# A MANUAL FOR DESIGNING A 5/8 LAMBDA VERTICAL ANTENNA FOR RADIO COMMUNICATION

**FINAL REPORT**

**BY**

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**D-III ENGLISH PROGRAM**

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# A MANUAL FOR DESIGNING A 5/8 LAMBDA VERTICAL ANTENNA FOR RADIO COMMUNICATION

FINAL REPORT

Presented to University of Merdeka Malang
in partial fulfillment of the requirements
for the degree of Ahli Madya in Diploma Three of English

By

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**AUGUST 2018**

This is to testify that the Final Report written by IZZATUL KHILMIAH has been approved by the advisor for further approval by the Examining Committee.

Malang, August 10th, 2018

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# DECLARATION OF AUTHORSHIP

Here with I,

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Declares that:

1. this diploma final report is the sole work of mine and has not been written in collaboration with any other persons, nor does it include, without due acknowledgement, the work of any other persons.
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# ABSTRACT

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Key Words: Final Report, vertical antenna, 5/8 λ vertical antenna

Antenna is a very important component in radio telecommunication system because it serves to transmit or receive radio waves. Antennas have various forms and functions. Antennas that are often used for radio communication is vertical antennas. Vertical antennas are classified as omnidirectional antennas. Vertical antenna emit waves in all directions. The vertical antenna that has a large gain is the 5/8 λ vertical antenna. In making 5/8 λ vertical antenna, the size of each part must be based on the formula ($\frac{300}{\text{F(Mhz)}} \times \lambda$). After making the vertical antenna complete, then measuring the frequency corresponding to the antenna using SWR (Standing Wave Ratio) meter. The frequency that matches with the antenna is 117,900 Mhz.

# ACKNOWLEDGEMENT

First of all I would like to express my deepest gratitude to Allah SWT for overflowing of blessing and guidance so that this Final Report can be finished on time. As a Moslem, I know that I cannot be successful without Allah SWT blessing. I also would like to gratefully acknowledge the contribution of the following people whose considerable efforts, suggestions, ideas and insight helped me to make this Final Report more valuable.

Secondly, thanks to my parents who always support me materially or non-materially in completing this Final Report. I also feel much moved to all friends, especially for my friends in D3 English Program that never left me in complicated situation when I am on process of making this final report.

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# INTRODUCTION

## 1.1 Background of Final Report

Technological developments in the field of electronics advance rapidly. It is characterized by the discovery of new technologies that are more useful, practical and economical. The existence of these technologies, bring ease-of-hand in carrying out daily activities. One of the technological development is radio. Radio is a communication tool that does not use cable as an intermediary medium, but it uses radio waves to transmit sound. Radio as a medium of communication is cheaper than other communication-information media. Almost every people has radio in their homes, whether in the form of portable radios that can be taken anywhere, the radio incorporated into one with a tape recorder, radio on the phone, or radio that can be heard through the internet. One of the advantages of radio is direct, it means the listener can directly listen to the information broadcast. In addition radio is also fast because it uses the public sphere of frequency as a means of inter-information. Furthermore, radio can be accessed or listened to anywhere and anytime. Therefore, radio can be heard while doing another job.

Radio can be used as a learning medium that is quite effective. Basically radio broadcasts in the teaching-learning program serve to improve audio communication skills, make the learning atmosphere more lively, and increase the

ability of imagination of events or broadcasted events. The advantage of radio is that the learning broadcast program can be recorded. The other advantages are message content can be used repeatedly with consistent, can reach remote areas, and can provide real-world atmosphere with various techniques and sound effects. Radio is suitable for teaching music, history, drama and language, can broadcast special events, actual and historical events.

Radio telecommunication system can use Amplitude Modulation (AM) and Frequency Modulation (FM). Compared to the AM system, the FM system has several advantages, including: more resistant to noise, wider bandwidth, high fidelity and stereo transmission. Frequencies allocated for FM broadcasts are between 88 - 108 MHz, which in this frequency region, it is relatively free from both atmospheric interference and unexpected interference. One important part of a radio station is antenna.

Antenna is a very important component in radio telecommunication system because it serves to transmit or receive radio waves. The antenna acts to receive electrical vibrations from the transmitter and transmit them as radio waves. The antenna has many types from simple to very complex shapes. Each type has its own characteristics and its usefulness. To reach a wider area in a radio broadcast antenna, it is expected to have omnidirectional emission properties.

