
S	B	S	040	S	032	029M	030	028	023	-	021	023M	022M	S
031	034	035	035	037	034	032	028	026	023	025	021	022	022	022
14	17	17	18	14	13	11	11	16	7	5	9	9	9	3
033	036	036	039	043	036	035	030	028	035	041	027	027	023	025
030	032	034	035	035	031	029	028	024	021	022	020	020	019	021
3	4	2	4	8	5	6	2	4	14	19	7	7	4	4

Characteristic: foEs

IONOSPHERIC DATA
Sweep: 1 Mc to 25 Mc in 0.5 minute
December 1963

Observed at:
Bangkok, Thailand
Lat. 13.73°N, Long. 100.57°E
105°E Mean Time (GMT + 7 hours)

Hour Date	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14
1	045M	030M	045M	020*	023	S	S	S	S	034M	S	036	B	B	B
2	022	056	026	025	S	-	-	-	S	035	G	B	B	040	B
3	B	S	B	B	B	S	S	030	028	033	033	033	S	S	034
4	B	019M	B	017	017	020	032M	S	S	032	G	G	S	S	036
5	S	S	017	B	021	S	S	S	028	030	034	034	037M	055M	055
6	S	B	B	B	S	S	S	S	S	S	S	S	S	B	B
7	034M	029M	021	025M	B	020	S	S	S	S	035	036	S	B	B
8	S	B	B	B	S	S	S	S	S	S	S	S	G	S	B
9	S	S	B	B	016	S	S	S	S	S	032	S	S	S	B
10	033M	019	019	029	032	030M	035M	032	034	038M	060M	039M	G	035	B
11	-	-	-	-	-	-	-	-	-	G	032	033	087	075M	076M
12	027.1	020	017	021M	022M	S	S	S	S	S	C	S	S	S	S
13	B	025M	025	029	029M	026	S	S	S	B	045M	038	044M	056M	S
14	S	B	B	S	S	S	029M	S	S	S	S	S	065M	063M	039
15	B	B	B	B	S	S	S	S	S	039M	059	S	S	S	B
16	B	B	B	S	S	S	S	S	S	048M	055	C	046	051	G
17	026	B	B	B	S	020	S	045M	C	S	037M	043M	040	041	C
18	S	S	C	C	C	C	C	C	C	036M	042	082M	070	055M	S
19	S	B	B	022	S	S	S	S	031	033	-	042	052S	053	047
20	B	B	B	B	C	C	B	B	039	055M	090A	058	039M	035	035
21	S	S	S	B	B	B	S	S	028	B	034	S	039	S	041
22	S	B	B	S	021	022	S	029	035	035	039M	044	044	043	034
23	S	S	S	B	S	S	S	S	B	B	S	041M	064M	067M	066M
24	042	025M	S	019M	S	S	S	S	S	049M	046	046M	063M	045	G
25	S	S	S	B	S	S	S	S	S	034	049	055M	037	034	045M
26	B	B	B	B	B	B	S	S	S	034	036	037	055M	035	043
27	021	017	B	S	S	S	S	030	044	044	045M	045M	041M	049	046
28	S	B	B	E	S	S	S	S	S	031	S	031	042M	052M	S
29	S	S	B	B	B	B	S	S	S	B	-	033	S	S	031
30	043M	080M	044	026	B	026M	S	S	B	034	042	037	037	039	036
31	043M	026M	B	055M	042M	025	S	B	G	S	B	S	036	S	045
Median	034	025	023	025	022	023	032	030	034	034	041	038	043	049	042
Count	10	11	8	11	9	8	3	5	9	18	18	20	20	19	16
UQ	043	030	035	029	030	026	034	038	041	039	046	044	059	055	046
LQ	026	019	018	020	021	020	030	030	028	033	034	035	039	039	036
QR	17	11	17	9	9	6	4	8	13	6	12	9	20	16	10

* Tabulation of 020 = 2.0 Mc.

