A DEVELOPMENT OF SLANT PATH RAIN ATTENUATION STATISTIC USING SYNTHETIC STORM TECHNIQUE

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ABSTRACT

Frequencies above 10 Ghz has become primary interest nowadays in satellite communication. However, it can be easily distracted due to the rain. Basically the aim for this project is to develop a slant path rain attenuation using Synthetic storm Technique. In this project, a few important parameters which is rain rate series per one minute at selected location is being converted to rain space series at horizontal or slant path using storm translation speed or commercial name "synthetic storm technique". The prediction was being tested at 11.6GHz at MEASAT-3 satellite with two years rain rate data. Study has been carried out to see how SST prediction model works and its reliable and it physical mathematical approach for developing slant path. This mathematical approach is actually to simply match the long term statistic of rain for example yearly cumulative distribution. An accurate elevation calculation that caused by the environment for the high frequency is needed in order to fully utilized the coverage during rain. The methodologies that have been used in this study were the comprehensive mathematical modeling which is Synthetic storm technique, UTM Semarak is selected location involved in the study also some reference document such as ITU-R document for comparison and referral purposed. This study has succeed to obtain a similar result by comparing to result obtained from previous study done in another country. The findings will help to make the affects of rain become less representatives, in other word, rain will be excluded partially or totally when small sample is available.

ABSTRAK

Secara amnya, objektif dalam melaksanakan projek ini adalah untuk menentukan taburan hujan dalam bentuk siri masa dapat di modelkan dalam penggunaan model matematik teknik "synthetic storm". Beberapa parameter atau nilai-nilai masukan yang penting dalam menentakan taburan hujan iaitu taburan hujan dalam bentuk siri yang diambil setiap 1 minit di lokasi yang dikehendaki dengan penggunaan halaju angin atau penterjemahan halaju kilat dengan berdasarkan satelit MEASAT-3. Model matematik ini diuji pada frekuensi 11.6 GHz dan berdasarkan data selama dua tahun. Penyelidikan ini bertujuan untuk melihat bagaimana "Synthetic Storm Technique" ini berfungsi dan sejauh mana model matematik boleh diharapkan dalam menentukan jangkaan taburan hujan ini. Ketepatan pengiraan sudut ketinggian pada frekuensi tinggi perlu agar dapat keseluruhan frekuensi dapat digunakan ketika hujan. Metodologi yang digunakan dalam projek ini adalah penggunaan model matematik yang menyeluruh iaitu "Synthetic Storm Technique". Pemilihan lokasi bagi projek ini iaitu UTM, Semarak, Kuala Lumpur serta dokumen rujukan seperti dokumen ITU-R sebagai perbandingan dan bahan rujukan. Keputusan yang di peroleh hasil dari penyelidikan ini adalah berjaya kerana hasil keputusan adalah hampir sama dengan hasil-hasil kajian dari kajian sebelum ini. Secara keseluruhan, hasil penyelidikan ini dapat mengurangkan kesan kehilanngan isyarat ketika hujan sebahagian atau keseluruhan.

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CHAPTER 1

INTRODUCTION

1.0 Review

There are many new developments in satellite communication technology. Frequency that is above 10Ghz are now become primary interest in satellite communication links. However satellite communication links are easily can be affected by huge rain attenuation.

1.1 Objectives of this project

In this research, we will develop a slant path rain attenuation using the Synthetic Storm Technique (SST) physical mathematical model technique. This includes analyzing rainfall rate measurement in UTM, Semarak and

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