

การหาค่าการหักเหของคลื่นวิทยุและกำลังประสิทธิผลที่มี  
ความโค้งของโลกสำหรับการแผ่กระจายคลื่นวิทยุในประเทศไทย



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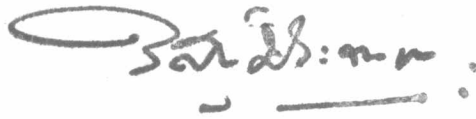
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THE DETERMINATION OF RADIO WAVE REFRACTIVITY  
AND EARTH EFFECTIVE RADIUS COEFFICIENT FOR RADIO WAVE  
PROPAGATION IN THAILAND

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บัณฑิตวิทยาลัย จุฬาลงกรณ์มหาวิทยาลัย อนุมัติให้บัณฑิตวิทยาลัยนี้เป็นส่วนหนึ่งของ  
การศึกษาตามหลักสูตรปริญญาโทบัณฑิต



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วิทยานิพนธ์เรื่อง การหาค่าการหักเหของคลื่นวิทยุและค่าสัมประสิทธิ์รีฟรัคทีฟที่มีความโค้งของโลก  
สำหรับการแผ่กระจายคลื่นวิทยุในประเทศไทย

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บทคัดย่อ

วิทยานิพนธ์นี้แสดงการคำนวณหาค่าการหักเหของคลื่นวิทยุบนพื้นผิวและค่าสัมประสิทธิ์รีเฟร็กทีฟความโค้งของโลก ตามบรรยากาศในประเทศไทย โดยใช้ข้อมูลของบรรยากาศ ที่กรมอุตุนิยมวิทยากระทรวงคมนาคมได้เก็บรวบรวมไว้ โดยใช้ข้อมูลของอุณหภูมิ, ความชื้นและความชื้นสัมพัทธ์บนพื้นผิว ในช่วงปี 2493-2513 ซึ่งมีทั้งหมด 46 สถานี ทำการเขียนเป็นแผนภูมิแสดงเส้นของการหักเหของคลื่นวิทยุบนพื้นผิวที่เท่ากันโดยแยกเป็นใน แต่ละ เเค่ละ เคื่อนและสรุปเป็นปี สำหรับการหาค่าสัมประสิทธิ์รีเฟร็กทีฟความโค้งของโลก ได้ใช้ข้อมูลของอุณหภูมิ, ความชื้นและความชื้นสัมพัทธ์ในช่วงปี 2509-2513 ซึ่งข้อมูลเหล่านี้ได้มาจากสถานีตรวจอากาศ 4 แห่ง ซึ่งเป็นสถานีตรวจอากาศที่ใช้ราคาโอโซนก็วัดข้อมูลคือ กรุงเทพฯ, เชียงใหม่, สงขลา, อุบลราชธานี ซึ่งในวิทยานิพนธ์นี้หาได้ 1.64 และได้ทำการหาความสัมพันธ์ระหว่างค่าการหักเหของคลื่นวิทยุบนพื้นผิว กับค่าสัมประสิทธิ์รีเฟร็กทีฟความโค้งของโลก ซึ่งสำหรับประเทศไทยจะได้  $k = 1 / (1 + 0.00104 N_0)$  ซึ่งประโยชน์ที่ได้รับ และสิ่งที่จะต้องทำการค้นคว้าวิจัยต่อไปได้กล่าวไว้แล้วในบทสรุปและวิจารณ์

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

Name : Mr. Pundit Purksamathanan

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#### 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, Chiangmai, 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.



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## LIST OF SYMBOLS

E	applied electric field (volt/m)
K	radio wave propagation constant
$\bar{K}$	mean value of radio wave propagation constant
N	radio wave refractivity (N-Unit)
$\bar{N}$	mean value of radio wave refractivity (N-Unit)
$N_s$	radio wave refractivity at the surface of the earth (N-Unit)
$\bar{N}_s$	mean value of radio wave refractivity at the surface of the earth (N-Unit)
P	atmospheric pressure (mb)
T	absolute temperature ( $^{\circ}$ K)
a	true earth's radius (Km)
$a_e$	effective earth's radius (Km)
c	velocity of light in vacuum ( $3 \times 10^8$ 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.)
$\rho$	gas density ( $\text{Kg/m}^3$ )
$\theta$	angle between ray part and the surface of constant refractive index
$\sigma$	standard deviation.



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