IONOSPHERIC DATA

ep: 1 Mc to 25 Mc in 0.5 minute

December 1963

09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
034M	S	036	B	B	B	031	B	S	S	B	S	030	035M	035
035	G	B	B	040	B	033	B	S	S	B	B	045M	S	B
033	033	033	S	S	034	B	B	S	S	029	B	026M	B	B
032	G	G	S	S	036	S	035	030	B	S	B	029	S	S
030	034	034	037M	055M	055	033	S	S	B	S	034	022M	B	021
S	035	036	S	B	B	032	031	044M	S	S	028M	027M	025M	032
S	S	S	G	S	B	S	S	S	S	S	S	S	C	S
S	032	S	S	S	B	S	S	031M	S	019	B	037	030	S
038M	060M	039M	G	035	B	G	G	031	030	031	021	032M	025	026
G	032	033	087	075M	076M	032	028	021	S	S	035M	B	B	C
-	S	S	S	S	S	S	S	S	S	B	055	068M	031M	046
S	C	S	044M	056M	S	S	S	045M	031	027	S	S	B	C
B	045M	038	043M	S	B	B	B	S	S	S	031M	B	E	-
S	S	S	065M	063M	039	B	041	040	056M	058M	B	S	B	S
039M	059	S	S	S	B	B	B	S	022	S	027M	S	B	B
048M	055	C	046	051	G	B	033	S	030M	037	053M	056M	029	B
S	037M	043M	040	041	C	C	C	C	C	C	C	C	C	S
036M	042	082M	070	055M	S	038M	030	031	S	030M	030	S	043M	S
033	-	042	052S	053	047	057M	050	052M	072	077M	S	B	S	S
055M	090A	058	039M	035	035	S	S	S	S	029	S	B	S	S
B	034	S	039	S	041	S	032	040	045	S	S	S	S	B
035	039M	044	044	043	034	S	030	045M	S	S	S	S	S	S
B	S	041M	064M	067M	066M	037M	S	037M	026	024	S	025	026	043
049M	046	046M	063M	045	G	G	S	S	021	S	S	S	S	S
034	049	055M	037	034	045M	029	S	S	S	S	055	041M	036	B
034	036	037	055M	035	043	049M	033M	030	030	S	031M	045M	030M	022
044	045M	045M	041M	049	046	S	G	049M	029	026M	S	028	B	S
031	S	031	042M	052M	S	S	S	S	S	S	034M	075M	023M	026
B	-	033	S	S	031	043	043	S	040M	S	S	S	055M	037
034	042	037	037	039	036	077M	G	042M	S	B	S	027	S	026
S	B	S	036	S	045	046M	047	030	037	025	055	063M	044M	S
034	041	038	043	049	042	037	033	038	030	029	034	032	030	029
18	18	20	20	19	16	13	12	16	13	12	13	17	13	10
039	046	044	059	055	046	047	042	044	042	034	054	051	039	037
033	034	035	039	039	036	032	031	031	028	026	029	027	026	026
6	12	9	20	16	10	15	11	13	14	8	25	24	13	11

Characteristic: h'Es

IONOSPHERIC DATA
Sweep: 1 Mc to 25 Mc in 0.5 minute
December 1963

Observed at:
Bangkok, Thailand
Lat. 13.73°N, Long. 100.57°E
105°E Mean Time (GMT + 7 hours)

