การหาค่าการหักเหของคลื่นวิทยุและค่าสัมประสิทธิ์รัศมีความโค้งของโลกสำหรับการแผ่กระจายคลื่นวิทยุในประเทศไทย

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วิทยานิพนธ์นี้เป็นส่วนหนึ่งของการศึกษาตามหลักสูตรปริญญาวิศวกรรมศาสตรมหาบัณฑิต
แผนกวิชาวิศวกรรมไฟฟ้า
บัณฑิตวิทยาลัย จุฬาลงกรณมหาวิทยาลัย
พ.ศ. 2520

THE DETERMINATION OF RADIO WAVE REFRACTIVITY AND EARTH EFFECTIVE RADIUS COEFFICIENT FOR RADIO WAVE PROPAGATION IN THAILAND

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A Thesis Submitted in Partial Fulfillment of the Requirements

for the Degree of Master of Engineering

Department of Electrical Engineering

Graduate School

Chulalongkorn University

1977

บัณฑิตวิทยาลัย จุฬาลงกรณมหาวิทยาลัย อนุมัติให้นับวิทยานิพนธ์ฉบับนี้เป็นส่วนหนึ่งของการศึกษาตามหลักสูตรปริญญามหาบัณฑิต

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วิทยานิพนธ์เรื่อง การหาค่าการหักเหของคลื่นวิทยุและค่าสัมประสิทธิ์รัศมีความโค้งของโลกสำหรับการแผ่กระจายคลื่นวิทยุในประเทศไทย

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ชื่อ นายบัณฑิต พฤกษาเมธานันท์ แผนกวิชาวิศวกรรมไฟฟ้า

ปีการศึกษา 2520

บทคัดย่อ

วิทยานิพนธ์นี้แสดงการคำนวณหาค่าการหักเหของคลื่นวิทยุบนพื้นผิวและค่าสัมประสิทธิ์รัศมีความโค้งของโลก ตามบรรยากาศในประเทศไทย โดยใช้ข้อมูลของบรรยากาศ ที่กรมอุตุนิยมวิทยากระทรวงคมนาคมได้เก็บรวบรวมไว้ โดยใช้ข้อมูลของอุณหภูมิ, ความดันและความชื้นสัมพัทธ์บนพื้นผิว ในช่วงปี 2493–2513 ซึ่งมีทั้งหมด 46 สถานี ทำการเขียนเป็นแผนภูมิแสดงเส้นของค่าการหักเหของคลื่นวิทยุบนพื้นผิวที่เท่ากันโดยแยกเป็นในแต่ละเดือนและสรุปเป็นปี สำหรับการหาค่าสัมประสิทธิ์รัศมีความโค้งของโลก ได้ใช้ข้อมูลของอุณหภูมิ, ความดันและความชื้นสัมพัทธ์ในช่วงปี 2509–2513 ซึ่งข้อมูลเหล่านี้ได้มาจากสถานีตรวจอากาศ 4 แห่ง ซึ่งเป็นสถานีตรวจอากาศที่ใช้ราดิโอซอนด์วัดข้อมูลคือ กรุงเทพฯ, เชียงใหม่, สงขลา, อุบลราชธานี ซึ่งในวิทยานิพนธ์นี้หาได้ 1.64 และได้ทำการหาความสัมพันธ์ระหว่างค่าการหักเหของคลื่นวิทยุพื้นผิว กับค่าสัมประสิทธิ์รัศมีความโค้งของโลก ซึ่งสำหรับประเทศไทยจะได้ $K=1/(1 + 0.00104\ N_s$ ซึ่งประโยชน์ที่ได้รับ และสิ่งที่จะต้องทำการค้นคว้าวิจัยต่อไปได้กล่าวไว้แล้วในบทสรุปและวิจารณ์

Thesis Title : The Determination of Radio Wave Refractivity and Earth Effective Radius Coefficient For Radio Propagation in Thailand

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Academic Year : 1977

ABSTRACT

The work in this thesis is concentrated on the evaluation of the radio wave refractivity at the surface of the earth (N_s), earth effective radius coefficient (K), and the relation between them in Thailand. The meteorological data from 46 stations in Thailand during the period 1951 to 1970 are used to evaluate the radio wave refractivity, and the data measured by radiosonde during the period 1966 to 1970 at Bangkok, Chiengmai, Songkhla, and Ubon Ratchathani are used to evaluate the earth effective radius coefficient. These data are made available by Meteorological Department, Ministry of Communications. The mean value of the earth effective radius coefficient is found equal to 1.64 and the relation between the radio wave refractivity at the surface of the earth, and the earth effective radius coefficient is $K=1/(1+0.00104\ N_s)$. The usefulness of these values in designing radio communication system is discussed in this thesis.