There are various types of antennas that are omnidirectional. One of them is a vertical antenna. This antenna has a physical size of 5/8 lambda (λ). The characteristic of this antenna is not yet widely known for its application for FM radio broadcasting system.

Vertical antenna is an easy-to-make type of antenna with an electrically conductive material of 1/8, 1/4, 5/8, 7/8 λ of wavelength. The difference in antenna wavelength it depends on the length of the element of the antenna, and this can be calculated by the formula $(\frac{300}{\text{F(Mhz)}} \times \lambda)$. The way of a vertical antenna radiator works depends on the existing ground connections. If the ground is not good, it will cause the current distribution in the radial antenna back to the transmitter and cause considerable power loss and feed point impedance which inhibits antenna radiation. The vertical antenna, with the greatest gain, compared to other vertical antenna types is the 5/8 λ vertical antenna which has a gain of 3.3 dBi. The 5/8 λ vertical antenna consists of vertical elements of 5/8 λ length and horizontal elements of 1/4 λ length. Based on these cases, an idea exists to design and implement a 5/8 λ vertical antenna, and proceed with fabrication and measurement, in order to be applied to FM radio broadcasting systems. The process of designing a 5/8 lambda vertical antenna is quite easy. The writer will explain the steps of making a vertical antenna, from designing until calculating the matching frequency.

## 1.2 Objective of Final Report

The objective of this final report is to apply knowledge about the "Antenna and Propagation" that has been learned during college into a form that can be applied in everyday life.

### 1.3 Significance of final Report

This final report has two significances. First, this is expected to be a medium for learning about “Antenna and Propagation”. Second, it can be a source of information and reference in the framework of the development of science and technology that is currently growing rapidly.

### 1.4 Procedure of the Final Report

In writing the final report, the writer does a process of pre-departure training, on-going process, and final report and examination in order to be able finish it, as below:

#### 1.4.1 Pre-departure Training

Before composing the final report, the writer gets the training organized by D-III English Program on May 9$^{th}$, 2018. The speaker of the training is one of alumni who has studied English in Merdeka University. She shared her experience of selecting well the title of the final report. She also shared how to get a job after graduating from her study.

#### 1.4.2 On-going Process

In this section, the writer does the processes of finding the theory, searching previous literature, and writing the final report during composing the final report.

##### 1.4.2.1 Finding the Theory

It is the most important thing for the writer on composing the final report, as this final report is a non-research based article. The writer search several

theories related to this title, for instance basic concept of antenna and propagation technology. Then, the writer finds the theory in some books and internet, such as article and other references.

#### 1.4.2.2 Searching Previously Literature

Non-research based articles definitely have advantage and inferiority. One of the advantages is that it does not require research, while the inferiority turns weaker if there is no prior research. To strengthen the preparation of the final report, the writer looks for the same observations that already exist. It is permissible if there are some observers who have discussed this topic, but it is in different study field.

#### 1.4.2.3 Writing the Final Report

After all of two points above are fulfilled, finally the writer composes the final report. The D-III English Program gives a guidebook about making formal report. The writer easily types good and right final report.

### 1.4.3 Final Report and Examination

After finishing the final report, the writer faces a final report examination which determines whether the final report is approved or not. If this is successful, the writer is declared to graduate from D-III English Program.

# CHAPTER II

# MAIN REPORT

## 2.1 Description of the Final Report

The description contains about Radio Communication, Antenna in general, Vertical Antena, and 5/8 λ Vertical Antenna.

### 2.1.1 Radio Communication

In creating an antenna for radio communication, the first thing to know is the meaning of radio and radio communications. The definition of radio is taken from https://en.wikipedia.org/wiki/Radio, radio is a technology used for sending signals by means of modulation and electromagnetic radiation (electromagnetic waves). This is the basic concept of radio communication that the reader must know before heading to the next discussion.

These waves pass through, and propagate through the air, and may also travel through a vacuum of space, because they do not require a transport medium (such as an air molecule). Radio technology uses radio waves as a means to carry information such as sound transmitted through space, amplitude or frequency. Radio communication systems require an antenna to convert electric current into radio waves and radio waves into electric current. Antenna can be used both for sending and receiving.