Hour Date	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14
1	110*	110	100	100	110	S	S	S	S	110	S	130	B	B	1
2	110	-	100	100	S	-	-	-	S	105	G	B	B	100	1
3	B	S	B	B	B	S	S	125	125	125	125	125	S	S	0
4	B	100	B	115	100	100	100	S	S	115	G	G	S	S	1
5	S	S	130	F	100	S	S	S	140	110	140	105	100	100	0
6	S	B	B	B	S	S	S	S	S	S	130	130	S	B	1
7	101	101	125	100	B	100	S	S	S	S	S	S	G	S	1
8	S	B	B	B	S	S	S	S	S	S	105	S	S	S	1
9	S	S	B	B	105	S	S	S	S	110	100	105	G	105	1
10	100	100	100	100	100	100	100	100	100	G	105	100	099	100	0
11	-	-	-	-	-	-	-	-	-	-	S	S	S	S	0
12	100	105	110	103	100	S	S	S	S	S	C	S	100	100	1
13	B	100	100	100	100	100	S	S	S	B	100	105	100	S	1
14	S	B	B	S	S	S	100	S	S	S	S	S	100	099	0
15	B	B	B	B	S	S	S	S	S	100	100	S	S	S	0
16	B	B	B	S	S	S	S	S	S	103	105	100	C	100	1
17	100	B	B	B	S	099	S	100	C	S	110	110	107	100	0
18	S	S	C	C	C	C	C	C	C	105	100	100	100	-	1
19	S	B	B	100	S	S	S	S	140	120	115	120	110S	110	1
20	B	B	B	B	C	C	B	B	115	101	100	101	105	110	1
21	S	S	S	B	B	B	S	S	130	B	120	S	100	S	0
22	S	B	B	S	120	115	S	125	115	105	108	110	110	103	1
23	S	S	S	B	S	S	S	S	B	B	S	095	095	099	0
24	100	100	S	095	S	S	S	S	S	100	100	100	099	099	0
25	S	S	S	B	S	S	S	S	S	110	110	105	110	105	1
26	B	B	B	B	B	B	S	S	S	120	100	120	105	110	1
27	090	090	B	S	S	S	S	130	109	105	110	101	102	100	1
28	S	B	B	B	S	S	S	S	S	110	S	110	100	100	1
29	S	S	B	B	B	B	S	S	S	B	-	101	S	S	1
30	100	099	098	099	B	099	S	S	B	100	100	100	099	100	0
31	100	100	B	099	095	099	S	B	G	S	B	S	100	S	0
Median	100	100	100	100	100	100	100	125	115	108	105	105	100	100	10
Count	10	10	8	11	9	8	3	5	9	18	20	20	20	18	1
UQ	101	101	127	100	108	107	100	128	135	110	113	115	105	105	10
LQ	100	100	100	099	100	099	100	100	106	105	100	101	100	100	0
QR	1	1	27	1	8	8	0	28	29	5	13	14	5	5	0

* Tabulation of 110 = 110 km.

IONOSPHERIC DATA

Sweep: 1 Mc to 25 Mc in 0.5 minute

December 1963

08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
S	110	S	130	B	B	B	160	B	S	S	B	S	120	120	110
S	105	G	B	B	100	B	115	B	S	S	B	S	105	S	B
125	125	125	125	S	S	090	B	B	S	S	110	B	100	B	B
S	115	G	G	S	S	110	S	115	110	B	S	B	100	S	S
140	110	140	105	100	100	095	110	S	S	B	S	101	105	B	100
S	S	130	130	S	F	B	160	120	111	S	S	103	101	100	101
S	S	S	S	G	S	B	S	S	S	S	S	S	S	C	S
S	S	105	S	S	S	B	S	S	115	S	115	B	105	103	S
S	110	100	105	G	105	B	G	G	112	115	100	129	115	100	105
100	G	105	100	099	100	099	100	150	140	S	S	100	B	B	C
-	-	S	S	S	S	S	S	S	S	S	B	110	103	109	105
S	S	C	S	100	100	S	S	S	105	100	100	S	S	B	C
S	B	100	105	100	S	B	B	F	S	S	S	110	B	B	-
S	S	S	S	100	099	095	E	125	120	110	110	B	S	B	S
S	100	100	S	S	S	B	B	B	S	115	S	110	S	B	B
103	105	100	C	100	110	G	B	-	S	100	105	105	103	100	B
C	S	110	110	107	100	C	C	C	C	C	C	C	C	C	S
C	105	100	100	100	-	S	100	145	120	S	099	110	S	105	S
140	120	115	120	110S	110	110	105	105	100	105	092	S	B	S	S
115	101	100	101	105	110	101	S	S	S	S	105	S	B	S	S
130	B	120	S	100	S	099	S	105	099	095	S	S	S	S	B
115	105	108	110	110	103	105	S	100	099	S	S	S	S	S	S
B	B	S	095	095	099	099	095	S	095	110	110	S	100	100	100
S	100	100	100	099	092	G	G	S	S	090	S	S	S	S	S
S	110	110	105	110	105	105	115	S	S	S	S	100	100	099	B
S	120	100	120	105	110	105	100	105	115	100	S	099	119	115	090
109	105	110	101	102	100	100	S	G	090	090	095	S	090	B	S
S	110	S	110	100	100	S	S	S	S	S	S	110	103	090	100
S	B	-	101	S	S	120	110	100	S	099	S	S	S	120	110
B	100	100	100	099	100	099	095	G	090	S	B	S	099	S	110
G	S	B	S	100	S	099	095	095	090	090	110	100	100	099	S
115	108	105	105	100	100	100	105	125	097	100	105	105	103	100	103
9	18	20	20	20	18	16	13	11	16	13	12	13	17	13	10
135	110	113	115	105	105	105	115	125	111	110	110	110	105	112	110
106	105	100	101	100	100	099	100	100	108	095	100	100	100	100	100
29	5	13	14	5	5	6	15	25	3	15	10	10	5	12	10

