SIERPINSKI CARPET FRACTAL ANTENNA WITH CIRCULAR SHAPED DEFECTED GROUND STRUCTURE (DGS)

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Peace and blessings of Allah be upon Prophet Muhammad.

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ABSTRACT

This work presents the design, simulation and fabrication of a Sierpinski carpet fractal antenna with circular shaped defected ground structure (DGS). The proposed antenna was designed and simulated at the centre frequency of 5.8 GHz and fabricated on Rogers RT/Duroid 5880 substrate with relative permittivity, ε_r of 2.2, substrate thickness, h of 0.381 mm and copper thickness, t of 0.017 mm. Computer Simulation Technology (CST) software was used in designing and simulation. Measurements of the parameters of the antenna were carried out by using Vector Network Analyzer (VNA). The antenna was designed with a circular shaped DGS. The performance of the antenna was improved through the position of the circular shaped DGS. Performance of the antenna was discussed in term of return loss (S_{11}), voltage standing wave ratio (VSWR) and radiation pattern.

This work was discussed of performance of the fractal antenna which was to see the comparison between different number of iterations and second discussion was done with the implementation of DGS and without DGS. The results from the simulation and measurement was compared and discussed. The measurement result for center frequency was 5.74 GHz and the return loss was 49.094 dB. Both the measured and simulated values concur well and satisfied the specification. The antenna has achieved unidirectional pattern and at the same time reduced in size and dimension. The antenna can be used for RFID application.

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CHAPTER 1

INTRODUCTION

1.1 INTRODUCTION

Antenna is defined as a means for radiating or receiving radio waves [1]. In other words, antenna is a guiding device operating between free-space to emitting and receiving electromagnetic energy in the form of radio frequency (RF) and microwave. A typical antenna involved of metal conductor where the transmission line is either a coaxial line or a waveguide [2]. The application of the antenna itself has advances modern wireless communication systems and at the same time the demand for antennas have increase dramatically where the size is the main concern.

Microstrip antennas became very popular in the 1970's primarily for space-borne applications. These antennas consist of a metallic patch on a grounded substrate. The metallic patch can take many different configurations. However, the rectangular and circular patches are most popular because of ease of analysis and fabrication. Microstrip antenna normally smaller than any other type of antennas and lightweight which is feasible to be constructed on any type of substrate. It is low profile, compatible to planar and non-planar surfaces, simple and inexpensive to fabricate using modern printed-circuit technology, mechanically robust when mounted on rigid surfaces, compatible with MMIC designs, and very versatile in terms of resonant frequency, polarization, pattern, and impedance [3]. Despite of that, the major disadvantages of the microstrip patch antenna are narrow bandwidth, low gain and low efficiency [4].