The radio communication system transmits various signals through radio waves. There are two functions of antenna, as transmitter and as receiver, in radio

communication system. There is a microphone on the transmitter and loudspeaker of the receiver, in the case of a voice communication system. In an article on http://www.sepengetahuan.com/2016/12/pengertian-radio-gelombang-radio-cara-kerja-radio-lengkap.html, describes how radio works in general. Radio waves emitted by the carrier wave, then radio waves reflected by the air layer in the earth's atmosphere, precisely in the ionosphere layer. In this layer the radio waves are reflected back to earth and captured by the tower of the receiver. And by using the way that has been explained, the message via radio can be to reflect can reach a very long distance.

### 2.1.2 Antenna

An antenna is a component designed to be able to emit and or receive electromagnetic waves. The basic concept of antennas, how the antenna works, must be understood by the readers. An antenna as a transmitting antenna is an electromagnetic transducer, which is used to convert a wave in the channel cable transmission, into waves propagating in free space, and the antenna as a receiving device can convert the free space wave into a consecutive wave (Alaydrus, 2011). Antenna is one of the important elements that must exist on a radio, TV, radar, and all other wireless communication devices. The type of the antenna varies according to design, radiation pattern, frequency, and gain.

An antenna consists of an element of metal materials connected to a transmission line of a transmitter or receiver that is related to electromagnetic waves. According to the website http://belajarelektronika.net/prinsip-kerja-karakteristik-dan-parameter-antena/, the way antennas work on the radio is a radio

that wants to transmit the program must record music or record the voice of the announcer through microfone first. Then the sound signal is converted into electrical signal. The electrical signals will enter the transmitter circuit and the electrical signal will flow along the antenna transmission cable until it reaches the Antenna. Electrons that contained in electrical signals are moving up and down repeatedly so that it will create electromagnetic radiation in the form of radio waves. The waves that include the radio program will then be transmitted and travel as fast as the speed of light. When a person activates the radio according to the transmitting frequency, the transmitted radio waves will flow through the antenna and cause the electrons to move up and down repeatedly on the antenna so that it will generate electrical energy. This electrical energy is then forwarded to the radio receiver circuit so that we can listen to various programs from the Radio Station. The antenna on the radio has a very important function for the radio itself. Antenna generally serves to convert electrical signals into electromagnetic signals and then radiate them. On the radio, the antenna serves to receive messages in the form of a signal sent by the central tower to be received by radio stations, which can be heard by the listener.

### 2.1.3 Parameters of Antenna

There are five parameters which explained by Lubis (2014), namely; directivity, gain, radiation pattern, beamwidth, and bandwidth.

#### 2.1.3.1 Directivity

The directivity of an antenna is measured in an antenna's ability to concentrate energy in one or more specific directions. The antenna can also be

specified in its steering depending on the radiation pattern. In an array of propagation will be given the amount of radiation wave energy. The elements in the array can be set, so it will lead to changes in patterns or more possible energy distribution in all directions (omnidirectional).

#### 2.1.3.2 Gain

Gain is an antenna character associated with the antenna's ability to direct the signal radiation. Gain is not a quantifiable quantity in a typical physical unit such as watts, ohms, or other, but a form of comparison. Therefore, the units used for gain are decibels. dBi is a unit for measuring antenna gain.

#### 2.1.3.3 Radiation Pattern

The antenna radiation pattern or antenna pattern is defined as a mathematical function or graphical representation of the antenna radiation properties as a function of the coordinates. The antenna radiation pattern is a 3-dimensional plot of signal distribution emitted by an antenna, or a 3-dimensional plot of signal reception rate received by an antenna.

#### 2.1.3.4 Beamwidth

Beamwidth is the amount of the angle of the beam of the frequency band the main radio calculated at 3 dB drops off the top of the main lobe.

#### 2.1.3.5 Bandwidth

The use of an antenna in a transmitting or receiving system is always limited by its working frequency region. In the range of working frequency antenna is required to be able to work effectively in order to receive or transmit waves in a particular frequency band.

### 2.1.4 Type of Antenna

Based on the website https://id.wikipedia.org/wiki/Antena_( radio), the type of antenna can be grouped based on function, gain, polarization, and shape.

#### 2.1.4.1 Antenna Based on Function

Based on its function, the antenna is divided into a transmitting antenna and a receiving antenna. Transmitter antennas are usually widely used on radio and television stations. The receiving antenna is usually used on devices such as radio, television, and other communication devices.

#### 2.1.4.2 Antenna Based on Gain

Based on the gain, the antenna is divided into VHF (Very High Frequency) and UHF (Ultra High Frequency) antennas which are usually used on television. The amount of antenna gain is affected by the number and arrangement of the antenna and the frequency used.