8

Characteristic: Type of Es

IONOSPHERIC DATA

Sweep: 1 Mc to 25 Mc in 0.5 minutes

December 1963

Observed at:

Bangkok, Thailand

Lat. 13.73°N, Long. 100.57°E

105°E Mean Time (GMT + 7 hours)

Hour Date	00	01	02	03	04	05	06	07	08	09	10	11	12	13
1	f6	f	f	f	f	-	-	-	-	l	-	h	h	-
2	f	8f	f3	f	-	-	-	-	-	l	-	-	-	l
3	-	-	-	-	-	-	-	l	cl	c	-	c	-	-
4	-	f	f	f	f	f	f	-	-	n	-	-	-	-
5	-	f	f	-	f	-	-	f	h	lh	h	c	l	l
6	-	-	f	-	-	-	-	-	-	-	h	h	-	-
7	f	f	f	f	f	f	-	-	-	-	-	-	-	-
8	-	-	-	-	-	-	-	-	-	-	c	-	-	-
9	7g	-	-	-	f	-	-	-	-	c	l	l	-	l
10	f	f	f	f	f	f	f4	l	l	-	c	c	l3	l
11	-	-	-	-	-	-	-	-	-	-	-	-	-	-
12	f	f	f	f	f	-	-	-	-	-	-	-	l	l
13	-	f2	f	f	f	f	-	-	-	-	l	l	c	-
14	-	-	-	-	-	-	f	-	-	-	-	-	l	l
15	-	-	-	-	-	-	-	-	-	l	l	-	-	-
16	-	-	-	-	-	-	-	-	-	l	l	-	l	c
17	f	-	f	f	-	f	-	l	-	-	c	c	c	c
18	-	-	-	-	-	-	-	-	-	c	l	l	l	l
19	-	-	-	f	-	-	-	-	h	lh	c	c	c	c
20	-	-	-	-	-	-	-	-	l	l	l	l	l	l
21	-	-	-	-	-	-	-	-	c	-	c	-	l	-
22	-	-	-	-	f	f	-	f	c	c	c	c	c	c
23	-	-	-	-	-	-	-	-	-	-	-	l	l	l3
24	f3	f	-	f	f	-	-	-	-	l2	l2	l	l	f
25	-	-	-	-	-	-	-	l	-	c	c	c	c	c
26	-	-	-	-	-	-	-	-	-	c	hl	cl	c	c
27	f	f	-	-	-	-	-	c	c	l	c	c	c	c
28	-	f	-	-	-	-	-	-	-	c	-	c	c	l
29	-	-	-	-	-	-	-	-	-	-	-	l	-	-
30	f	f2	f	f	-	f	-	-	-	ch	l	lh	lh	cl
31	f2	f	-	f3	f	f	-	-	-	-	-	c	l	-
Median	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Count	-	-	-	-	-	-	-	-	-	-	-	-	-	-
UQ	-	-	-	-	-	-	-	-	-	-	-	-	-	-
LQ	-	-	-	-	-	-	-	-	-	-	-	-	-	-
QR	-	-	-	-	-	-	-	-	-	-	-	-	-	-

