

**DESIGNING TERAHERTZ H-SHAPED DIPOLE ANTENNA  
AND PARAMETRIC STUDY ON THE PERFORMANCES  
OF THE ANTENNA**

**Thesis is presented in partial fulfillment for the award of the  
Bachelor of Engineering (Hons.) Electronics (Communication)  
UNIVERSITI TEKNOLOGI MARA (UiTM)**



**ISMAIL BIN IBRAHIM EDHAM  
FACULTY OF ELECTRICAL ENGINEERING  
UNIVERSITI TEKNOLOGI MARA  
40450 SHAH ALAM,  
SELANGOR, MALAYSIA**

**JULY 2014**

## **ACKNOWLEDGEMENT**

First and foremost, all praises to Allah the All-Mighty for the strengths and His blessing for me in continuing this learning process and completing this thesis. My research project would not have been completed without the help of many people. First of all, I would like to express my deepest gratitude to my beloved supervisor Dr. Aziati Husna Binti Awang for her supervision, caring, patience and constant support.

My special thanks also go to my friends Ameerul Faisal bin Asmari and Ahmad Syazwan Bin Mahadan for helping in completing this thesis. Their support also was the factors of my spirit.

I would like to express my appreciation to all the lecturers and UiTM staffs for the kindness and moral support during my study. Deepest gratitude to all my friends especially my class member for invaluable assistance.

Last but not least, I would like to thank my parent to give me full support during the completion of this thesis. Thank you for your endless support and love.

Thank you so much.

## ABSTRACT

This thesis study about the H-shaped Terahertz Dipole antenna parameters. The effect of the parameters was experimented and simulated. The designed antenna structure used copper as the patch antenna and Gallium Arsenide, GaAs as the substrate of the antenna. While there is no ground and feed line for this antenna. This is because it used laser as a feed for the antenna. The radiated wave will be radiate at the back of the antenna. The patch antenna was designed to radiate 1THz, this frequency is just for the reference frequency as we need to do the parametric study to the parameters of the antenna. A complete simulation was done using CST Studio Suite 2013. The designed antenna are not fabricate, as it is very small in size. Only simulation was done for the designed antenna. The physical parameters that involved in this simulation are length of H-shape dipole antenna ( $L_a$ ), width of H-shape dipole antenna ( $W_a$ ), length of H-shape dipole antenna (internal length) ( $L_d$ ), length of gap ( $L_g$ ), width of gap ( $W_g$ ), width of substrate ( $W_s$ ), length of substrate ( $L_s$ ), thickness of copper ( $T_c$ ) and thickness of substrate ( $T_s$ ). The result obtained shows that every single physical parameters of the antenna gives unique response to the performances of the antenna. It does not have any constant response for each physical parameters. This shows that THz antenna have a lot of different from microwave antenna. The result can be used for other researcher to study about the antenna in the same scope of study.

# TABLE OF CONTENTS

<b>LIST OF TITLE</b>	<b>PAGE</b>
<b>DECLARATION</b>	1
<b>DEDICATION</b>	11
<b>ACKNOWLEDGEMENT</b>	111
<b>ABSTRACT</b>	1V
<b>TABLE OF CONTENTS</b>	v-v11
<b>LIST OF TABLES</b>	v111
<b>LIST OF FIGURES</b>	1X
<b>LIST OF ABBREVIATIONS</b>	X
<b>CHAPTER</b>	
<b>1 INTRODUCTION</b>	
1.1 BACKGROUND STUDY	1
1.2 PROBLEM STATEMENT	2
1.3 OBJECTIVE	2
1.4 SCOPE OF THE PROJECT	2
1.5 OUTLINE OF THESIS	3
<b>2 LITERATURE REVIEW</b>	
2.1 INTRODUCTION	4
2.2 TERAHERTZ	4
2.3 TERAHERTZ SOURCES	6
2.3.1 Solid State Oscillators	6
2.3.2 Gas and Quantum Cascade Laser	6
2.3.3 Laser Driven THz Emitters	8
2.3.4 Free Electron Based Sources	9
2.4 PHOTONCONDUCTIVE ANTENNA	9

## **CHAPTER 2**

### **LITERATURE REVIEW**

#### **2.1 INTRODUCTION**

In this chapter, the sources of the research and the previous study about Terahertz technology will be discuss briefly. All of the journal and books that related will be taken into account in this chapter. In this chapter also the expected result of the research will begin to expose in a right way. The scope for this research are mainly about the terahertz technology, terahertz sources, photoconductive antenna and H-shaped dipole antenna.

All the theory that related to this title will be taken and discuss, then the parameters that affect the performance of the antenna will be inform in this chapter. The theories that will be used in this research are very useful from the start of the research till the end of it. When doing this chapter, it gives full understanding of what is the research is all about. That is why this chapter is considered as the roots of the research.

#### **2.2 TERAHERTZ**

Terahertz is mainly known as waves that lies between the microwave and infrared waves region, therefore it shares some of their features[6]. Terahertz radiation are classified as