

UNIVERSITI TEKNOLOGI MARA

**UWB MICROSTRIP ANTENNA BASED
ON CIRCULAR PATCH TOPOLOGY
WITH STEPPED BLOCKS AND
DEFECTED GROUND STRUCTURE**

MOHD AIZAT BIN SULAIMAN

Thesis submitted in fulfillment
of the requirements for the degree of
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Faculty of Electrical Engineering

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CONFIRMATION BY PANEL OF EXAMINERS

I certify that Panel of Examiners has met on 23rd June 2014 to conduct the final examination of Mohd Aizat Bin Sulaiman on his Master of Science thesis entitled “UWB Microstrip Antenna based on Circular Patch Topology with Stepped Blocks and Defected Ground Structure” in accordance with Universiti Teknologi MARA Act 1976 (Akta 173). The Panel of Examiners recommended that the student be awarded the relevant degree. The panel of Examiners was as follow:

Sukreen Hana Herman, PhD

Lecturer

Faculty of Electrical Engineering

Universiti Teknologi MARA

(Chairman)

Mohd Khairul Mohd Salleh, PhD

Lecturer

Faculty of Electrical Engineering

Universiti Teknologi MARA

(Internal Examiner)

Muhammad Ramlee Kamarudin, PhD

Associate Professor

Fakulti Kejuruteraan Elektrik,

Universiti Teknologi Malaysia

(External Examiner)

SITI HALIJJAH SHARIFF, PhD

Associate Professor

Dean

Institute of Graduate Studies

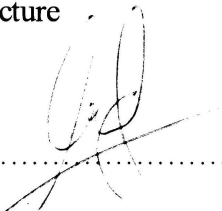
Universiti Teknologi MARA

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AUTHOR'S DECLARATION

I declare that work in this thesis was carried out in accordance with the regulations of Universiti Teknologi MARA. It is original and is the result of my own work, unless otherwise indicated or acknowledge as referenced work. This research report has been not submitted to any other academic institution or non-academic institutions for any degree or qualification.

I, hereby acknowledge that I have been supplied with Academic Rules and Regulations for Post Graduate, Universiti Teknologi MARA, regulating the conduct of my study and research.

Name of Student	:	Mohd Aizat Bin Sulaiman
Student I.D. No.	:	2011811608
Programme	:	Master of Electrical (EE780)
Faculty	:	Faculty of Electrical Engineering
Thesis Title	:	UWB Microstrip Antenna based on Circular Patch Topology with Stepped Blocks and Defected Ground Structure
Signature of Student	:	
Date	:	October 2014

ABSTRACT

The growth of wireless communications technology over the past few years resulted in increasing number of wireless terminals worldwide. This also led to massive increase of user capacity, which is critical in maintaining the quality of services in a wireless communication system. Therefore, the development of breakthrough technologies that provides a new method of increasing the efficiency of frequency usage, and developing new frequency resources are essential. UWB uses very low energy pulses and transmit in a way which allows it to co-exist with other traditional narrowband and continuous carrier wave systems operating in the same frequency band. Corresponding to this development, research and design of UWB-capable antennas are essential for implementation and commercialization of UWB systems. UWB antennas are challenging and difficult to design because the antennas should be able to operate efficiently throughout the UWB frequency range as defined by the FCC. At the same time, due to integration requirement of the UWB system, the UWB antennas must be small, compact, and able to transmit stable signals. This thesis focuses on the design of UWB antenna in order to achieve stable return loss and stable radiation pattern in the range of UWB which are presented into four types of UWB antennas. The first design of the UWB antenna studied in this thesis consists of a circular microstrip monopole antenna with partial ground plane. However, this design did not cover all UWB range and the radiation pattern diverges at high frequency range of UWB. To overcome these problems, rectangular open stub lines and quarter wave transformer were introduced in the second design. The rectangular open stub line is used to maintain the return loss and the radiation pattern while quarter wave transformer is used to distribute 50ohm of impedance at the end of the feedline. The third design introduced the Wing open stub line structure at the both side of circular microstrip monopole antenna to improve the result from previous design. The fourth design was focused on the miniaturization of the UWB antenna from the third design while maintaining the antenna performance by applying Defected Ground Structure (DGS) concept. All the antennas were designed on Rogers 5880 printed circuit board (PCB) with overall size of $26 \times 40 \times 0.787 \text{ mm}^3$ and dielectric substrate, $\epsilon_r = 2.2$. The performance of each designed antennas was analyzed in terms of bandwidth, gain, return loss, radiation pattern, and verified through actual measurement of the fabricated antennas.

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