PERFORMANCE TESTING AND COMPARING BETWEEN CONVENTIONAL AND METAMATERIAL RECTANGULAR PATCH ANTENNA

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ABSTRACT

This thesis presents the performance testing of both rectangular conventional and metamaterial patch antenna with electromagnetic bandgap structure (EBG) approach on the ground plane. The performances of both antennas are compared to determine which one had the better performance as a receiver with fixed transmitter. Both antennas operate at the same frequency of 2.4GHz. The scope of performance testing includes the signal strength and the transfer duration of two files which differ in size (16.6MB and 369MB). The testing was done by using two Ubiquiti equipments which is Bullet M2 as a transceiver embedded with AirOS firmware for the test bed. The transceivers are connected to the laptops for configuring and monitoring. The scope of projects includes varying output power for the transmitter and the distance between transmitter and receiver. Table and graph of the results obtained are tabulated. From the results, it is proven that conventional patch antenna is better as receiving antenna since it has better signal strength of -70dBm compared to the metamaterial patch antenna which only recorded to have -74dBm at the 20 metres distance between transmitter and receiver. On top of that, the average time taken to complete file transfer also shows that the conventional antenna has better performance compared to metamaterial patch antenna with the duration of 24.44 seconds (16.6MB file) and 151.44 seconds (369MB file) while the metamaterial is having longer duration to complete transferring file with 51.21 seconds (16.6MB file) and 236.5 seconds (369MB file).

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CHAPTER 1

INTRODUCTION

This chapter consists of a brief introduction about the background of the overall project including problem statements, objectives, scope of works and outline of the thesis.

1.1 BACKGROUND

Recently microstrip patch antennas are widely used in satellite communications, aerospace, radars and biomedical applications due to its inherent characteristics such as light weight, low profile, low cost, mechanically robust, compatibility with integrated circuits and very versatile in terms of resonant frequency, polarization, radiation pattern and matching impedance. Microstrip antennas however face main weaknesses in terms of narrow bandwidth, low efficiency and relative large size [1, 2].

Patch antennas are incorporated with different materials to overcome their drawbacks. There are many kind of materials were used to improve the performances of microstrip patch antenna. Among them, metamaterials are found to be most suitable [3]. Metamaterials are also known as left-handed metamaterial (LHM) where the permeability and permittivity were simultaneously negative [4]. Negative permittivity means that the