ANTENNAS AND PROPAGATION

Modeling, Simulation & Measurements

Edited by

MD. RAFIQUL ISLAM B.Sc.,M.Sc.,Ph.D.,MIEEE
International Islamic University Malaysia

JALEL CHEBIL B.Sc.,M.Sc.,Ph.D.,MIEEE
International Islamic University Malaysia

IIUM PRESS

INTERNATIONAL ISLAMIC UNIVERSITY MALAYSIA

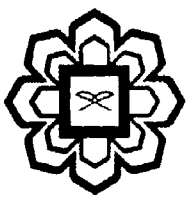
ANTENNAS AND PROPAGATION:

Modeling, Simulation & Measurements

Edited by

MD. RAFIQUL ISLAM B.Sc.,M.Sc.,Ph.D.,MIEEE
International Islamic University Malaysia

JALEL CHEBIL B.Sc.,M.Sc.,Ph.D.,MIEEE
International Islamic University Malaysia



IIUM Press

Published by:
IIUM Press
International Islamic University Malaysia

First Edition, 2011

Perpustakaan Negara Malaysia Cataloguing-in-Publication Data

Md. Rafiqul Islam & Jalel chebil: Antennas and Propogation: Modeling, Simulation & Measurements
Bibliography p.
Includes Index
ISBN

ISBN: 978-967-418-138-3

Member of Majlis Penerbitan Ilmiah Malaysia – MAPIM
(Malaysian Scholarly Publishing Council)

Printed By:
IIUM PRINTING SDN.BHD.
NO. 1, JALAN INDUSTRI BATU CAVES 1/3
TAMAN PERINDUSTRIAN BATU CAVES
BATU CAVES CENTRE POINT
68100 BATU CAVES
SELANGOR DARUL EHSAN
TEL: +603-6188 1542 / 44 / 45 FAX: +603-6188 1543
EMAIL: iiumprinting@yahoo.com

Table of Content

Chapter 22

A Matlab Program for Predicting Rain Rate and Rain Attenuation Distributions in Malaysia

Jalel Chebil[1] and Tharek Abd. Rahman[2]

22.1 Introduction

The advancement in information technology has now become an integral part in the socio-economic development of countries. The development of the Malaysia's Multimedia Super corridor is the country recognition of this fact in the light of the current information explosion. Updating and maintaining an advanced telecommunications infrastructure is one of the key point in the development of information technology. One of the major problems faced by many communication systems operating at frequencies above 10 GHz in Malaysia is the degradation of the radiowave propagation because of the high intensity rainfall in this region. This restricts the path length of microwave system and the use of higher microwave frequencies for line-of-sight and satellite communication. The knowledge of the rain attenuation at the frequency of operation is extremely required for the design of a reliable communication system at a particular location. Although many predicting models were described in the literature, they may not be applicable to the Malaysian environment due to the lack of rainfall and rain attenuation data with one-minute integration time in this region. The Universiti Teknologi Malaysia (UTM) had started a compaign to collect rainfall and rain attenuation data in Malaysia for several years. In this chapter, the collected data with the appropriate analytical conversions are used to develop a MATLAB program for predicting the one-minute rain rate and rain attenuation values at any location in Malaysia for any frequency above 10 GHz.

22.2 BACKGROUND INFORMATION

This section reviews the fundamental theories used in the prediction of rain rate and rain attenuation distribution.

22.2.1 ITU-R Rain Attenuation Model

At frequency range above 10 GHz, radio waves propagating through rain are attenuated because of absorption and scattering of transmitted energy. Some energy is absorbed by water, which is a lossy dielectric medium, and the other is scattered by the rain droplets in all direction [1]. This results in the attenuation of the transmitted energy. The development

[1] *Department of Electrical and Computer Engineering, Kulliyyah of Engineering International Islamic University Malaysia (IIUM)*

[2] *Wireless Communication Centre, Faculty of Electrical Engineering, University of Technology Malaysia, Locked bag 791, 80990 Johor Bahru, Malaysia*