

DESIGN OF TULIP AND HIBISCUS ANTENNA

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This report is submitted in partial fulfillment of the requirements for the award of Bachelor of Electronic Engineering (Telecommunication Electronics) With Honours.

Faculty of Electronic and Computer Engineering
UNIVERSITI TEKNIKAL MALAYSIA MELAKA

APRIL 2010



UNIVERSITI TEKNIKAL MALAYSIA MELAKA
FAKULTI KEJURUTERAAN ELEKTRONIK DAN KEJURUTERAAN KOMPUTER

BORANG PENGESAHAN STATUS LAPORAN
PROJEK SARJANA MUDA II

Tajuk Projek : DESIGN OF TULIP AND HIBISCUS ANTENNA

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To my beloved mother and father

ACKNOWLEDGEMENT

In the name of ALLAH, Most Generous and Most Merciful

It is with the deepest sense of gratitude of the Almighty ALLAH who gives strength and ability to complete this project. All good aspirations, devotions and prayers are due to ALLAH whose blessing and guidance have helped me throughout to entire project.

First and foremost, I wish to express my sincere gratitude to my supportive supervisor En.Mohamad Zoinol Abidin bin Abdul Aziz, who was instrumental in providing guidance and supervision throughout conducting this project. His willingness to assist in my comprehension and application of antenna concepts is invaluable and will not be forgotten. The completion of this report would not also be the possible without some special people who had provide me with the guidance and much-needed assistance on the design and measurement of Tulip and Hibiscus Antenna every single step of the way.

The report is also dedicated to all staffs at FKEKK's Laboratory, for giving me the chance to use test and measurement equipment at the laboratory. Not forgetting, Saidatina, Izzatul, Nurbaiti and Nurfaisya who had offered me continuous guidance and co operations during the course of this project.

Special appreciations are dedicated to all my lecturers at Faculty of Electronics and Computer Engineering for giving me supports and guidance throughout the years of my studies in Universiti Teknikal Malaysia Melaka. Lastly, lot of thanks to my family for their love and trust and to those had been involved in this project directly and indirectly.

ABSTRACT

Microstrip patch antenna shapes that been used for this project is tulip and hibiscus shaped. This tulip and hibiscus antennas eschew a dielectric substrate and suspend a metal patch in air above a ground plane using dielectric spacers; the resulting structure is less robust but provides better bandwidth. Because these antennas have a very low profile, are mechanically rugged and can be conformable, they can be applied on the exterior of aircraft and spacecraft, or are incorporated into mobile radio communications devices. The main purpose of this project is to design tulip and hibiscus antenna with a certain frequency, bandwidth, gain, structure and layout. The focus is on microstrip and printed antenna design. The scope of work in the design is the simulation parts which involved with some materials and tools using parametric study. The parameter (ISM frequency, bandwidth, gain, VSWR) in the design of tulip and hibiscus antenna is simulated using CST software. FR4 microstrip board is used for fabrication, measurement and testing. The measurement of the parameter (ISM frequency, bandwidth, gain, VSWR) of tulip and hibiscus antenna is done using Vector Network Analyzer. The best performance of tulip antenna is the antenna that has quarter-wave feedline. This can be observed through the value of resonance frequency, f_r and the return loss that achieved.

ABSTRAK

Antena Mikrostrip lekap yang telah digunakan untuk projek ini adalah berbentuk tulip dan bunga raya. Antena tulip dan bunga raya jauh daripada substrat dielektrik dan memberi sebuah logam lekap di udara dengan menggunakan “spacer” dielektrik bumi, struktur yang dihasilkan kurang kuat tetapi mempunyai jalur lebar yang lebih baik. Oleh kerana antena ini mempunyai profil yang sangat rendah, secara mekanik kasar dan boleh serupa, ia dapat diaplikasikan pada bahagian luar kapal dan luar angkasa, atau dimasukkan ke dalam peranti radio komunikasi mobile. Tujuan utama projek ini adalah untuk merekabentuk antena tulip dan bunga raya pada frekuensi dan jalur lebar tertentu, “gain”, struktur dan gambarajah. Fokusnya adalah pada rekabentuk antena yang dicetak mikrostrip. Ruang lingkup pekerjaan dalam rekabentuk adalah sebahagian daripada simulasi yang terlibat dengan beberapa bahan dan alat dengan menggunakan kajian parametrik. Parameter (frekuensi ISM, jalur lebar, “gain”, VSWR) dalam perancangan antena tulip dan bunga raya disimulasikan menggunakan perisian CST. Papan mikrostrip FR4 digunakan untuk fabrikasi, pengukuran dan pengujian. Pengukuran parameter (frekuensi ISM, jalur lebar, “gain”, VSWR) dari antena tulip dan bunga raya dilakukan dengan menggunakan “Vector Network Analyzer”. Antena Tulip yang mempunyai kebolehan beroperasi yang paling bagus ialah antenna tulip yang mempunyai garis-masuk berukuran jalur-suku garis-masuk. Ini dapat dilihat melalui frekuensi resonan dan “return loss” yang diperolehi.

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LIST OF ABBREVIATIONS

Symbol	Definition
ADS	Advanced Design System
AR	Axial Ratio
BW	Bandwidth
CP	Circular polarization
CST	Computer Simulation Technology
EM	Electro-magnetic
EMC	Electromagnetically Coupled
FNBW	First-null Beamwidth
FR4	Flame Retardant (Type-4)
GSM	Group Special Mobile
HPBW	Half-power Beamwidth
IEEE	Institute of Electrical and Electronics Engineers
ISM	Industrial, Scientific and Medical
LP	Left-hand Polarization
LHCP	Left Hand Circular
MWO	Microwave Office
PCB	Printed Circuit Board
Q	Quality Factor
RF	Radio Frequency
RFID	Radio Frequency Identification
RP	Right-hand Polarization