CHAPTER I
INTRODUCTION

1.1 Background

One of the important components which we never realize was Antenna. One of the importance of it which occurs daily was connecting people to people. As time goes by antenna itself already encounters several interventions. The antenna used a radio signal which could radiate signal between the transmitter and receiver. The microwave was the common radio signal use for the antenna which radiates from 300 MHz - 300 GHz. One of the best-known microwave frequency usage is used for fixed line-of-sight communication systems such as Satellite and Mobile or radio Communications.

Concerning the use of a high-frequency band that has been used for microwave radio transmission, several adjustments had to been done for fulfilling the desire parameters. Several of those parameters which observable are S-Parameters, VSWR, Return Loss, Efficiency, etc. An experiment should be conducted to fulfilling the desire antenna design.

One of the antennae which can be used to fulfill the requirement is a Microstrip Patch Antenna (MPA). A Microstrip Patch Antenna was considerable option caused low profile, simple and inexpensive to manufacture using modern printed-circuit technology, mechanically robust when mounted on rigid surfaces, and when the particular patch shape and mode are selected, also they were very versatile in terms of resonant frequency, polarization, pattern, and impedance [1]. This antenna has a widespread design for patches and a large number of theories for conducting research.

Based on the previous research, Microstrip Patch Antenna has another purpose that is being a multiband antenna and Where these antennas work on several frequencies and needs, such as WiMax, Wi-fi application, Satelite communication, etcetera [2],[3],[4],[5]. This undergraduate thesis examines the working principle of an extraordinary antenna which adopting the batik pattern that works on the same frequencies and has the same requirement as a standard Microstrip Patch Antenna.

Proximity Coupled is a type of antenna rationing using two substrates where the feedline is enclosed between the two substrates. Proximity coupled itself also offers various advantages over the conventional edge, where one of them was en-

hancing the antenna bandwidth without having undesired radiation caused by the discontinuities and asymmetry of contacting feed methods. Hence the bandwidth enhancement via non contact feeding methods could be accomplished using aperture coupling [6].

A variety of Microstrip Patch Antenna's patch design was also given a result that had several advantages on the diverse shapes of MPA's patches. Towards 3 different shapes (rectangular, circular, and elliptical) has been tested, 2 of them score far better performance results than the other one [7]. As shown on table 1.1, the elliptical patch has shown much better on parameters performance test where the circular patch was showing a better result than the rectangular patch on almost the parameter test. Hence a circular patch design was selected cause the performance results were near better than the elliptical one besides that it was suitable for adopting the batik pattern. Another reason with the circular shape chosen to be the microstrip patch was based on a questionnaire asking about eye comfort geometrical shape, where 16 of 25 peoples contributed were chosen circular shape as the most eye comfort geometrical shape which the data showed in figure 1.1. Where the circular patch was only the beginning, the patch needed to be carved with a batik pattern to achieve a good artistic value as an art piece while still having a great antenna performance. Adopting a batik pattern into an antenna, will be a substitutability option for people to still have a working antenna and still having a good artistic value for decorative in their home. One of the problems adopting a batik pattern was the extraordinary shape often seen on batik pattern, which betokens extraordinary shape were artificial structures designed on the antenna that have properties not obtainable in nature. Several examples were of extraordinary shape antenna were several researchers were carving Chinese character onto the antenna itself which the antenna was tested on Super High-Frequency band and Ultra High-Frequency band [8],[9]. Side, the extraordinary shape was a great option which found on batik pattern to enhance its artistic value where it would be also one of the points that would create a better performance to the antenna itself. Another reason was antenna carved with batik pattern will add another value to batik art sales and enhance the batik value as an unusual product to be applied.