#### 2.1.4.3 Antenna Based on Polarization

Based on the polarization, the antenna is divided into two antennas with polarization in one direction and antenna with polarization in all directions. Antenna based polarization is divided into two, namely directional and omnidirectional.

##### 2.1.4.3.1Directional

Directional antenna is an antenna whose directional radiation pattern is directed so that the effectiveness of the radio beam is only in one direction only. This type of antenna is a narrow beam antenna type, which has a more directed power transmission. Directional antennas send and receive radio signals in only

one direction and are usually used for point to point or multiple point connections, such as grid antennas, satellite dishes, yagi, and sectoral antennas.

#### 2.1.4.3.2 Omni Directional

Omnidirectional antennas can emit waves in all directions with the form of a perpendicular landing pattern. Omnidirectional antennas can be used to connect multiple directional antennas in point-to-multipoint communication systems such as cellular, radio and television connections.

### 2.1.4.4 Antenna Based on Shape

An example of an antenna based on its shape is a parabolic antenna, microstip and helix. The parabolic antenna is an antenna with the parabolic form, the signal beam will be concentrated at the midpoint of the antenna. Parabolic antennas are usually designed for UHF, satellite television broadcast receivers, and microwave transmissions.

## 2.1.5 Vertical Antenna

A description of the vertical antenna is obtained from the website http://denova-agracia.blogspot.com/2011/11/. A vertical antenna is one type of vertical polarized omnidirectional antennas. This antenna is usually connected to a conductor in a coaxial or suitable transmission line, the shield of the transmission line connected to the ground. In this way, the ground (or large conductive surface) plays the second conductor role of the dipole, thus forming a complete circuit. Understanding the working of vertical antennas is a basic concept that needs to be understood before designing a vertical antenna. The monopole antenna relies on a conductive soil, the so-called structural foundation may be used to provide contact

with better soil for earth or which itself acts as a ground plane to perform a function independent of a direct contact with ground. An antenna impedance is a resistance value that occurs when an antenna is supplied with an electric current. The magnitude of the impedance becomes an important factor in the performance of an antenna performance.

The works of the vertical antenna radiator are very dependent on the existing connections, if the ground is not good enough to cause the current distribution in the radial the antenna will return to the transmitter resulting in considerable power loss and impedance feed point improper and result in antenna radiation. The vertical antenna with the greatest gain compared to other vertical antenna types is the 5/8 lambda (λ) vertical antenna which has a gain of 3.3 dBi. The 5/8 λ vertical antenna consists of vertical elements of 5/8 λ length and horizontal elements of 1/4 λ length. Based on these cases, an idea exists to design and implement a 5/8 λ vertical antenna, and proceed with fabrication and measurement, in order to be applied to radio broadcasting systems.

### 2.1.6 Vertical Antenna 5/8 λ

Antenna 5/8 λ is an antenna with three-dimensional basic geometry, is a combination of straight line, circle, and cylinder. There are some basic characteristics of a 5/8 λ single wire antenna axis, ie: 5/8 λ antenna has a circular polarization with a circular polarized feeding element expected to lose due to cross polarization can be overcome; dimension of the antenna has a linear relationship with the wavelength of the middle frequency of operation, so its dimension will be smaller with increasing frequency of operation; good direction

and reinforcement over a wide frequency range; the input impedation is resistive and relatively constant over the operating working frequency range, making it easier for the realization of impedance overhaul; VSWR is relatively constant.

The definition of VSWR (Voltage Standing Wave Ratio) is explained on the website http://antenapropagasi.blogspot.com/2016/02/vswr-voltage-standing-wave-ratio-dan.html. VSWR is the ratio between the incoming wave and the reflected wave, where the two waves form standing waves. Standing Wave is a combination of reflection and interference. The reflection wave interferes with the wave coming so the phase of the wave comes disturbed by the reflection wave which causes the incoming wave to be damaged. If the VSWR value is higher, it means that the performance of the antenna is not getting better or the interference wave is getting bigger. VSWR is a matching determinant between antenna and transmitter.

