ANTENNAS AND PROPAGATION

Modeling, Simulation & Measurements

Edited by

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Chapter 30

Antenna Losses Due To Rainfall And Its Effect On The Rain Attenuation Measurements

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

30.1 Introduction

A microwave link at 18.585 GHz, horizontally polarized, was set up between two points inside the Universiti Teknologi Malaysia-Skudai campus (UTM-Skudai) at a separation of 300m. The data collection system is controlled by a computer which operates 24 hours with a sampling rate of one second. The rain attenuation measurements started since 1st of August 1995. Along the microwave link path, a 0.5 mm tipping bucket rain gauge is installed to measure the rain rate with 1-min integration time. The measured data should represent the attenuation due to rain on the propagation path. Unfortunately, the measured data contains some other losses which are due to rain effect on antennas. These losses are unwanted and must be filtered out in order to estimate the desired rain attenuation due to propagation path with good accuracy. The losses due to rainfall on the antenna are determined by the details of the installation such as the shape and condition of the antenna surface and the positioning of the antenna [1-4]. The antenna used is of parabolic shape with 4 feet diameter and it is positioned vertically. This position prevents large amount of water from accumulating on the antenna surface. Both receiving and transmitting antennas are not covered by any radome thus exposing the antenna feeds and reflecting surfaces to rain. Since no theoretical information is available for estimating these losses, several tests were performed as it will be explained in the coming section.

30.2 Tests for Wet Antenna Losses

In the first test, the antenna surface and its feeder are sprayed separately for about 2 minutes. It is observed that during the spray the feeder losses reach 3 dB and the surface losses reach about 0.2 dB as indicated in Figure 30.1. When the water is turned off, the surface losses persist for few minutes, then decreases to zero. For the feeder, its losses decreases sharply to about 0.5 dB, then decreases slowly to zero. Undoubtedly, these losses are caused by the presence of water as layer or as drops on the antenna which dries out with time. The effect of water on the antenna feeder is quiet large and definitely affect the accuracy of the collected data. These losses can be minimized by covering the antenna by a radome.

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