CHAPTER I
INTRODUCTION

1.1 Background

The development of telecommunication technology for wireless communication both voice and data is growth very rapidly over the last two decades. This could potentially lead to lack of sources in a particular spectrum frequency. However there are fact that show the existence of gaps in occupancy frequency, Where some spectrum usage sometimes wasted. One of the problem in wireless communication is the availability of frequency spectrum. As more and more devices go wireless, future technologies will face spectral crowding, and coexistence of wireless devices will be a major issue.

Ultrawide bandwidth offers attractive solutions for many wireless communication areas. With its wide bandwidth, UWB has a potential to offer a capacity much higher than the current narrowband systems for short-range applications and also to overcome the interference from the narrowband system. This is due to the capability of these license exempt wide bandwidth wireless systems to yield low cost, low energy, short range, extremely high capacity wireless communications links UWB become a technology that which is often used as technology in the wireless communicaton.

Antenna with wide operating bandwidth that may be suitable as a sensing antenna that can be able to realize UWB antenna which operate at 3-12 GHz has been discussed before by [1] with the middle frequency is 7.5 GHz by using planar Rectangular-shaped patch with ridged ground plane by designing patch with gradual steps, a single slot on the patch, and a partial ground plane with special slit. In this paper describes the proposed antenna which has a very wide operating bandwidth, from the simulation, the impedance bandwidth of the PTMA with a trapezoid-ridged is improved up to 11 GHz. With the ridged ground plane, an bandwidth improvement from approximately 40% to about 4:1, The measured VSWR of the printed PTMA with the triangle-ridged ground plane is less than 2 from 3 to 10 GHz, and the higher-edge frequency of the impedance bandwidth can be improved from 10 GHz up to 12 GHz. Ultrawide bandwidth (3 to 12 GHz) has been demonstrated. The other method of forming the groundplane of the antenna also has been discussed by [2] that The simulated results of the proposed antenna have

shown wide operating frequency bandwidth from 2.9 GHz up to 16 GHz, while themeasured results ranging from 3.1 GHz up to 12 GHz omnidirectional radiation pattern of the antenna. Another method by forming the groundplane also has been discussed in [3] that the simulated result of the proposed antenna have shown wide operating frequency from 1500 - 2700 MHz with fractional bandwidth of the antenna is 57.14% with bandwidth value is 1200 MHz and gain of the measurement antenna is 6.15 dBi and radiation pattern of the antenna is bidirectional.

With combining several methods from the reference to obtain a wide bandwidth the writer then designing the Rectangular patch as a radiating element for electromagnetic wave, after that by using Trapezoidal ground as a reflector and the last method is by adding a Trapezoidal-cut to the groundplane this method cause the radiation pattern of the microstrip antenna be more like omnidirectional and widen the antenna bandwidth based on the reference that has been reviewed. This method is been performed in this undergraduate thesis to find an optimum performance for the antenna design, such us wide bandwidth and VSWR below 1.5 and other specification that can support the ultrawideband antenna for wireless communication, After that, the antenna performance from the simulation and measurement results is used as a comparison in this undergraduate thesis and then antenna is been analyzed whether the antenna that design by the writer can be rated as an ultrawideband antenna.

1.2 Formulation of Problem

The development of telecommunication technology for wireless communication both voice and data is growth very rapidly over the last two decades. One of the problem in wireless communication is the availability of frequency spectrum. As more and more devices go wireless, future technologies will face spectral crowding, and coexistence of wireless devices will be a major issue. However there are fact that show the existence of gaps in occupancy frequency, Where some spectrum usage sometimes wasted. The problem that was taken at this undergraduate thesis is to cover all the unused frequency for wireless communication because of that the use of the frequency band is not evenly distributed caused by the users is too crowded. Ultra Wideband (UWB) is needed to be implemented for wireless communication by designing antenna Microstrip Rectangular with Trapezoidal-cut that have an ultra wideband with groundplane that can be implemented to cover and reduce the unused frequency spectrum.

1.3 Purpose of Research

The purpose of this research is to design and realize the antenna with ultra wideband characteristic, such as having a bandwidth greater $\geq$500 MHz, having a fractional bandwidth of more than 20% and having a omnidirectional radiation pattern that can be applied for wireless communication.

1.4 Scope of Problem

The limitation of problem from this undergraduate thesis are:

1. This research is focused on antenna design and realization.
2. This thesis is only focused on the analysis on the antenna performance between simulation and measurement
3. This thesis is only focused on the work frequency, and does not discuss the direct application
4. Expected antenna specification as follow :
   - Frequency : 1 - 12 GHz
   - Bandwidth : UWB
   - Radiation Pattern : Omnidirectional
   - Return Loss : $< -10dB$
   - Substrate : FR-4 Eproxy
   - Patch : Copper

1.5 Research Methods

The method used in the process of completing this thesis are:

1. Study of Literature
   Understanding the concept and theory that used, some reference are needed, like book, article and journal that supporting the process of the thesis
2. Designing and Simulation
   Designing process and antenna simulation do by using software to simplify the calculation and to obtain the ideal antenna. After doing the simulation then the antenna will be fabricated

3. Antenna Manufacturing
   The process of realizing the antenna in the form of fabrication is done by photoecthing and carried out by experienced parties, with reference to the antenna dimensions of the simulation results.

4. Measurement
   The measurement process is carried out in two stages, namely the measurement of network parameters for measuring bandwidth, VSWR, and return loss. While radiation parameter measurements are made to measure gain, radiation pattern, and polarization.

5. Analyze the Data
   The analysis is carried out after the design, simulation, realization, and measurement processes have been carried out. The analysis carried out is to compare the measurement results with the simulation results.

6. Make the Conclusion
   After analyzing, the last step is to make the conclusion from the analysis.

1.6 Book Structure of This Thesis

Systematics of writing in the undergraduate thesis that will be made, consists of five chapters are organized as follows:

1. **CHAPTER I INTRODUCTION**
   This chapter describes the background, formulation problems, objectives, Scope of problem, research methodology and systematic research of the undergraduate thesis

2. **CHAPTER II BASIC CONCEPT**
   This chapter contains concepts and related basic theories with this final project research.

3. **CHAPTER III SYSTEM MODEL AND THE TECHNIQUE**
   This chapter discusses the antenna design process microstrip along with antenna design modeling.

4. **CHAPTER IV**
   This chapter contains an analysis of the antenna parameters measured, namely VSWR, return loss, bandwidth, gain, radiation pattern, and polarization.

5. **CHAPTER V**

   This chapter contains the conclusions drawn from the design process as well as analysis and suggestions for further research development