#### 2.1.6.1 Spesification of 5/8 λ Vertical Antenna

Before designing the antenna, the first thing to do is to calculate the length of the antenna parts with the formula: $\frac{300}{\text{F(Mhz)}} \times \lambda$. The antenna that will be made has a frequency of 150 Mhz, so the following results are obtained:

length of vertical antenna 5/8 λ

$$=\frac{300}{150} \times \frac{5}{8} = 2 \times \frac{5}{8} = 1{,}25\ m = 125\ cm$$

length of distance with ground using 1/8 λ

$$=\frac{300}{150} \times \frac{1}{8} = 2 \times \frac{1}{8} = 0{,}25\ m = 25\ cm$$

the length of fin or horizontal element of antenna with 1/4 λ

$$=\frac{300}{150} \times \frac{1}{4} = 2 \times \frac{1}{4} = 0{,}5\ m = 50\ cm$$

After doing the calculation, the next step is to determine the material used to make the antenna. The elements used are:

Aluminum pipes are used for vertical elements on the antenna. The 1 inch aluminum pipe is an aluminum pipe that has a diameter of 1 inch. This is used for the top of the vertical element.

**Figure 2.1 Aluminum Pipe 1 inch**

The 1/2 inch aluminum pipe is an aluminum pipe that has a diameter of 1/2 inch. This is used for the lower of the vertical element.

**Figure 2.2 Aluminum Pipe ½ inch**

PVC (Polyvinyl chloride) pipe is pipe made of plastic. PVC pipe diameter is bigger than aluminum pipe. This is used to connect the top vertical elements with the lower vertical elements.

**Figure 2.3 PVC Pipe**

PVC tape is used to band the connection between PVC pipe and aluminum pipe so  the connection is not released.

**Figure 2.4 PCV Tape**

The bracket is used to place a 1/2 inch aluminum pipe, which functions as a horizontal element.

**Figure 2.5 Bracket**

The PL 259 connector is placed on the end of the coaxial cable. This is used to connect coaxial cables with radio devices.

**Figure 2.6 PL259 Connector (Male)**

Male and female connectors are used to connect coaxial cable with copper wire. If it is connected, then this will be the loading part of the antenna.

**Figure 2.7 Male and Female Connectors**

Coaxial cable is a cable that is usually used in a network as a data transmission medium. Here, a coaxial cable is used to connect an antenna to a radio device.

**Figure 2.8 Coaxial Cable RG8**

The copper wire is placed on the outer side of the PVC pipe which is used as a loading part.

**Figure 2.9 Copper Wire**

### 2.1.6.2 Designing a 5/8 λ Vertical Antenna

After calculating and selecting materials, here will be explained the steps of antenna design. First, cut the aluminum pipe 1 inch in diameter to 125 cm and 150 cm. Second, for antenna loading, cut the PVC pipe to 5 cm and attach it in the middle of two aluminum pipes as a link between the two pipes. Third, insert a 1 cm PVC pipe on each aluminum pipe and wrap a copper wire that serves as a coil of 5 turns to the outside of the PVC pipe. Fourth, connect the Coil end to the male connector, attach the male connector to a 125 cm aluminum pipe using a female connector and cover PVC pipes with PVC tape. Fifth, Connect the second male connector and coil and attach the second connector to the PVC pipe. Sixth, connect the coaxial cable RG8 cable with the female connector to the male connector. Then, insert the coaxial cable RG8 cable into a 150 cm aluminum pipe and connect with the PL259 male connector. Seventh, to make the horizontal part, cut the aluminum pipe 1/2 inch in diameter into 4 sections with a length of 50 cm.

Next, insert the bracket into the aluminum pipe 1 inch in diameter with a distance of 25 cm from the bottom. The last, insert four parts 1/2 inch aluminum pipe into the bracket and glue it.

The 5/8 λ vertical antenna that has been finished can be seen in Figure 2.10.

