Metamaterial Patch Antenna with Electromagnetic Band Gap (EBG) Structure for WLAN Application

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Peace and blessings of Allah be upon Prophet Muhammad

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ABSTRACT

This paper presents a rectangular microstrip patch antenna with electromagnetic band gap (EBG) structures at the ground plane is applied for wireless local area network (WLAN).The antenna is designed to resonate at the 5 GHz frequency. The combination of the rectangular microstrip patch antenna is fabricated on top of the substrate Rogers RO5880 with dielectric constant of 2.2 and substrate thickness is 0.508 mm. Simulations and measurements have been carried out to verify the performance of EBG structures in patch antenna. All the simulation and measurement work is done by using Computer Simulation Technology (CST) software. Vector Network Analyzer (VNA) has been used to measure the fabricated antenna. The designs are divided into two categories that are a conventional antenna without EBG and real antenna with EBG. Furthermore, this work is mainly focused on improving the performance of patch antenna and reducing the size of antenna by applying EBG structures. All the calculation, simulation result and measurement regarding this design also provided. The results of antenna are very encouraging as it increases the value of bandwidth and return loss (S_{11}).

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CHAPTER 1

INTRODUCTION

1.1 BACKGROUND

The advanced development of wireless communication systems required a very effective and smart patch antenna. Microstrip patch antenna plays a very important role. Furthermore, this antenna is commonly used as printed antennas in practice. The advantages of patch antenna meet the specification for WLAN application. This antenna is very low profile, inexpensive, light weight, simple and comfortable to planar or nonplanar surface [1].However, microstrip patch antenna had its weakness, like low gain and directivity, small bandwidth, small wavelength and the signals will reflect back to the source. This will produce side lobe and back lobe [2].There are methods that can overcome this problem, like increasing the height of the substrate to increase efficiency and bandwidth. Due to this action, the pattern and polarization of antenna degrades [1]. In order the overcome this problem, metamaterial is the best way to applied as its characteristic can improve the antenna [3].