

**DESIGN OF RADIATION PATTERN
RECONFIGURABLE MICROSTRIP ANTENNA ARRAYS**

**This thesis is presented in partial fulfillment for the award of the
Bachelor of Engineering (Hons.) Electrical**

UNIVERSITI TEKNOLOGI MARA (UiTM)



**NURFARAHIN AFIQAH BINTI ZAIKI
FACULTY OF ELECTRICAL ENGINEERING
UNIVERSITI TEKNOLOGI MARA
40450 SHAH ALAM
SELANGOR**

ACKNOWLEDGEMENT

First and foremost, I would like to express my gratitude to my supervisor, Associate Professor Dr. Mohd Tarmizi bin Ali for the valuable guidance and advice. I am grateful for his willingness to share examples related to my final year project that absolutely motivates me to do my best. Besides, I would like to thank the authorities of University Technology Mara (UiTM) for providing a good environment and facilities in order for me to complete this project. Finally, an honorable mention goes to my family and friends that has always been understanding and helpful. Without their help, I would have undergone many difficulties while completing my project.

ABSTRACT

This paper reports the design of radiation pattern reconfigurable microstrip patch antenna arrays. The design applies the quarter-wave transformer concept in producing a feed line that divides the power equally for an eight element linear array of rectangular microstrip patch. The objective of this project is to compare the radiation pattern and gain with increasing array element. The design uses two switches and operates at the frequency of 5.8 GHz for wireless applications. This paper focuses on the comparison of beamwidths obtained from arrays made of four and eight elements. The antennas demonstrate reconfigurability by producing narrow (concave) or wide (convex) beams.

The performance of the radiation pattern reconfigurable microstrip patch antenna array was examined based on the radiation pattern characteristics. Two different beam patterns were produced in accordance to the number of elements used. The configurability was achieved by employing a 0.5 mm wide microstrip slit to replace the switch.

TABLE OF CONTENTS

CHAPTER	CONTENT	PAGE
	Approval	ii
	Declaration	iii
	Acknowledgement	iv
	Abstract	v
	Table of Contents	vi
	List of Figures	viii
	List of Tables	x
	List of Symbols and Abbreviation	xi
1	INTRODUCTION	
	1.1 Introduction	1
	1.2 Background of study	1
	1.3 Problem Statement	3
	1.4 Objectives	4
2	LITERATURE REVIEW	
	2.1 Introduction	5
	2.2 Microstrip Antenna	5
	2.3 Methods to Achieve Reconfigurability	8
	2.4 Types of Arrays	9
3	MICROSTRIP ANTENNA STRUCTURE	
	3.1 Introduction	11
	3.2 Calculations	11
	3.3 Single Patch Structure	13
	3.4 Quarter-wave Transformer Structure	14
	3.5 Two-element Array Structure	16
	3.6 Four-element Array Structure	17
	3.7 Truncation of Feed Line	18

CHAPTER 1

INTRODUCTION

1.1 INTRODUCTION

In the first chapter, the project's background is discussed in order to give a general overview of the project. It contains all the related basic information about the project for the purpose of giving a better understanding for design of a reconfigurable microstrip antenna.

1.2 BACKGROUND OF STUDY

In the context of an antenna, reconfigurability is the ability to change an individual radiator fundamental operating characteristics through electrical, mechanical or other means ideally. Reconfigurable antennas should be able to alter their frequencies, impedance bandwidth, polarizations and radiation patterns independently to accommodate with changing operating requirements [1].

In this project, a radiation pattern reconfigurable antenna is proposed. Methods of producing a radiation pattern reconfigurable antenna are by rerouting currents via switches [2], by using parasitic coupling [3], and by employing