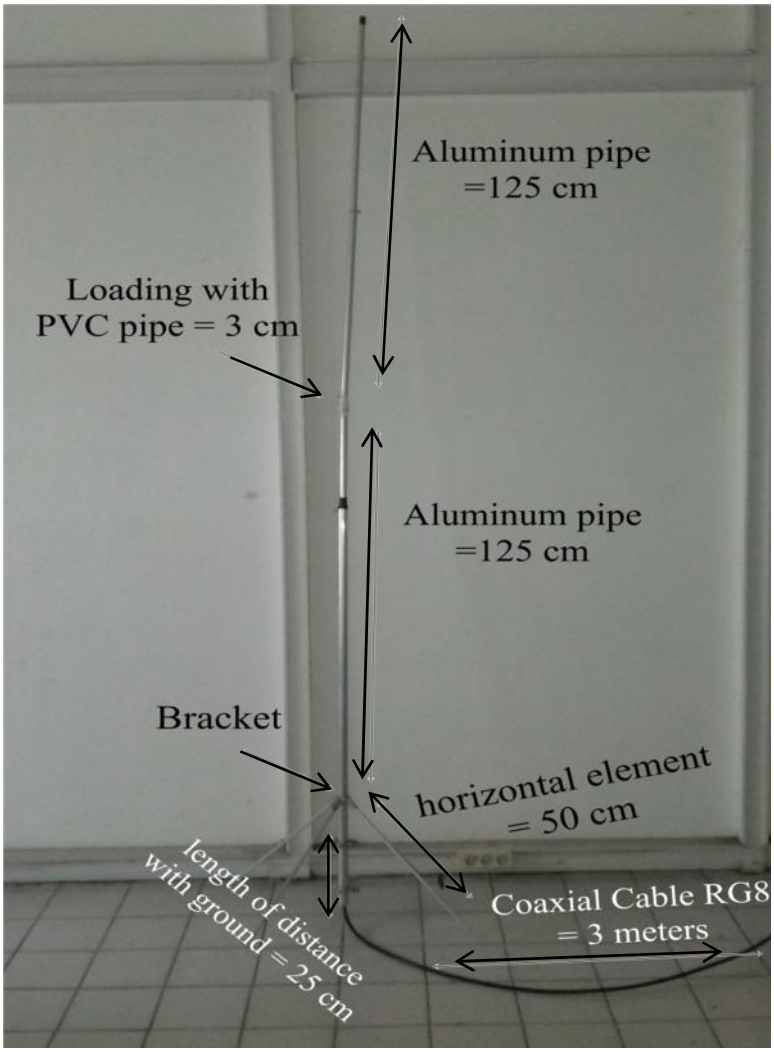


**Figure 2.10 5/8 λ Vertical Antenna**

### 2.1.6.3 Antenna Impedance

An explanation of the antenna impedance can be seen on the website https://firmanriyadi.wordpress.com/2013/11/19/antenna/, that is the antenna impedance is the ratio between voltage and current at the point the antenna is fed

through the transmission line. The amount of impedance is an important factor in the performance of an antenna. The incompatibility of the antenna impedance with the transmission line will affect the transfer of power that will be transmitted by the antenna. To make the impedance matched with transmission, the most optimal impedance is 50 ohms (Ω). 50 Ω is the most optimal impedance for an antenna with coaxial cable, resulting in high power handling but the damping factor is quite low. To find out the impedance that matches the 5/8 λ vertical antenna, it can be measured using a SWR meters. The steps to find matching frequency using SWR meter are as follows:

First, set the power supply to 12 Volts, then connect it to the SWR meter. In Figure 2.11 shows the power supply image, 5/8 λ vertical antenna, and SWR meter.

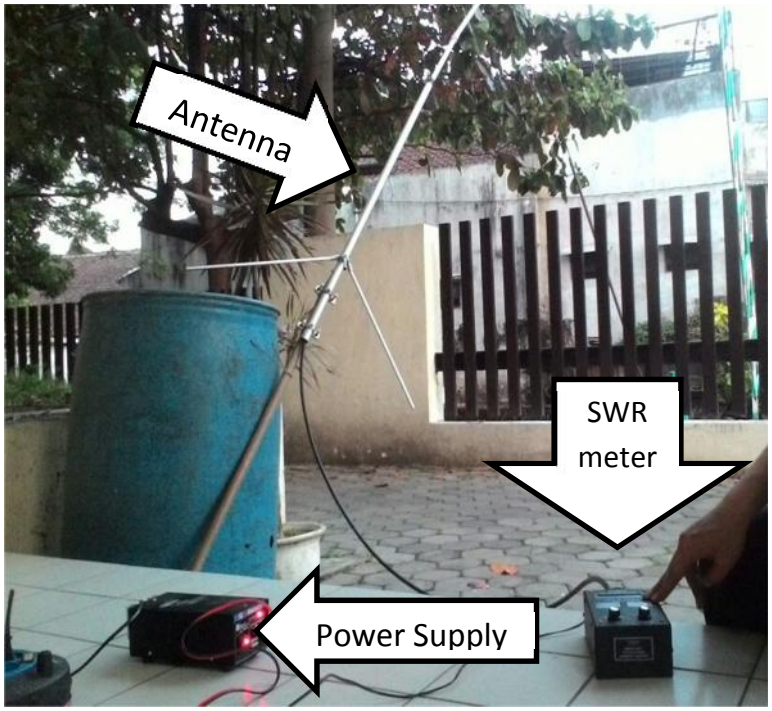


**Figure 2.11 Connect Power Supply with SWR meter**

Second, connect the antenna cable to the SWR meter. Then press the ON button on the SWR meter.

