DESIGN OF RECTANGULAR MICROSTRIP PATCH ANTENNA INCORPORATED WITH METAMATERIAL AND DGS STRUCTURE

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ABSTRACT

This thesis presents a microstrip rectangular patch antenna incorporated with metamaterial and Defected Ground Structure (DGS) structure. The antenna operating at 2.4GHz for wireless application. By incorporating the Circular rings Defected Ground Structure (DGS) fabricated on the ground plane R03003 substrate, this antenna is having metamaterial properties. Nicholson-Ross-Weir (NRW) method was employed to verify the metamaterial structure that possessed negative values of permittivity (ε_r) and permeability (μ_r). Computer Simulation Technology Microwave Studio (CST-MWS) has been used to solve the problem of statements. Vector Network Analyzer (VNA) has been used to measure the fabricated antenna.

The results of novel antenna are very encouraging as it increases the value of total bandwidth and return loss (S_{11}) about 12.48% and 16.22%, respectively. Besides that, it has been successfully reducing size of the substrate of RMPA about 16.67%.

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CHAPTER 1

INTRODUCTION

1.1 INTRODUCTION

Antenna acts as transformer, it has two modes of operation either transmitter or a receiver. In transmission mode, the antenna will change the electrical signal guided by the wire or wave guide into a propagating free space wave. While in reception mode, it does the reverse process where it captures the electromagnetic wave and transform it back to electrical signal.

With increasing rapidly requirements especially for wireless communication system, the demand for smaller antenna plays a major role in the reliability and performance of the system. Without the proper design of the antenna, the signal generated by the Radio Frequency (RF) system will not be transmitted properly and only minimum of signal can be detected at the receiver. One of the most popular type of antenna is the microstrip patch antenna (MPA).

MPA first took form in the early 1970's [1], and interest was renewed in the first microstrip antenna proposed by Deschamps in 1953 [2]. The microstrip patch antennas (J. R. James & P. S. Hall, 1989) has increasingly wide range of applications in wireless communication systems due to their great benefits such as easy to handle and low cost, low power handling capability of printed circuits and reduction in size which the printed circuits are thin and thus require less volume than their waveguide. Despite these advantages, microstrip antennas present major challenges to the designer due to an inherently narrow bandwidth; typically 1-5%, low gain and poor polarization [3]. Simply, microstrip structure consists of a thin sheet of low-loss