

ANTENNAS AND PROPAGATION

Modeling, Simulation & Measurements

Edited by

MD. RAFIQUUL ISLAM B.Sc., M.Sc., Ph.D., MIEEE
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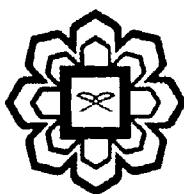
INTERNATIONAL ISLAMIC UNIVERSITY MALAYSIA

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Chapter 26

Propagation Study on Rain Attenuation at 18 GHz in Malaysia

Jalel Chebil¹ and Tharek Abd. Rahman²

26.1 Abstract

Designing line of sight (LOS) or satellite link systems require the knowledge of the rain attenuation statistics in the location of interest in order to predict accurately the future link performance and availability. This paper reports the result of more than one year measurement of rain attenuation of 18 GHz horizontally polarized microwave signals in Malaysia. It is shown that the ITU-R's predictions underestimate significantly the specific rain attenuation as well as the accumulated time of attenuation exceeding preset levels. It is recommended to re-evaluate the parameters values in the ITU-R rain attenuation model in order to use it in tropical region.

26.2 Introduction

Attenuation due to rainfall can severely degrade the radio wave propagation at frequencies above 10 GHz. It restricts the path length of microwave system and the use of higher microwave frequencies for line-of-sight and satellite communication. Since the tropical climate in Malaysia is characterized by high intensity rainfall, then 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 rain attenuation data in this region. The Universiti Teknologi Malaysia (UTM) in collaboration with CELCOM Sdn. Bhd. had collected rainfall and rain attenuation data in Malaysia. In this chapter, the results of rain attenuation measurements over one year period from February 1996 to January 1997 are reported and compared with the ITU-R [1] values.

26.3 Background Information

The simplest model for the specific rain attenuation γ (dB/km) which is adopted by the ITU-R assumes a power-law relationship between γ and the rain rate R (mm/h). It is expressed as

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