



**FACULTY OF ELECTRICAL ENGINEERING  
UNIVERSITI TEKNOLOGI MARA**

**FINAL YEAR PROJECT 2**

**SUBMISSION OF PROJECT THESIS REPORT**

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## ABSTRACT

This paper presents a regular microstrip patch antenna with mushroom-like electromagnetic band gap (EBG) structures placed on the antenna with varying parameters. The patch antenna is designed at the 2.45GHz frequency. The regular patch antenna is made with copper patch and FR-4 as the substrate. The FR-4 has a dielectric constant of 4.7 and substrate thickness of 1.6mm. All the simulation work is completed through the use of Computer Simulation Technology (CST) software. Simulations were carried out using CST to verify the performance of EBG structures with different parameters in patch antenna. The designs are divided into two categories that are EBG structures with via and EBG structures without via. This work is to test whether the EBG structure placement is able to increase the performance of the regular patch antenna and at what parameters does the performance of the patch antenna improve. The result of the simulations show that the type of EBG structure placement that has been used for the simulation only improved the performance of the antenna's gain but not other antenna performance. The best antenna designed that could be fabricated has been fabricated and measured.

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# CHAPTER 1

## INTRODUCTION

This chapter start with the elaboration of background of the antenna and its evolution and EBG's . This section will proceeds to give explanation on microstrip patch antenna and Electromagnetic Band Gap (EBG).

### 1.1 BACKGROUND

At the early part of the year 1890, there were not much antennas that had existed in the world. These basic devices were primary used as a part of early experiments that were run to demonstrated electromagnetic waves transmission. During World War II, these antennas had become highly comprehensive that their usage had altered the lives of normal people across the world by way of radio and television reception. This successes signifying growth that rivals that of the auto industry during the same time period because at that time the number of antennas were used in the United States was around one per household.

Microstrip antenna was introduced for the first time in the 1950s. Nevertheless, it took about 20 years for the concept be realized which came about because of the advancement of the printed circuit board (PCB) technology in use in the 1970s. This lead to microstrip antennas being the most widespread antenna types that has a wide assortment of applications due to their visible advantages of low profile , light weight, planar configuration, low cost, superior portability, easy of conformal, suitable for array with the ease of fabrication and integration with microwave monolithic integrate circuits (MMICs) since that time .Nowadays, they are even widely involved for the military and civilian applications such as radio-