UNIVERSITI TEKNOLOGI MARA

ANTENNA OPTIMIZATION USING SLOT TECHNIQUES FOR WIDEBAND APPLICATION

MOHAMAD AMIR IMRAN
BIN MOHD HASLI

Thesis submitted in fulfillment
of the requirement for the degree of
Master of Science

Faculty of Electrical Engineering

July 2017

CONFIRMATION BY PANEL OF EXAMINERS

I certify that a Panel of Examiners has met on 15th June 2017 to conduct the final examination of Mohamad Amir Imran Bin Mohd Hasli on his Master of Science thesis entitled "Antenna optimization using slot techniques for wideband application" in accordance with Universiti Teknologi MARA Act 1976 (Akta 173). The Panel of Examiners was as follows:

Ramli Adnan, PhD
Associate Professor
Faculty of Electrical Engineering
Universiti Teknologi MARA
(Chairman)

Mohd Tarmizi Ali, PhD
Associate Professor
Faculty of Electrical Engineering
Universiti Teknologi MARA
(Internal Examiner)

Siti Zuraidah Ibrahim, PhD
Associate Professor
School of Computer & Network Engineering,
Universiti Malaysia Perlis
(External Examiner)

PROF. SR. DR. HAJI ABDUL HADI HAJI NAWAWI
Dean
Institute of Graduate Studies
Universiti Teknologi MARA
Date : 18th July, 2017

AUTHOR'S DECLARATION

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

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

Name of Student	:	Mohamad Amir Imran Bin Mohd Hasli
Student I.D No.	:	2014216586
Program	:	Master of Science – EE750
Faculty	:	Electrical Engineering
Thesis Title	:	Antenna Optimization Using Slot Techniques for Wideband Application
Signature of Student	:	……..……..……..……..……..……..……..
Date	:	July 2017

ABSTRACT

In recent years, the complexity of antenna design and function has growth rapidly as it continue to emerge together with technology to help solve human problems. Designers adopt a few antenna design techniques that offered room of analysis and broad study which promise positive outcome to meet user's application demand. This thesis work focuses on analyzing a design of patch antenna used in portable radio transceiver to access modern, existing wireless services including GSM, PCS, DCS, GPS, UMTS, WLAN, and WiMAX. The antenna configuration utilized present techniques available in the open literature such as modification of radiator and modification of ground plane. Each techniques presents different advantages and disadvantages depending on the required analysis and application. It is proven that introduction of slot in antenna radiator excites new resonant and improve frequency bandwidth by proper placing and tuning the slot dimension as part of the radiator configuration. As the complexity of radiator modification troubled designers, researcher shows that applying a slot on the ground plane could also exploit positive advantages to the antenna performance while minimize ground plane area that could be used for electronic circuitry in a more complex system. Such antenna suit the current design demand and become a good candidate for wireless communication application, where compactness and wideband properties are critical. The proposed antenna managed to achieve a total of 6.7% dimension reduction by utilizing these techniques. This thesis present an approach to respond to current design challenge and demand in wireless communication application. A small and compact wideband monopole planar antenna, was presented. The antenna is modified by using several techniques to enhance the performance of the antenna, such as corrugated slot, radiator slot, parasitic element, ground plane shape and ground slot. The design was inspired by a previous work and focus to enhance the performance by utilizing the abovementioned modification techniques above. The proposed antenna has wideband coverage for all wireless services operating from 850 MHz to 3 GHz at 6dB return loss, hence suitable for handheld, portable devices. The performance of the designed antenna was verified theoretically by software simulation and experimentally by VNA measurement. The obtained radiation pattern shows omnidirectional characteristic, especially on lower frequency and is obvious in E-plane views. The measured antenna gain and efficiency range from 2.3 to 5.0 dBi, suitable for wireless application. With the presented antenna designed as a potential solution to modern wireless communication antenna application, the current design challenge and complexity would be addressed accordingly.

TABLE OF CONTENTS