IONOSPHERIC DATA

weep: 1 Mc to 25 Mc in 0.5 minute

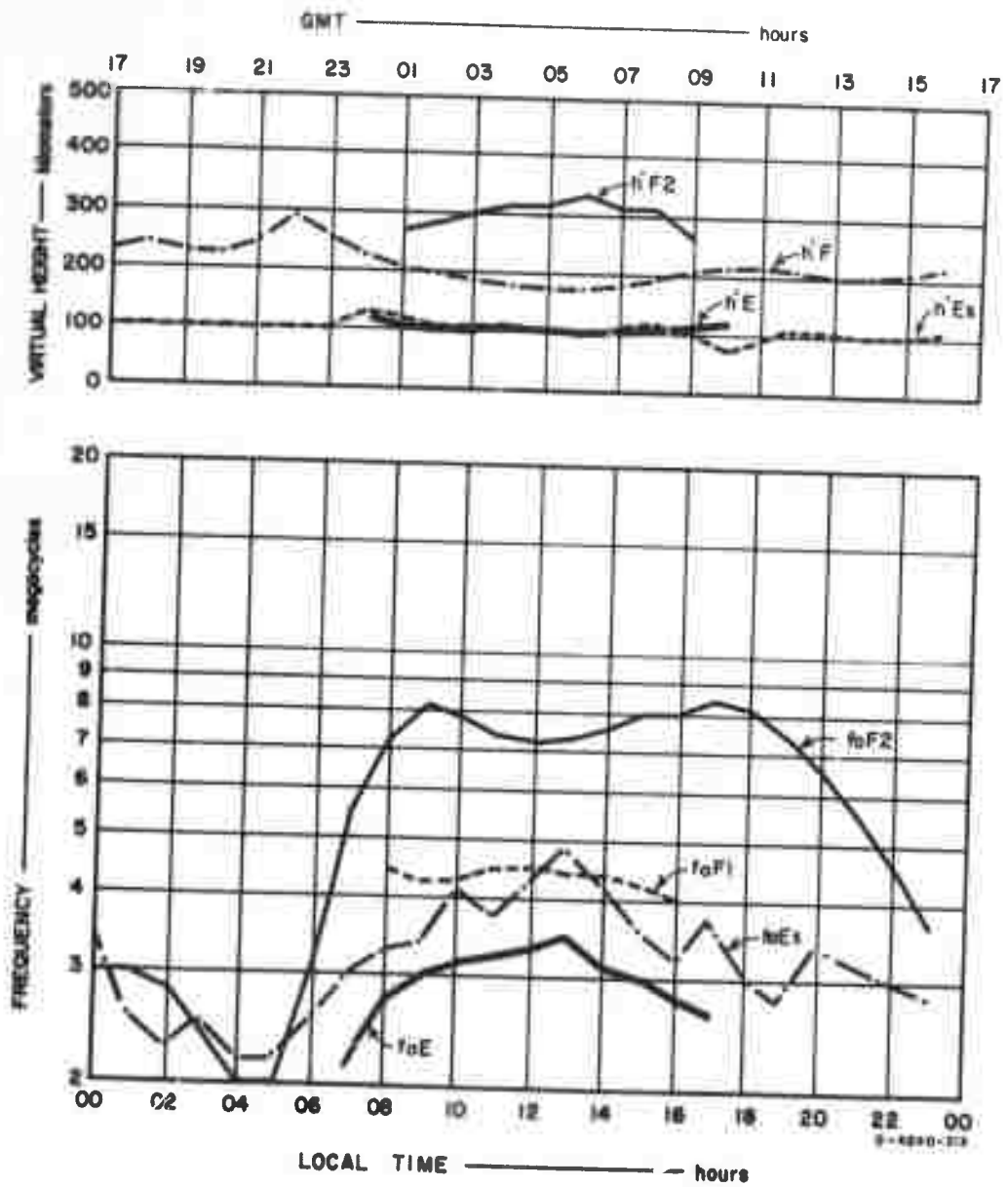
December 1963

09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
l	-	h	h	-	-	h	-	-	-	-	-	f	f	f4
l	-	-	-	l	-	c	-	-	-	-	-	f3	-	-
c	c	c	-	-	l	-	-	-	-	f	-	f	-	-
n	-	-	-	-	c	-	n	f	-	-	-	f	-	-
lh	h	c	l	l	l2	c	-	-	-	-	f	f	-	f
-	h	h	-	-	n	h	c	3f	-	-	f	f	f	f2
-	-	-	-	-	-	-	-	-	-	-	-	-	f	-
-	c	l	-	l	7g	-	-	c	-	f	-	f	3f	-
-	c	c	l3	l	l3	l	h	f	f	f3	f	f	f	f
-	-	-	-	-	-	-	-	n	-	-	f	-	-	-
-	l	l	l	l	-	-	-	f	f	f	-	f3	f	f
-	-	-	c	-	-	c	-	-	-	-	f	-	-	-
l	l	-	l	l	l	-	c	-	f5	f2	f	f	f	-
l	l	-	l	c	c	l	l	-	f	f	f	-	f	-
-	c	c	c	c	-	-	-	-	-	-	-	-	-	-
lh	c	l	l	l	-	l	h	h	-	f	f	-	f	-
l	l	c	c	c	c	c	f	f	f	f	-	-	-	-
-	c	-	l	-	l	-	l	f	-	-	-	-	-	-
-	c	c	c	c	c	c	l	f	f	-	-	-	-	-
l2	l2	l	l	l3	l	l	-	lh	f	f	-	f	f	f
c	c	c	c	c	c	c	-	-	-	-	f	-	-	-
c	hl	cl	c	c	c	l	l	f	f3	-	f	f3	f	-
l	c	c	c	c	-	-	-	l	f	f	-	f	-	f
c	-	c	c	l	-	c	-	-	-	-	f3	-	f	-
-	-	l	-	-	c	l	c2	-	f3	-	-	-	-	f
ch	l	lh	lh	cl	lc	l	-	l	-	-	f	f	-	f
-	-	c	l	-	l	l	l	lc	f	f	f3	f	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

MEDIAN VALUES DECEMBER 1963

Hour Local	fmin (Mc)	foF2 (Mc)	M(3000)F1	h'F2 (km)	h'F (km)	foF1 (Mc)	M(3000)F2	foE (Mc)	h'E (km)	fbEs (Mc)	foEs (Mc)	h'Es (km)
00	1.6	3.0	3.35	-	230	-	-	-	-	1.9	3.4	100
