ENHANCEMENT OF RECTANGULAR SHAPE ANTENNA WITH ELECTROMAGNETIC BAND GAP (EBG) AT 6GHZ

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With the name of ALLAH Most Gracious Most Merciful

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ABSTRACT

This thesis presents the design, analysis, simulation, fabrication and measurement of Rectangular Shape Antenna using Metamaterial Structures with Electromagnetic Band Gap (EBG) and also investigates the potential properties of the proposed antenna use in C-band application. The proposed and the conventional rectangular patch antenna are designed at a center of operating frequency of 6 Ghz to meet the WLAN applications. The antenna design was simulated by using Rogers RO3003 as the substrate of the antenna. All the simulation work for both patch antennas was design by using Computer Simulation Technology (CST) Microwave Environment Studio. Metamaterial characteristic which is exhibit negative permittivity and permeability of the proposed EBG structures have been verified using Nicolson Ross Weir (NRW) method. The performance of the potential properties for both antennas was then compared in term of directivity, gain, return loss, bandwidth and the size of patch antenna. As a result of combining the rectangular patch with EBG structure, the potential properties of the proposed antenna increase such as return loss (S11), Voltage Standing Wave Ratio (VSWR) and size of the antenna patch reduces to a great extent in comparison to the rectangular patch without EBG. The return loss (S11) for both antennas meet the specification of -10 dB cut off.

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CHAPTER 1

INTRODUCTION

1.1 BACKGROUND OF PROJECT

Microsrtip patch antennas are currently one of the fastest growing segments in the telecommunications industry all over the world. It promises to become the preferred and reliable medium of telecommunications in the future. This microstrip patch antennas are the most common form of printed antennas. They are popular for their low profile geometry, light weight and low cost [1]. These antennas have many advantages when compared to conventional antennas and hence have been used in a wide variety of applications ranging from mobile communication to satellite, aircraft and other applications. This microstrip patch antenna also widely used in microwave frequency region because of compability with PCB Printed Circuit Board technology and its simplicity to manufacture the antenna [2].

Similarly, electromagnetic band gap (EBG) structures have attracted much attention in the recent years in the microwave community for its unique properties. These structures are periodic in nature that forbids the propagation of all electromagnetic surface waves within a particular frequency band called the bandgap thus permitting additional control of the behavior of electromagnetic waves other than conventional guiding and/or filtering structures [4]. EBG structures are dielectrics which can alter the propagation of electromagnetic waves in certain direction and certain frequency bands. It can prominently achieve surface wave suppression to minimize cross talk between neighboring devices and improving antenna efficiency by acting as a perfect magnetic