ACKNOWLEDGMENT

The author wishes to express his gratitude to Asst. Prof. Dr. Narong Yoothanom, of Department of Electrical Engineering, Chulalongkorn University, his main thesis adviser, for his helpful guidance and encouragements. Also at the same affiliation with his advisor, Dr. Prasit Prapinmongkolkarn gave him a great number of discussions.

Thanks also to Mr. Sutham Malila, Mr. Olan Piantham, Mr. Sukit Therawatanawit and Mr. Prawuthi Kosolchiboon, all of Telephone Organization of Thailand. On top of this the burden of data collection would not have been so convenient without the helping hands of Commander Damrong Charoensook and Commander Sawai Soontarosot, both of the Meteorological Department, Ministry of Communications.

The author devotes all good parts of this thesis to his mother and everyone who has given him assistances, encouragements and motivation.

TABLE OF CONTENTS

		Page
ABSTRACT (THAI)		IV
ABSTRACT (ENGLISH)		V
ACKNOWLEDGMENT		VI
LIST OF SYMBOLS		VIII
LIST OF TABLES		IX
LIST OF ILLUSTRATIONS		XI
CHAPTER		
I	INTRODUCTION	1
II	THEORY	3
III	METHOD OF CALCULATION	15
IV	RESULTS	57
V	APPLICATIONS OF K FACTOR	143
VI	CONCLUSION AND SUGGESTION FOR FUTURE WORK	152
BIBLIOGRAPHY		155
APPENDIX		
I	METEOROLOGICAL DATA	158
II	RADIOSONDE DATA	204
III	SATURATION VAPOUR TABLE	216
IV	COMPUTER PROGRAM	220
VITA		221

LIST OF SYMBOLS

E	applied electric field (volt/m)
K	radio wave propagation constant
$\overline{K}$	mean value of radio wave propagation constant
N	radio wave refractivity (N-Unit)
$\overline{N}$	mean value of radio wave refractivity (N-Unit)
N_s	radio wave refractivity at the surface of the earth (N-Unit)
$\overline{N}_s$	mean value of radio wave refractivity at the surface of the earth (N-Unit)
P	atmospheric pressure (mb)
T	absolute temperature (°K)
a	true earth's radius (Km)
a_e	effective earth's radius (Km)
c	velocity of light in vacuum (3×10^8 m/sec.)
d	distance (Km)
e	water vapour pressure (mb)
e_s	saturated water vapour pressure (mb)
h	height (Km)
h_k	effective height of the surface (Km)
n	radio wave refractive index
s	distance along the surface of the earth (Km)
v	phase velocity (m/sec.)
ρ	gas density (Kg/m^3)
θ	angle between ray part and the surface of constant refractive index
σ	standard deviation.

LIST OF TABLES

Table No.		Page
1	The climatological data for the period 1951-1970 at Chiang Rai.	18
2	The results calculated from climatological data for the period 1951-1970 at Chiang Rai	19
3	The results calculated from meteorological data at Ubon Ratchathani weather station for the period 1966-1970 in January.	36
4	The value of earth effective radius coefficient and constant b	38
5	The relation between N_s, K and N_s, a_e	40
6	The results calculated from climatological data for radio wave refractivity at the surface of the earth during the period 1951-1970 of 46 stations	56
7	The results calculated from the radiosonde data during the period 1966-1970 at Bangkok weather station.	79
8	The results calculated from the radiosonde data during the period 1966-1970 at Chiang Mai weather station	82

