

**ENHANCEMENT OF BANDWIDTH THROUGH A SANDWICH E-SHAPE
BETWEEN MULTILAYER STRUCTURE**

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“In the name of ALLAH S.W.T, The Most Gracious and The Most merciful. Peace is upon the Holy Prophet, Muhammad S.A.W.”

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ABSTRACT

This thesis presents a comparative study of the performances between single layer patch antenna and patch antenna with a sandwich E-shape between multilayer structure. The design process of these antennas were using Computer Simulation Technology (CST) Microwave Studio software. The type of substrate used for both antennas was R03003 substrate with the relative permittivity, $\epsilon_r= 3$ and thickness, $h= 0.5$ mm and $h= 0.75$ mm. These antennas were designed to resonate at frequency 2.4 GHz. This study was focusing on enhancing the bandwidth and at the same time increased the value of return loss, gain and directivity of the antenna. The simulation results show that the bandwidth of patch antenna with a sandwich E-shape between multilayer structure was increased by 61.74% compared to single layer patch antenna. The return loss, gain and directivity were also increased by 34.02%, 21.95% and 1.07% respectively. For multilayer with a sandwich E-shape patch antenna, the usage of thicker substrate was also enhanced those parameters by 6.66%, 37.34%, 21.68% and 5.08% respectively. Nevertheless, the usage of wider sandwich E-shape dimension was only increased the values of return loss, bandwidth and directivity by 5.10%, 1.24% and 0.05% respectively but decreased the value of gain by 0.59%.

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CHAPTER 1

INTRODUCTION

1.1 BACKGROUND OF STUDY

In terms of the general point of view, antenna is known as a metallic conductor system that can radiates and captures the electromagnetic energy. It is also known as metallic device like wires and rods in order to receive the waves of radio. The IEEE Standard stated that the antenna is used for transmitting and to gain the waves of radio [2]. Antenna is usually utilised to interface transmission line to the atmosphere or vice versa [1]. Antenna is also one of the vital component for the wireless communication systems. In addition, in terms of communication studies, antenna is one of the main active fields [3]. These include television, satellite communication, radar, radio broadcasting, point to point communications and most importantly the wireless communications. In order to meet the specification required in these applications, the antenna with different properties is produced from a developed design techniques.

For wireless communication system, there are always a demand on the longer service life of the battery, high data bit rates and smaller devices. In terms of technical point of view, these demands indicate that the needs of smaller, more efficient and also broader bandwidth antennas [4]. There are a few common type of antennas which are microstrip, array, aperture, reflector and lens. This study was focusing on the microstrip patch antenna.

Patch antenna is consisting of radiated patch which is commonly made of conducting materials like copper or gold. The feeding lines and radiating patch are generally photo etched on the dielectric substrate which have ground plane. It is also can take any shape [14]. Patch antenna also called planar antenna. It is due to its flat