This undergraduate thesis focused on design, simulate, and analyze the effect of having Microstrip Patch Antenna which has been carved by a batik pattern with proximity couple feeding. The MPA would have 2 different patches of design regard with the circular patch design for the base patch shape. The working principle of these Microstrip Patch Antenna designs would be observed on frequencies range between 1 GHz - 6GHz. The expected result of this antenna was creating a MPA by

adopting an artistic value of the Batik Pattern as Patches that achieve good aesthetic value and also work as good as another antenna. Thus, the Microstrip Patch Antenna would be analyzed based on the antenna parameters such as VSWR, return loss, efficiency, and gain.

Table 1.1 Comparative Results[7]

Parameters	Rectangular Patch	Circular Patch	Elliptical Patch	*Comments*
Resonance Peak (GHz)	5.00	5.00	5.00	Exactly Matched
Return loss (dB)	-51.165	-42.988	-63.934	Elliptical patch is better
Bandwith (MHz)	220	200	200	Rectangular patch is better
VSWR (dB)	0.048	0.1232	0.011	Elliptical patch is better
Gain (dB)	2.76	2.9334	2.9657	Elliptical patch is better
Directivity (dB)	4.617	4.6342	4.66	Elliptical patch is better
Efficiency	59.78%	63.29%	63.64%	Elliptical patch is better

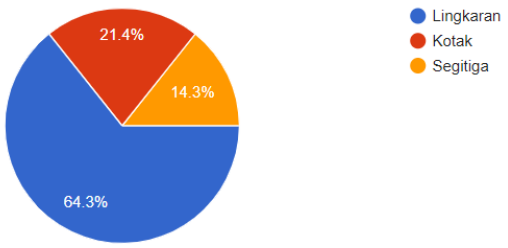

Figure 1.1 Total Data Based on the questionnaire

1.2 Problem

The problem formulation of this undergraduate thesis is to adopt a conventional antenna design while achieving the same quality as the conventional one. Consequently, the data from the simulation will be insufficient with the calculation which has been differential between several antennae formula.

1.3 Purpose

The purpose of this undergraduate thesis is to design and realize an antenna with adopting a batik pattern as the patch design which radiating on a High-Frequency Band and analyzes it through each of the antenna parameters.

1.4 Scope of Problems

This Final Project Has Scope of Problem as Shown below.

1. This Experimentation using A Microstrip Patch Antenna.
2. Microstrip Patch Antenna was used cause of the wide characterization and variety of design also theories.
3. This Experimentation focusing on the design and realization of the antenna which analyzes with the frequency of 1 - 6 GHz.
4. The antenna parameters which been measured and analyzed such as VSWR, Return Loss, S-Parameters, Electric Field (E-Field), and Power Efficiency.
5. The Dimension of the antenna has been calculated based on the formula in [1].
6. Designing the antenna was done using the software.

1.5 Research Method

The stages of research methodology proposed in this thesis are fulfilled as follows:

1. Literature Study

   The literature study discusses the concept of MPA and the High-Frequency Band. References from textbooks, journals, conference papers, thesis, and dissertation books are required for resembling the idea and the design of the antenna.

2. Designing

   Starting by conducting initial calculation based on the formula which forms a base antenna dimension and constructing the Batik pattern for the antenna patch.

3. Simulation

   After finishing the design and the initial calculation, the base dimension was tested and reviewed using the simulation. Optimization of the design also occurs in this step.

4. Analysis

   The comparison process between the simulation and the fabrication data was necessary. the aim of analyzing both of the data was to determine the conclusion and suggestion for this undergraduate thesis.

1.6 Thesis Organization

The rest of this thesis is organized as follows:

- Chapter II LITERATURE REVIEW
  This chapter explains the theories, tools, and equipment related to this thesis.
- Chapter III SYSTEM MODEL
  This chapter explains the design procedure, simulation and optimization, and the final configuration.
- Chapter IV RESULT AND ANALYSIS
  This chapter discusses the comparison between different batik pattern that applied and the correlation of the patch radius on the performance of Microstrip Patch Antenna.
- Chapter V CONCLUSION AND SUGGESTION
  This chapter explains the conclusion and suggestion drawn from the data based on the result and analysis chapter.