Table No.		Page
9	The results calculated from the radiosonde data during the period 1966-1970 at Songkhla weather station	85
10	The results calculated from the radiosonde data during the period 1966-1970 at Ubon Ratchathani weather station.	88

LIST OF ILLUSTRATIONS

Figure		Page
1.	The derivation of Snell's law for the curved earth	5
2.	Geometry for determination of ray bending	7
3.	Earth geometry for curvature CE	7
4.	Geometry for curved earth representation for modified earth radius	9
5.	Value of h_k	12
6.	Map of radio wave refractivity at the surface of the earth in annual for the period 1951-1970 in Thailand	20
7.	Map of radio wave refractivity at the surface of the earth in January for the period 1951-1970 in Thailand	21
8.	Map of radio wave refractivity at the surface of the earth in February for the period 1951-1970 in Thailand	22
9.	Map of radio wave refractivity at the surface of the earth in March for the period 1951-1970 in Thailand	23
10.	Map of radio wave refractivity at the surface of the earth in April for the period 1951-1970 in Thailand	24
11.	Map of radio wave refractivity at the surface of the earth in May for the period 1951-1970 in Thailand	25
12.	Map of radio wave refractivity at the surface of the earth in June for the period 1951-1970 in Thailand	26
13.	Map of radio wave refractivity at the surface of the earth in July for the period 1951-1970 in Thailand	27
14.	Map of radio wave refractivity at the surface of the earth in August for the period 1951-1970 in Thailand	28
15.	Map of radio wave refractivity at the surface of the earth in September for the period 1951-1970 in Thailand	29
16	Map of radio wave refractivity at the surface of the earth in October for the period 1951-1970 in Thailand	30

Figure		Page
17	Map of radio wave refractivity at the surface of the earth in November for the period 1951-1970 in Thailand.	31
18	Map of radio wave refractivity at the surface of the earth in December for the period 1951-1970 in Thailand.	32
18a	Graphs showing the seasonal variations of N_s	33
19	Graph showing radio wave refractivity versus height at Ubon Ratchathani weather station during the period 1966-1970 in January.	37
20	Graph showing the relation between the radio wave refractivity at the surface of the earth and the earth effective radius.	41
21	Graph showing the relation between the radio wave refractivity at the surface of the earth and the earth effective radius coefficient	42
22	Map of earth effective radius coefficient of Thailand In annual.	43
23	Map of earth effective radius coefficient of Thailand in January.	44
24	Map of earth effective radius coefficient of Thailand in February.	45
25	Map of earth effective radius coefficient of Thailand in March	46
26	Map of earth effective radius coefficient of Thailand in April.	47
27	Map of earth effective radius coefficient of Thailand in May.	48

Figure		Page
28	Map of earth effective radius coefficient of Thailand in June	49
29	Map of earth effective radius coefficient of Thailand in July	50
30	Map of earth effective radius coefficient of Thailand in August	51
31	Map of earth effective radius coefficient of Thailand in Septemper	52
32	Map of earth effective radius coefficient of Thailand in October	53
33	Map of earth effective radius coefficient of Thailand in November	54
34	Map of earth effective radius coefficient of Thailand in December.	55
35	Graph showing radio wave refractivity and height at Bangkok weather station in January.	91
36	Graph showing radio wave refractivity and height at Bangkok weather station in February.	92
37	Graph showing radio wave fefractivity and height at Bangkok weather station in March.	93
38	Graph showing radio wave refractivity and height at Bangkok weather station in April.	94
39	Graph showing radio wave refractivity and height at Bangkok weather station in May.	95
40	Graph showing radio wave refractivity and height at Bangkok weather station in June.	96
41	Graph showing radio wave refractivity and height at Bangkok weather station in July.	97
42	Graph showing radio wave refractivity and height at Bangkok weather station in August.	98

