CHAPTER 1

INTRODUCTION

1.1 Introduction

Nowadays, the use of small size and low-cost electronics systems is increasing due to advancements in integrated systems. Recent developments in microstrip patch antennas make entire world acceptable as low profile radiator[1]. Microstrip antennas are very attractive from the side of designing compact and cost effective wireless communication systems. In contrast to the merits such as light weight, low profile, ease of integration with printed circuits, but microstrip antennas suffer from excitation of surface waves, poor radiation efficiency and low gain [2].

Recently, the scientific community showed a very particular interest in a new technology for the improvement of the performances of antennas. It is a matter of the technology of EBG (Electromagnetic Band Gap) structures applicable to a frequential spectrum extremely wide covered from the acoustic until the optical frequencies. EBG structures are periodic structures in which the electromagnetic wave propagation is forbidden for an exciting incident wave with certain defined space direction. In other words, EBG structures allow to control the electromagnetic wave propagation in function to the characteristics of the periodic texture composing the structure[3].

EBG substrates have found possible applications in the antenna technology to improve performance like reducing mutual coupling between effects due to truncated surface waves that would be excited in a standard antenna substrate [4]. EBG substrates can also be

used to eliminate scan blindness phenomena presented in array antennas.. EBG structures basically made of dielectrics or metals. These structures are periodic in one, two or three dimension

1.2 Problem Statement.

Use of microstrip antenna is very effective, low profile and low cost needed. However, compared to conventional microwave antennas, microstrip patch antennas suffer from a number of disadvantages. With the intention to overcome this limitation, a thick, high permittivity substrate is used and potential propagation of surface waves was founded to be a serious problem. Surface waves reduce antenna efficiency and gain, limit the bandwidth, increase of end-fire radiation and cross-polarization levels, and narrow the applicable frequency range of microstrip antennas. Besides the surface wave excitation that reduces the antenna efficiency, the main problem is the inherently narrow bandwidth of microstrip antenna's.

To enhance the bandwidth of microstrip antennas, EBG structure have found possible in antenna technology to improve antenna performance by reducing the effect of surface waves. EBG structures permit additional control of the behavior of electromagnetic waves in a different way from conventional guiding and filtering structures. EBG has the potential to provide a simple and effective solution to the problems of surface and leaky waves and various types of EBG structures have been studied reviews these issues to address [5].

1.3 Objectives

Main objectives of this research are:

i. To design a microstrip antenna and conduct an analysis to work at frequency of 2.4 GHz.
ii. To design an EBG structure and conduct an analysis to work at frequency of 2.4 GHz

iii. To integrate the proposed EBG and antenna then evaluate the performance.

1.4 Scope of Projects

These research limitation problems associated with **t**he application of EBG structure in microstrip antenna to be applied on Wi-Fi (2.4 GHz):

i. Design and simulate microstrip antenna working at frequency of 2.4 GHz using CST microwave studio software.
ii. Design and simulate EBG structure at frequency of 2.4 GHz using CST software.
iii. Integrate the EBG with antenna.
iv. Analyze the performance of the antenna with and without the existing of the EBG structure Design and simulate microstrip antenna with EBG structure at frequency of 2.4 GHz using CST software.
v. Fabricate the proposed designs.
vi. Perform a measurement on the EBG microstrip antenna has been Measured using VNA (Vector Network Analyzer).