CHAPTER 1
INTRODUCTION

1.1 Introduction

Telecommunication is a very important thing nowadays. The era of information technology now demands fast, real-time, anywhere and anytime. Wireless communication system is a communication system with transmission media in the form of propagation of electromagnetic waves without having to be connected to cables. Application examples of this system is WLAN that uses the IEEE 802.11 standards that commonly called Wi-Fi.

IEEE 802.11ax, officially marketed by the Wi-Fi Alliance as Wi-Fi 6 (2.4 GHz and 5 GHz) and Wi-Fi 6E (6 GHz), is an IEEE standard for wireless local-area networks (WLANs) and the successor of Wi-Fi 5 (802.11ac). It is also known as High Efficiency Wi-Fi, for the overall improvements to Wi-Fi 6 clients in dense environments. It is designed to operate in license-exempt bands between 1 and 7.125 GHz, including the 2.4 and 5 GHz bands already in common use as well as the much wider 6 GHz band (e.g. 5.925–7.125 GHz in the US, a band 1.200 GHz wide).

WLAN "Wireless Local Area Network" is one of the most popular wireless communication standards. In the market, this technology is widely used both in offices, campus or other public places. In practice, the antenna is a device used to access WLAN, the antenna functions as a device that used to transmit and receive radio waves or electromagnetic waves that radiated to the free medium to be emitted.

A microstrip antenna is a metal conductor (patch) attached to the ground plane which contains a dielectric material. Through decades of research, It is known that the operational capability of a microstrip antenna is connected to its shape. Microstrip antenna is one of the most popular antennas today, this is because Microstrip antenna are very suitable in today's telecommunication devices which pay attention to shape and size. Besides that, microstrip antennas are easy to make, easy to install,and have a low cost. But, microstrip antennas also have some drawbacks which is narrow bandwidth. This can be solved because the antenna bandwidth can be increased by various methods such as increasing the thickness of the substrate with the dielectric value low constant, with probe feeding cutting slot, as well as by testing the antenna with different forms.

In this final project, there are several types of microstrip antennas that can be designed for meet the needs of WiFi technology, this design uses a rectangular shape and look for the microstrip antenna formula needed by WLAN technology that works at 2.4 and 6 GHz frequencies.

1.2 Problem Identification

The exponential growth of telecommunication over the past three decades increases the amount of data the average person uses exponentially. This growth is more noteworthy especially with the evolution of wireless communications which requires the development of low cost, lightweight, and low profile antennas that are capable of maintaining high performance over a wide bandwidth [2]. In order to fulfil this needs, this proposal tries to make an antenna that can fulfil this role by making a dual-band antenna, the dual-band is very effective for such an important devices as WLAN, if there is a problems with one of the band, the other band will be the secondary option, the chance for the WLAN devices to lost a connection will be reduced, the 2.4 and 6 GHz is the best choice for an WLAN devices, as it carry more data the higher the frequency and better the modulations in the futures with a trade off the higher the frequency the shorter the coverable area, there is also a disadvantage of the dimension of the antenna the higher the frequency the smaller the antenna patch will be, this disadvantage lead to another disadvantage that is the smaller the antenna the worse the performance of the antenna will be, the dimension and the cost of the electricity will be higher by using the dual-band, in spite all of that, the future of telecommunication will move forward to more higher frequency as we can see the history of it, the disadvantage of this antenna will become a small price to pay.

1.3 Objectives and Contribution

To solve the problems described in subsection 1.2, this thesis design and the realization of Dual-Band Microstrip antenna using a 2.4 and 6 GHz frequency to achieve the best results to solve this problems, this proposal using the CST microwave to simulate and to achieve a desired results before comes into the fabrication and the realization of the antenna, the design of the antenna will be very similar to this paper [3], the main objective of this proposed proposal is to make a Dual-Band 2.4 Ghz and 6 Ghz Rectangular Patch Microstrip antenna and come into the realization of the antenna.

1.4 Scope of The Thesis

The scope of this Thesis is.

- The observation is done by simulation using 3D model simulation software and measurement in the antenna lab.
- To gain VSWR below 2.
- To gain huge value of bandwidth
- the value of gain must be above 0 dBi.
- The frequency range that was observed only from 2.4 to 6 GHz.

1.5 Research Method

This Thesis divided by six sections of *workpackages* (WP):

1. WP1: Literature Study this thesis, the author studies about Dual-Band antenna and the antenna in general from lecturer, textbooks, journals, and papers.
2. WP2: Calculating the antenna using the basic and given formula to create the basic of the antenna before created it in the simulation.
3. WP3: Simulation process is done to give a desired results and dimension to the antenna before Fabrication process to ensure the best performance of antenna.
4. WP4: Fabrication and Antenna measurement was done after the antenna finished the simulation process, after fabrication the next step is to calculate the parameters of the antenna that had been printed out.
5. WP5: Analysis after the simulation and measurement results were obtained, both were compared and analyzed to ensure that the results were in accordance with desired specifications.
6. WP6: Writing report, after all of the results and analysis were obtained, the next step was writing the report in the form of thesis.

1.6 Book Structure

The rest of this thesis is organized as follows:

- Chapter 1 INTRODUCTION
  This chapter contains a description, background, problem identification, objective and contribution, scope of this thesis, research method, and book structure of this thesis.

- Chapter 2 BASIC CONCEPT
  This chapter consists of the explanation and basic theory about antenna in general, Dual-Band antenna, and their parameters.

- Chapter 3 PROPOSED MODEL OF ANTENNA
  This chapter consists of the final antenna system model and design of Dual-Band Rectangular Microstrip Antenna of 2.4 and 6 GHz for this thesis.

- Chapter 4 RESULTS AND ANALYSIS
  This chapter discusses the analysis result of simulation and measurement of antenna parameters observed, such as gain, VSWR, and radiation pattern.

- Chapter 5 CONCLUSIONS AND SUGGESTION
  This chapter contains the conclusion from the analysis and suggestion.