**Figure 2.12 Connect the Antenna with SWR meter**

Third, measure the frequency by turning the wiper. The wiper can be adjusted until the matching frequency is obtained.


**Figure 2.13 Results when the Impedance is 50 Ω**

So the frequency that matches with the antenna is 117,900 Mhz.

## 2.2 Skills Required for Writing the Final Report

Skills required in the Final Project are basic concept, literature study, writing skill.

### 2.2.1 Basic Concept

To make this final report, the writer must know about the basic concept of Radio Communication, Antenna and Vertical Antenna. The basic concept of radio communication, antenna and vertical antenna can be found in the Description of the Final Report.

### 2.2.2 Literature Study

The literature study is the way used to search for data or sources related to the final project. Literary studies can be obtained from various sources, such as journals, documentary books, internet and libraries.

### 2.2.3 Writing Ability

Writing ability is the skill of composing what is in the mind to be applied to writing. The writer uses writing ability to write a final report. Correct grammar, punctuation and spelling are parts of writing ability. Wrong writing and poor spelling will make the reader not understand the message the writer wants to convey. Therefore, the writer learns how to compile the correct final report using writing ability.

## 2.3 Problem and Solution

During composing this final report, the writer surely has a lot of problems both internal and external problems. On this part, the writer distinguishes three

elements, those are: Internal Problem, External Problem, and the last Solutions of the Problems.

### 2.3.1 Internal Problem

On the internal problem, the writer has difficulty in finding materials to make a 5/8 λ vertical antenna, because there are some very rare materials. 1 inch aluminum pipes are very difficult to find. To solve the internal problem, the writer uses materials from the antenna that are not used in the electrical engineering laboratory.

### 2.3.2 External Problem

On the external problem, the writer has difficulty on composing of the final report, that is misunderstanding in knowing the spesification about characteristic of antenna because each references describes with different mentions. For the external problem, the writer must search many references in order to understand the spesification about characteristic of antenna.

## 2.4 The Relevance of the Final Report with The Writer's Future Career

The final report will be useful for the development of radio technology. With this report, it is hoped that it can make it easier for writer to enter the working world related to this report such as radio station as a technician.

# CHAPTER III

# CONCLUSIONS AND SUGGESTION

## 3.1 Conclusions

Writing the final report is the most important for students' graduation. In completing the final report, the writer has successfully implemented all the courses he has taken during these six semesters. The writer knows the skill of how the structure of a paper, especially in the preparation of the Final Report. Based on chapter 2, which is the Main Report, the writer made several conclusions.

Antenna is an important component in radio communication. An antenna consists of an element of metal materials connected to a transmission line of a transmitter or receiver that is related to electromagnetic waves. The antenna has several parameters that must be known, namely directivity, gain, radiation pattern, beamwidth, and bandwidth. Antenna types can be grouped according to function, gain, polarization, and shape. If you want to make an antenna you must know first what the antenna functions and how the antenna transmits its signal.

Vertical antennas are one type of omnidirectional antenna which transmits signals in various directions. A 5/8 lambda vertical antenna is the easiest antenna to make. In making a 5/8 vertical antenna λ, the calculation to find the antenna length must refer to the formula, otherwise the frequency value will change. Antenna performance will be better if there are more horizontal elements. The

design of the λ vertical 5/8 antenna is made using aluminum, because aluminum has a lightweight and sturdy structure so that the use of antennas mounted in high places will withstand wind and weather changes.

Antenna measurements using SWR meters are needed to get a matching frequency. So it can be concluded that the matching frequency with a 5/8 lambda vertical antenna is 117,900 Mhz. And this means the author got the right calculation and finished making the 5/8 lambda vertical antenna successfully.

## 3.2 Suggestions

On the suggestion, the writer divides it into three elements, those are suggestion of final report for D-III English Program, suggestions of final report for the readers, and suggestions of final report for the public.

### 3.2.1 Suggestions of Final Report for D-III English Program

The writer suggests that this final report will open up new insights, especially for Electrical major students. Therefore, it is expected that this final report can also be a reference for Electrical Engineering students who take D-III Double Degree English Program and can add interest in Electrical Engineering students to follow the Double Degree Program.

