UNIVERSITI TEKNOLOGI MARA

CLUTTER DISTRIBUTION ANALYSIS OF A TROPICAL FOLIAGE CLUTTER FOR DIFFERENT ENVIRONMENTS BASED ON FSR MICRO-SENSOR NETWORK

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ABSTRACT

Comparison of four different environments (border, seaside, free space and forest) on measuring the wind clutter using forward scatter radar (FSR) operates in ultra-high and very high frequency (UHF and VHF) bands is analyzed in this paper. In this project, clutter level ranging from low, medium, strong and very strong on each locations were studied. The pattern of wind clutter level measurement characteristics is investigated and executed using distribution models at different operating frequencies as well as comparing the data distributions of four different locations in order to identify the best distribution model. Sample of data in form of Real Strength Signal Indicator (RSSI) signals is evaluated using five distributions model (Log-Normal, Log-Logistic, Gamma, Weibull and Nakagami). This comparison justified that Border suits the best location as the strongest clutter area amidst Seaside and Free space, while Forest is determined as the lowest clutter area as the accurate distribution of clutter model. The parameters of the five distributions are evaluated using maximum likelihood estimation (MLE) approach followed by Goodness of Fit (GOF) method by using Root Mean Square Error (RMSE) test to prove the best distributions among. Gamma distribution model is discovered as the best distribution model in this research for foliage clutter for all cases of frequency bands and four environments.

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CHAPTER 1
INTRODUCTION

1.1 BACKGROUND OF STUDY

Radar is the acronym for radio detection and ranging. This system of radar merely identify, measure and discover the reflected objects' speed using electromagnetic waves. The echo of the signals that reflected from the objects is received through the radar system as well as transmitting electromagnetic waves out to the space [1].

Radar system which navigates through radio waves can be used to determine the velocity, movement and angle of the object. Radar configuration is divided into two types which are monostatic and bistatic radar. Monostatic radar is where the transmitter and receiver are collocated while bistatic having a considerable distance between the transmitter and receiver to expected target distance.

Forward scatter radar operation enhance the measured signal in forward direction with such condition depending on operation wavelength of the signal, targets' physical size and unaffected by the stealth techniques that are currently passive. The signal strength of forward scatter with same power transmitted by transmitter rise as operating frequency of the signal increase. Despite the fact that it increases with the frequency, the cross section of high forward scatter radar' extent of angular region lessened. This proved that trade off concerning coverage and sensitivity's optimization parameters in meeting the requirements of the system detection.

A region exists in a system of forward scatter radar closely between transmitter and receiver base line encountered with the direct signal, hold approximately as zero content of Doppler reflected signals. Detection of the target might be limited due to this feature, which of operational frequency function, velocity of the target, geometry of the system and the resolution of Doppler whose depending on integration time, time of beam transit and performance of the equipment. This restriction is affected by actual signal of Doppler that being generated. Instead of that, the forward scatter radar detection performance could be bounded by several factors if the transmitter and receiver present in direct line of sight such as; receiver handling capability of maximum