CHAPTER I
INTRODUCTION

1.1 Background

Telemedicine is one of the technologies that uses wireless communication in the human body to provide long-distance health services [1]. Telemedical technology is defined as technology that provides medical services to persons who can be monitored remotely [2]. since Indonesia has a very diversified geographical position, including islands, enormous landmasses, and much that cannot be reached quickly, and the presence of medical workers is not fairly dispersed in each part of Indonesia And because of the restricted number of doctors in certain areas, as well as the lack of medical facilities in certain areas, health services in Indonesia are undoubtedly a severe concern. From these issues, can be concluded as a proposes methods for employing wireless communication on the human body, sometimes known as a Wireless Body Area Network (WBAN).

WBAN is typically used to make it easier for doctors, medical workers, or the patient's family to monitor the patient's health in real time [3]. WBAN is made up of on-body and off-body sensors that can be employed in applications. Typically, a chip device sensor can be used to obtain data in the form of body temperature, blood pressure, respiration, heart rate, glucose levels, and signal waves via Electro Cardio Gram (ECG) [4]. The sensor chip gadget is attached to or embedded in the body of the patient. The sensor chip will communicate data through the transmitting antenna, which will be received by a receiving device. As for the antenna, it must be flexible and lightweight in order to be comfortable for users to use. This is referred to as a wearable antenna.

An antenna is a radio-frequency device that converts electrical signals into electromagnetic waves that flow across free space or air, and vice versa. The microstrip antenna is a popular choice for wireless communication. Microstrip antennas have various advantages, including their small size, simple manufacturing process, ease of installation, and low cost. The downside of microstrip antennas is

their limited bandwidth. Wearable antennas are microstrip antennas that can be connected to garments or placed directly on the human skin. Wearable antennas have various advantages, including their compact size, light weight, ease of construction, and ability to work across a wide frequency range [5]. Because the substrate material is a flexible and thin substance, wearable antennas can also be bent or curved. With such flexibility, the antenna can adjust to changes in the shape of the body and continue to function correctly. However, wearable antennas have a disadvantage in their use since they have a thin substrate and hence a narrower bandwidth than the others. In general, this antenna is utilized in the Industrial, Scientific, and Medical (ISM) band because it is the most suited band for WBAN because it is license-free and has sufficient bandwidth.

Therefore, in this final project, the design of a wearable antenna at ISM 2.4 GHz frequency with flexible materials will be uses a textile-based substrate that is different from the usual microstrip antenna substrate. This antenna will be applied to the health sector, especially telemedicine and can make it easier at the same time and get comfort when used. Testing of this antenna will be carried out on the arm to support WBAN (Wireless Body Area Network) applications with good SAR (Specific Absorption Rate) values and also get a very wide bandwidth. And a flexibility test will be carried out on the antenna. The aspects discussed are VSWR parameters, bandwidth, gain, and radiation pattern.

1.2 Problem Identification

The microstrip antenna are required to have several characteristics based on the background in this Final Project, several challenges can be formulated for designing and realizing a wearable microstrip antenna, which include how to get the right characteristics for the antenna to work at the desired frequency, how to design and realize a wearable microstrip antenna that matches the desired characteristics, and how to design a microstrip antenna with a thin substrate that can be formulated with desired characteristics.

1.3 Objective and Contribution

The objectives and problems that will be discussed in this Final Project are:

1. Designing wearable antennas at ISM frequency
2. Realize the antenna using predefined specifications
3. Analyze the SAR value of the effect of the wearable antenna distance from the body part through software simulation
4. Checking the SAR value according to the effect of the wearable antenna distance from the body part
5. Analyzing the effect of distance and curvature on wearable antennas on antenna performance values
6. Analyze the performance comparison between the results of simulation values and live antenna measurements

1.4 Scope of Problem

The problem posed in this final project is constrained by a number of factors, including:

1. Wearable microstrip antenna design for telemedicine healthcare applications
2. Only design and build the antenna; it is not incorporated into the system
3. The material utilized is thin material
4. The antenna parameters to be measured and studied are gain, VSWR, pattern, radiation, and bandwidth
5. The SAR calculation is only performed using software in a simulation

1.5 Research Method

The method used in the completion of this final project is:

1. Study of literature

Collection of references through library books, scientific journals and articles on the internet related to the final project

1. Design and Simulation

   After a literature study has been carried out, the design and simulation process are carried out based on theories and specifications that have been obtained previously using software

2. Realization

   At this stage the process of making the antenna is done manually, namely by using own hands or homemade

3. Measurement

   The measurement process is carried out using a Network Analyzer and Spectrum Analyzer to measure the parameters needed in this final project such as gain, VSWR, impedance, radiation pattern, polarization.

4. Analysis and Evaluation

   In the analysis portion, a study is conducted to derive results that can afterwards be evaluated for any potential limitations in the research.

1.6 Writing Systems

The rest of this undergraduate thesis is written as follows:

1. Chapter I INTRODUCTION

   This chapter contains a background, problem identification, objective and contribution, scope of problem, research method, and writing systems.

2. Chapter II BASIC CONSEPTS

   This chapter contains an explanation of concepts and basic theories that are related to the research being carried out for the undergraduate thesis.

3. Chapter III DESIGN MODELS AND SYSTEMS

   This chapter contains the flowchart, design process, antenna specifications, design planning, and simulation processes.

4. Chapter IV ANALYSIS AND MEASUREMENT

This chapter contains antenna fabrication, measurement of the antenna, the differences between simulation and measurement of the antenna.

5. Chapter V CONCLUSION AND SUGGESTION
   This chapter contains conclusions and suggestions for this study.