### 3.2.2 Suggestions of Final Report for the Readers

The writer hopes that this final report will be useful for readers to increase knowledge about the antenna. The readers must know the basic concept of the communication system and the basic understanding of the antenna because this final report explains how the radio communication system and antenna making

work. The writer also suggests that in searching for materials to make antennas, readers should look for materials in online stores. Online stores usually provide a lot of even rare materials, such as 1/2 inch aluminum pipe and PL 259 connector, so readers will easily find the material needed.

### 3.2.3 Suggestions of Final Report for the Publics

The authors suggest that this final report is also useful for publics to enrich knowledge so they can design its own antenna easily.

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# UNIVERSITAS MERDEKA MALANG
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## FORM OF THE PROPOSED FINAL REPORT TITLE

Name : Izzatul Khilmiah

NIK : 15063100014

Faculty : Fakultas Ilmu Sosial dan Budaya

Major : D-III English Program

**Title of The Final Report Proposed:**

| NO. | TITLE OF THE FINAL REPORT | EXPLANATION |
|---|---|---|
| 1. | **A MANUAL FOR DESIGNING A 5/8 LAMBDA VERTICAL ANTENNA FOR RADIO COMMUNICATION** | |
| 2. | | |
| 3. | | |

Malang, May 10th 2018

Student name, who receive,

Izzatul Khilmiah Octavia Lessy Ono, A.Md.

# CONSULTATION SHEET

STUDENT'S NAME : IZZATUL KHILMIAH

OJT PLACE & ADDRESS : -

ADVISOR'S NAME : ELFIRAHMI THAMRIN S.Pd., M.Pd.

| NO. | DATE | TOPIC OF CONSULTATION | ADVISOR'S SIGNATURE |
|---|---|---|---|
| 1. | May 10, 2018 | Submiting Chapter I and Consultation | |
| 2. | May 25, 2018 | Revising Chapter I | |
| 3. | July 4, 2018 | Submit revision chapter I and chapter II consultation | |
| 4. | July 13, 2018 | Revising chapter II | |
| 5. | July 20, 2018 | Submit revision of chapter II | |
| 6. | July 30, 2018 | Revising chapter II and chapter III consultation | |
| 7. | August 3, 2018 | Revising chapter III | |
| 8. | August 10, 2018 | Submit all chapter and get approval | |
| 9. | | | |
| 10. | | | |

# REVISION SHEET

STUDENT'S NAME : IZZATUL KHILMIAH

ADVISOR'S NAME : ELFIRAHMI THAMRIN, S.Pd.,M.Pd.

EXAMINER'S NAME (I) : UNING MUSTHOFIYAH, S.S., M.Pd.

EXAMINER'S NAME (II) : YASMIN FARANI, S.Pd., M.Pd.

| NO. | DATE | TOPIC OF CONSULTATION | SIGNATURES (Advisor / Examiner) |
|---|---|---|---|
| 1. | August 24th, 2018 | Chapter I-III (revising of some incorrect tenses), chapter III (suggestion), and revising abstract, revised by Mrs. Uning Musthofiyah | |
| 2. | August 27th, 2018 | Chapter I-III (revising of some incorrect tenses), revising abstract, revising of final report title, chapter I (background), and chapter II (description, mention skills required, mention future career), revised by Mrs. Yasmin Farani | |
| 3. | August 28th, 2018 | Submit revision to Mrs. Uning Musthofiyah | |
| 4. | August 29th, 2018 | Submit revision to Mrs. Yasmin Farani<br>Revising chapter I-III (revising of some incorrect tenses), and chapter II (description), revised by Mrs. Yasmin Farani | |
| 5. | August 29th, 2018 | Revising of final report title, chapter I-III (revising of some incorrect tenses), and chapter II (description), revised by Mrs. Uning Musthofiyah | |
| 6. | | | |
| 7. | | | |
| 8. | | | |

# CURRICULUM VITAE


Name : Izzatul Khilmiah

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Phone/Mobile : 085804579703


**Personal Information**

Date of birth : 7th March, 1995

Place of birth : Probolinggo

Age : 23 years old

Health : Excellent

Interests : Sport, Traveling, Music

Marital status : Single

Nationality : Indonesian

**Education Background**

1. Kebonsari Kulon 2 Elementary School Probolinggo 2001-2008
2. Junior High School 2 Probolinggo 2008-2011
3. Vocational High School 2 Probolinggo 2011-2014
4. D-III English Program UNMER Malang 2015-2018