

ANTENNAS AND PROPAGATION

Modeling, Simulation & Measurements

Edited by

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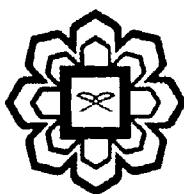
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Chapter 31

Modeling of Wet Antenna Losses for Frequencies 15-38 GHz

Md Rafiqul Islam¹, Jalel Chebil¹ and Tharek Abd. Rahman²

31.1 Introduction

The measured rain attenuation is due to the effect of rain on propagation path and the effect of rain on antenna. This effect of rain on radome surface or on the parabolic reflector and on the feed window is significant at higher frequencies. Recent studies show that this loss affects the measurement of rain attenuation [1-3]. No physical or theoretical antenna wetting models are available in literature for terrestrial line-of-sight links at frequency range 15 GHz to 38 GHz. In order to measure this loss, a water sprayer test was conducted and the results are presented in this chapter. An analytical approach has also been proposed for the calculation of wet antenna loss from the measured rain rate and rain attenuation statistics at 15, 23, 26 and 38 GHz bands. The results are also presented. Thus a physical model for wet antenna effects at these frequency bands has been developed for Malaysian environment.

The measured rain attenuation is the attenuation on propagation path and the wet antenna effects. A water spray test was conducted for the estimation of wet antenna effects on experimental microwave links. An analytical approach is also proposed for the calculation of wet antenna losses.

31.2 Wet Antenna Effects

31.2.1 Water Spray Test

A series of water spray tests were performed on three antennas installed at the roof of WCRL in UTM Skudai Campus. The diameter of all antennas are 0.6 m and the operating frequencies are 23, 26 and 38 GHz bands. Two antennas operated at 25 and 37.06 GHz are covered by radomes and the other one is exposed to atmosphere. All antennas are parabolic in shape and are functioning as a receiver of 300 m LOS terrestrial link.

The water spray test was done by controlling the nozzle position of the hose pipe. A water vessel having capacity of 1200 Gal was brought to the nearest position of the

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