01	1.5	3.0	3.40	-	245	-	-	-	-	1.5	2.5	100
02	1.5	2.9	3.52	-	230	-	-	-	-	2.0	2.3	100
03	1.5	2.4	3.50	-	230	-	-	-	-	1.8	2.5	100
04	1.6	2.0	3.45	-	250	-	-	-	-	1.8	2.2	100
05	1.7	2.0	3.20	-	290	-	-	-	-	2.0	2.3	100
06	1.8	2.9	3.35	-	255	-	-	-	-	2.6	3.2	100
07	2.5	5.4	3.50	-	225	-	-	2.10	115	2.5	3.0	125
08	2.7	7.1	3.35	270	210	4.4	4.00	2.75	105	2.8	3.4	115
09	2.6	8.2	3.15	283	200	4.2	3.85	3.00	105	3.1	3.4	108
10	2.5	7.3	3.00	305	190	4.3	3.90	3.15	105	3.4	4.1	105
11	2.8	7.2	2.75	310	182	4.5	4.05	3.20	108	3.5	3.8	105
12	2.2	7.2	2.80	312	185	4.5	4.10	3.30	100	3.5	4.3	100
13	2.9	7.3	2.70	330	180	4.4	4.10	3.50	101	3.7	4.9	100
14	2.8	7.5	2.85	310	180	4.4	3.90	3.10	105	3.4	4.2	100
15	2.5	8.0	2.90	310	200	4.2	3.70	3.05	105	3.2	5.7	105
16	2.3	8.1	3.05	265	210	4.0	3.90	2.80	110	2.8	3.3	105
17	2.0	8.5	3.28	-	225	-	-	2.70	120	2.6	3.8	97
18	1.8	8.2	3.40	-	220	-	-	-	-	2.3	3.0	100
19	1.8	7.3	3.50	-	215	-	-	-	-	2.5	2.9	105
20	1.8	6.5	3.35	-	210	-	-	-	-	2.1	3.4	105
21	1.8	5.7	3.50	-	210	-	-	-	-	2.2	3.2	103
22	1.8	4.6	3.55	-	215	-	-	-	-	2.2	3.0	100
23	1.7	3.7	3.55	-	220	-	-	-	-	2.2	2.9	103

IONOSPHERIC DATA
MONTHLY MEDIAN CHARACTERISTICS
BANGKOK, THAILAND
DECEMBER 1963



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RESEARCH
INSTITUTE**

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