BANDWIDTH ENHANCEMENT AND SIZE REDUCTION OF METAMATERIAL PATCH ANTENNA

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ABSTRACT

A rectangular microstrip patch antenna with metamaterial property was proposed on a height of 0.75mm Rogers RO3003 substrate with nine squares of Electromagnetic Band Gap (EBG) structures on the ground plane. This combination was investigated for the metamaterial characteristics. This work is mainly focused on increasing the bandwidth of a low profile microstrip patch antenna, to reduce the size of the substrate and the patch. The patch antenna along with the EBG structure was designed to resonate at 2.5GHz for WiMax applications. Simulations have been carried out to verify the performance of the EBG structure. Both simulation and measurement works were done using Computer Simulation Technology Microwave Studio (CST-MWS) and Vector Network Analyzer (VNA), respectively. Metamaterial characteristics that exhibit a double negative permittivity and permeability have been verified using Nicolson-Ross-Weir (NRW) approach. The results show that the bandwidth was enhanced by 97.72% and the size of substrate and patch were reduced by 12.81% and 23.28%, respectively.

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CHAPTER 1

INTRODUCTION

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

1.1 Background

Wireless is a term used to describe telecommunication system in which electromagnetic waves carry the signal over part of the communication path. This technology allows completing the same tasks that usually have to accomplish with the use of a cable or wire [1].

WiMax is a new technology in mobile computing [1]. WiMax is short form of Worldwide Interoperability of Microwave Access [2]. WiMax performs similar to some extend such as WiFi but at a higher speed, at great distance and for greater number of users. Two parts of WiMax are WiMax tower and WiMax receiver. A single WiMax tower can provide coverage to a very large area. The receiver and antenna, however, could be a small box or PCMCIA (Personal Computer Memory Card International Association) card, or can be built into a laptop just like the way WiFi access is today [3].

One of the important elements in the RF system in receiving and transmitting the radio wave signals from and into the air medium is the antenna [4]. Since many years, antennas are the object of many developments to allow their integration in