

DESIGN OF A COMPACT PYRAMIDAL HORN ANTENNA

This thesis is presented in partial fulfillment for the award of the Bachelor of Electrical
Engineering (Honors) by
UNIVERSITI TEKNOLOGI MARA
MALAYSIA



NORHAFIZI BIN LONG
Faculty of Electrical Engineering
UNIVERSITI TEKNOLOGI MARA
40450 SHAH ALAM,
SELANGOR, MALAYSIA.

ACKNOWLEDGEMENT

Syukur Alhamdulillah, thanks to Allah S.W.T. that gives me the time and strength also the opportunity to settle and complete this final year project as entitled “Design Of A Compact Pyramidal Horn Antenna” although I have several problem, I merge to resolve it successfully.

I would like to express my sincere gratitude and appreciation to my project supervisor, Mr Mohd Tarmizi bin Ali for providing me with valuable guidance, support, commitment, ideas and constructive comment during the course of this project.

I also thankful to laboratory technician in Microwave Laboratory for their support and technical expertise.

My gratitude also to my family for their love inspirations and invaluable support through out the years, for without them, I would never gone this far.

Lastly, very special thanks to our classmate, housemate and all my friends who has help directly or indirectly in process of completing this final year project for their ever enduring support.

Thank you very much. Wassalam.

NORHAFIZI BIN LONG

Faculty of Electrical Engineering

UNIVERSITI TEKNOLOGI MARA

Shah Alam, Selangor Darul Ehsan.

ABSTRACT

An antenna consists of any structure made of material bodies that can be composed of either conducting or dielectric materials or may be a combination of both.

The development of a compact horn antenna is reviewed in this paper. The design is based on the frequency used. The horn is widely used as a feed element for large radio astronomy, satellite tracking and communications dishes. It is a common element of phased arrays and serves as a universal standard for calibration and gain measurements of other high-gain antennas. The horn is nothing more than a hollow pipe of different cross sections which has been tapered to larger opening. The type, direction, and amount of taper can have a profound effect on the overall performance of the element as a radiator.

LIST OF CHAPTERS

CHAPTER		PAGE
1.	INTRODUCTION	
1.1	Preface	1
1.2	Introduction Of An Antenna	2
2.	FUNDAMENTAL PARAMETERS OF ANTENNA	
2.1	What Is An Antenna And How Does It Works?	5
2.2	Radiation Pattern	6
2.2.1	Isotropic, Directional, and Omni Directional Pattern	7
2.2.2	Principal Patterns	8
2.2.3	Radiation Pattern Lobes	10
3.	HORN ANTENNA	
3.1	Aperture Antenna	12
3.1.1	Open Ended Rectangular Waveguide	13
3.2	Horn Antenna	14
3.2.1	Waveguide	16
4.	PYRAMIDAL HORN ANTENNA	
4.1	Aperture Fields and Radiated Fields	19
4.2	Directivity of A Pyramidal Horn	24
4.3	Friis Transmission Formula	25
5.	DESIGN PROCEDURE	
5.1	Design Parameters	26
5.2	Manufacturing Issues	27
5.3	Measurement Aspects	28
5.3.1	Far-Field Measurement	28
5.3.2	Near-Field Scanning Techniques	30

5.4	Accurate Gain Measurement of horn Antennas in the Shortened Far-Field	33
5.5	Gain Transfer Method	34
6.	DESIGN THE PYRAMIDAL HORN ANTENNA	
6.1	Frequency	35
6.2	Waveguide	35
6.3	The Horn	37
7.	EXPERIMENT PROCEDURE	
7.1	Equipment	39
7.2	Pre-lab Preparation	39
7.3	Experiment Set-up	40
8.	RESULT AND DISCUSSIONS	
8.1	Result	42
8.2	Discussions	47
9.	CONCLUSION	
9.1	Conclusion	49
	REFERENCES	51
	APPENDIX	52