Figure		Page
43	Graph showing radio wave refractivity and height at Bangkok weather station in September.	99
44	Graph showing radio wave refractivity and height at Bangkok weather station in October.	100
45	Graph showing radio wave refractivity and height at Bangkok weather station in November.	101
46	Graph showing radio wave refractivity and height at Bangkok weather station in December.	102
47	Graph showing radio wave refractivity and height at Bangkok weather station in annual.	103
48	Graph showing radio wave refractivity and height at Chiang Mai weather station in January.	104
49	Graph showing radio wave refractivity and height at Chiang Mai weather station in February	105
50	Graph showing radio wave refractivity and height at Chiang Mai weather station in March.	106
51	Graph showing radio wave refractivity and height at Chiang Mai weather station in April.	107
52	Graph showing radio wave refractivity and height at Chiang Mai weather station in May.	108
53	Graph showing radio wave refractivity and height at Chiang Mai weather station in June.	109
54	Graph showing radio wave refractivity and height at Chiang Mai weather station in July.	110
55	Graph showing radio wave refractivity and height at Chiang Mai weather station in August.	111
56	Graph showing radio wave refractivity and height at Chiang Mai weather station in September	112

Figure		Page
57	Graph showing radio wave refractivity and height at Chiang Mai weather station in October.	113
58	Graph showing radio wave refractivity and height at Chiang Mai weather station in November.	114
59	Graph showing radio waver refractivity and height at Chiang Mai weather station in December.	115
60	Graph showing radio wave refractivity and height at Chiang Mai weather station in annual.	116
61	Graph showing radio wave refractivity and height at Songkhla weather station in January.	117
62	Graph showing radio wave refractivity and height at Songkhla weather station in February.	118
63	Graph showing radio wave refractivity and height at Songkhla weather station in March.	119
64	Graph showing radio wave refractivity and height at Songkhla weather station in April.	120
65	Graph showing radio wave refractivity and height at Songkhla weather station in May.	121
66	Graph showing radio wave refractivity and height at Songkhla weather station in June.	122
67	Graph showing radio wave refractivity and height at Songkhla weather station in July	123
68	Graph showing radio wave refractivity and height at Songkhla weather station in August.	124
69	Graph showing radio wave refractivity and height at Songkhla weather station in September	125
70	Graph showing radio wave refractivity and height at Songkhla weather station in October	126

Figure		Page
71	Graph showing radio wave refractivity and height at Songkhla weather station in November	127
72	Graph showing radio wave refractivity and height at Songkhla weather station in December	128
73	Graph showing radio wave refractivity and heihgt at Songkhla weather station in annual.	129
74	Graph showing radio wave refractivity and height at Ubon Ratchathani weather station in January	130
75	Graph showing radio wave refractivity and height at Ubon Ratchathani weather station in February	131
76	Graph showing radio wave refractivity and height at Ubon Ratchathani weather station in March.	132
77	Graph showing radio wave refractivity and height at Ubon Ratchathani weather station in April.	133
78	Graph showing radio wave refractivity and height at Ubon Ratchathani weather station in May	134
79	Graph showing radio wave refractivity and height at Ubon Ratchathani weather station in June	135
80	Graph showing radio wave refractivity and height at Ubon Ratchathani weather station in July.	136
81	Graph showing radio wave refractivity and height at Ubon Ratchathani weather station in August	137
82	Graph showing radio wave refractivity and height at Ubon Ratchathani weather station in September	138
83	Graph showing radio wave refractivity and height at Ubon Ratchathani weather station in October	139
84	Graph showing radio wave refractivity and height at Ubon Ratchathani weather station in November	140

Figure		Page
85	Graph showing radio wave refractivity and height at Ubon Ratchathani weather stationin December	141
86	Graph showing radio wave refractivity and height at Ubon Ratchathani weather station in annual	142
87	Path profile of K = 1.6 showing the designning of antenna height for the microwave route from Bangkok to Chachoengsao	146
88	Path profile of K = 4/3 showing the designning of antenna height for the microwave route from Bangkok to Chachoengsao.	147
89	The received signal plotted in variation with time of the receiver at Chachoengsao with the antenna height 62.5 m. above mean sea level.	148
90	The received signal plotted in variation with time of the receiver at Chachoengsao with the antenna height 62.5 m. above mean seallevel.	149
91	The received signal plotted in variation with time of the receiver at Chachoengsao with the antenna height 79 m above mean sea level	150
92	The received signal plotted in variation with time of the receiver at Chachoengsao with the antenna height 79 m above mean sea level.	151