

UAE MAPPED ATTENUATION AT RF FREQUENCIES (UAE-MARF)

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1. INTRODUCTION

Although the Ku-band has been widely used for satellite communications in temperate regions, there has been a limited usage of it for commercial operations. The effects of different factors like rain and aggregate on Ku-band satellite signals have not been fully quantified [1]. With the increasing use of the C-band, operators may soon have no choice but to move to the Ku-band, particularly if the demand for TV up linking is high [2]. The Ku-band is split into multiple segments that vary by geographical region as defined by the ITU [3]. Tropical Rainfall Measuring Mission (TRMM) is the first space mission dedicated to quantitatively measuring tropical and subtropical rainfall which is one of the most important and least-known parameters affecting the global climate system. TRMM was launched into a low earth orbit in late November 1997 operating at a frequency of 13.8 GHz. The TRMM orbit is circular and is at an altitude of 218 nautical miles (350 km) and an inclination of 35 degrees to the Equator. This places the satellite's precipitation radar (PR) frequency in the Ku-band. Currently, the satellite orbits the earth about 15 to 16 times everyday making in excess of 9000 scans every orbit. Each time a scan is made the radar sweeps through -17 to 17 degree (relative to nadir) taking about 49 separate cross-track scans. The major objective of TRMM is to increase our understanding of global climate change through space-based measurements of tropical rainfall and Earth radiation. This paper develops both theoretical (Microphysical) and experimental models for the prediction of attenuation and reflectivity of satellite signals at Ku-band in the UAE. The theoretical model gives a detailed study on the effect of the attenuation and the reflectivity due to the increase of the frequency or the density of different hydrometeor. The experimental model, which is based on actual measurements obtained from NASA, is used to extract the required precipitation radar (PR) products. By apply the image analysis techniques on the PR data for one whole year (2000), a graphical representation of attenuation at Ku-band in the UAE is obtained. Results of this paper are vital for the successful design of satellite TV broadcast systems in the UAE operating at Ku-band. This system is used to determine exact earth location from TRMM PR data then processes these data into images.

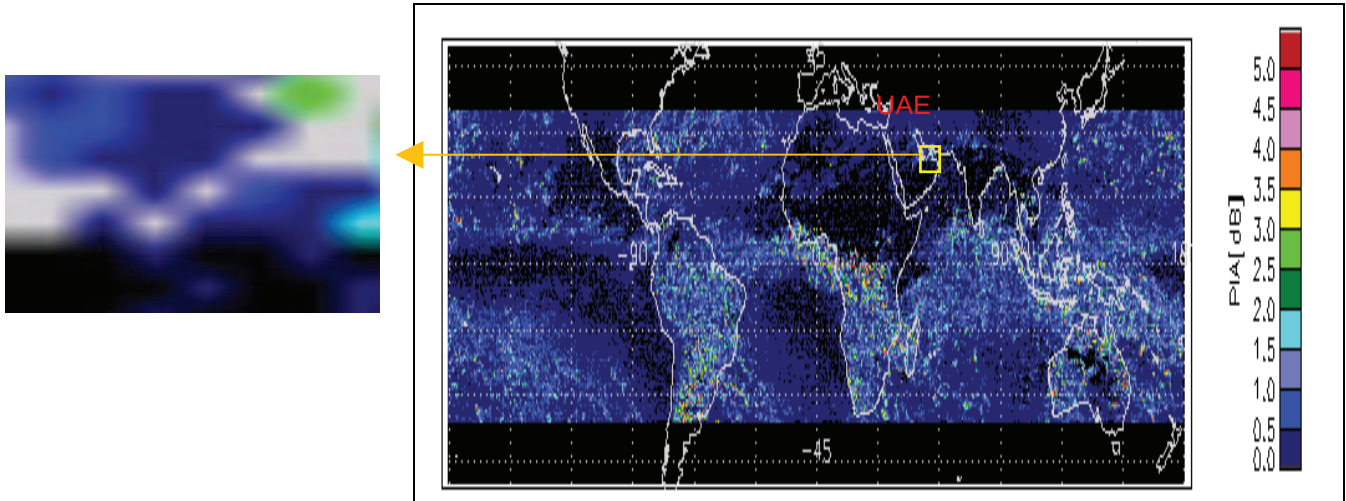


Figure 1: GLOBAL and UAE map of attenuation at Ku-band at Jan 2000

The system consists of two elements. The first element is the TRMM satellite, which records the information about the covered areas. The second element is the computer working station, which runs the system using MATLAB software. TRMM satellite is sending microwave towards the earth and then receiving the reflected waves. These reflected waves containing the information about the objects that in the way of the waves and then TRMM satellite process these information and store it as a HDF files. MATLAB codes were used to convert HDF files format to Binary format in order to study and plot images of the coverage area. Also MATLAB can be used as an image processing tool to process the images that plotted by using TRMM data.

2. REFERENCES

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