

**UNIVERSITI TEKNOLOGI MARA
CAWANGAN PULAU PINANG**

**BROADBAND RECTANGULAR ARRAY
SLOTTED ON RESISTIVE LAYER FOR
MULTILAYER MICROWAVE ABSORBER**

NUR ANISAFIA BINTI SUHAIMI

**BACHELOR OF ENGINEERING (HONS) ELECTRICAL AND
ELECTRONIC ENGINEERING**

July 2017

ABSTRACT

Microwave absorber is used to absorb unwanted signal in communication system. The higher the signal captured, the more the efficiency of the system. To improve the absorption performance, the slotted design based on the antenna will be develop and test to observe the absorption performance. The slotted will be arrange in the arrays to monitor the amount of the signal absorbed. The slotted will be develop in flat multilayer to observe the performance of the absorber in term of absorption. The biomass material also used in the design of the slotted since it will effect the performance of the absorber. The material use is mixed carbon that contain of carbon and paint. The CST microwave studio is used to design the slotted array and will be simulate to get the result to compare with the hardware of the design. The measurement of the hardware is using Arch method measurement and the result will be analyze together with simulation results. The result from the simulation and the measurement will be analyze and compare to conclude the absorption performance.

ACKNOWLEDGEMENT

Alhamdulillah. First and foremost, I would like to thank Allah S.W.T for giving me the time, strength and blessing to finish this study. Without His blessings, none of this is possible. Special appreciation goes to my parent for their love, understanding and unconditional support throughout this long and tough journey.

I would like to express my special gratitude and thanks to my supervisor, Puan Norhayati Mohamad Noor and also my co-supervisor, Tn Hj Hasnain Bin Abdullah@Idris for their valuable advice, support, ideas and guidance throughout this study.

I would also like to acknowledge the assistance from the technicians and staff En Mohd Soofee at microwave laboratory for their continuous help and support during the lab work.

TABLE OF CONTENTS

CHAPTER	TITLE	PAGE
	AUTHOR'S DECLARATION	i
	ABSTRACT	ii
	ACKNOWLEDGEMENT	iii
	TABLE OF CONTENTS	iv
	LIST OF TABLES	vii
	LIST OF FIGURES	viii
	LIST OF SYMBOLS	x
	LIST OF ABBREVIATIONS	xi
1	INTRODUCTION	1
	1.1 Overview	1
	1.2 Problem Statement	2
	1.3 Objectives	2
	1.4 Scope of Study	2
	1.5 Thesis Organizations	3
2	LITERATURE REVIEW	4
	2.1 Overview	4
	2.2 Electromagnetic Waves	4
	2.3 Microwave Absorber Theory	6
	2.3.1 Pyramidal Microwave Absorber	6
	2.3.2 Wedge Microwave Absorber	7
	2.3.3 Convoluted Microwave Absorber	7
	2.3.4 Flat Laminate Microwave Absorber	8
	2.3.5 Reflectivity	8
	2.3.6 Impedance Matching	9
	2.4 Dielectric Material	10
	2.4.1 Permittivity	11

CHAPTER 1

INTRODUCTION

1.1 OVERVIEW

Microwave absorbers are widely used in many industry especially in communication system such as antenna, in anechoic chamber and etc. The anechoic chamber is a room that designed to absorb reflection in electromagnetic waves. The absorbers are design based on the dielectric material, frequency range and the size of the material that can absorb. The design of the material is based on the quarter of the wavelength. The electric permittivity and magnetic permeability will determine the absorbers [1]. Equation for the wavelength, $c=\lambda f$ is used to find the frequency for the design of the absorber. The design will determine the signal absorbed based on the range of 8GHz – 12GHz frequency.

Microwave absorbers come in many types such as pyramidal, honeycomb, flat and etc. Pyramidal absorbers mostly used in the anechoic chamber. A variety of practical absorbers that exists nowadays, capitalize on the very low of reflectivity levels that result from the shape of the microwave absorbers. By eliminating reflection in an anechoic chamber, a free space environment can be created by using absorbers [1]. The performance of the absorber will be influenced by the different shape of the microwave absorber. The electromagnetic absorption and temperature distribution characteristics of the absorber is critical element to be considered [2].

Generally, antenna used to radiate and transmitting the signal. However, to transmit the signal, there are many interference that disturb the efficiency of the signal. This is lead to the uses of the microwave absorber to eliminate the unwanted signal. The slotted will be stacked on the top of the other material for example paper. The different dimensions of the slotted will show the effectiveness of the signal absorbing.

Dielectric properties are crucial elements in designing the microwave absorber. The reflected wave with a thin sheet attenuated independently of the electric