ULTRA WIDE BAND ANTENNA WITH DEFECTED GROUND STRUCTURE FOR 5G APPLICATION

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ULTRA WIDE BAND ANTENNA WITH DEFECTED GROUND STRUCTURE FOR 5G APLLICATION

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This report is submitted in partial fulfilment of the requirements for the degree of Bachelor of Electronic Engineering with Honours

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I hereby declare that I have read this thesis and in my opinion this thesis is sufficient in terms of scope and quality for the award of Bachelor of Electronic Engineering with Honours.

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DEDICATION

This project is dedicated to my parents, family, and friends, as well as those who worked tirelessly in helping and assisted me in completing this project.

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ABSTRACT

Fifth-generation wireless (5G) is the next iteration of cellular technology, expected to boost wireless network speed and responsiveness dramatically. Besides that, Ultra-Wide Band (UWB) technology is rapidly developing area in the field of Wireless Communication. This is because there's several issue of wireless portable devices that require antennas that operate at numerous frequencies for various wireless transmission functions, and antenna operation bands and functions are becoming increasingly challenging. Furthermore, there are demands for fast data speeds, low power consumption, cheap cost, and a large network capacity from LTE 4G users, and these demands encourage this project to be realised. The goal of this project is to design a UWB antenna with Defected Ground Structure (DGS) that can operate at 3.5GHz and be used for high-speed data applications. Additionally, the goal of this project is to verify simulation results by fabrication and testing, with the value of S_{11} having to be less than -10dB with a greater gain. As a solution a rectangular microstrip patch antenna with a half-ground defective ground structure (DGS) for ultra-wide band (UWB) applications. The antenna was then fabricated using an etching procedure and a FR-4 substrate. Finally, the Vector Network Analyzer (Agilent) is utilised to determine the S-Parameter based on the measurement findings.

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ABSTRAK

Tanpa wayar generasi kelima (5G) ialah lelaran teknologi selular seterusnya, dijangka meningkatkan kelajuan rangkaian wayarles dan responsif secara mendadak. Selain itu, teknologi Jalur Lebar Ultra (UWB) sedang berkembang pesat dalam bidang Komunikasi Tanpa Wayar. Ini kerana terdapat beberapa isu peranti mudah alih wayarles yang memerlukan antena yang beroperasi pada pelbagai frekuensi untuk pelbagai fungsi penghantaran wayarles, dan jalur dan fungsi operasi antena menjadi semakin mencabar. Tambahan pula, terdapat permintaan untuk kelajuan data yang pantas, penggunaan kuasa yang rendah, kos yang murah, dan kapasiti rangkaian yang besar daripada pengguna LTE 4G, dan permintaan ini menggalakkan projek ini direalisasikan. Matlamat projek ini adalah untuk mereka bentuk antena UWB dengan Defected Ground Structure (DGS) yang boleh beroperasi pada 3.5GHz dan digunakan untuk aplikasi data berkelajuan tinggi. Selain itu, matlamat projek ini adalah untuk mengesahkan hasil simulasi melalui fabrikasi dan ujian, dengan nilai S_{11} perlu kurang daripada -10dB dengan keuntungan yang lebih besar. Sebagai penyelesaian antena tampalan jalur mikro segi empat tepat dengan struktur tanah rosak separuh tanah (DGS) untuk aplikasi jalur ultra lebar (UWB). Antena kemudiannya dibuat menggunakan prosedur etsa dan substrat FR-4. Akhir sekali, Penganalisis Rangkaian

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Vektor (Agilent) digunakan untuk menentukan Parameter S berdasarkan penemuan pengukuran.

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Nothing has been more important to me in the pursuit of this project other than the members of my family. I would like to thank family, Mrs Roslini Akmar Binti Mohd Hashim whose love and guidance are with me in whatever I pursue and also my elder brother Muhd Nazirul Bin Azizol Azlan who assisted me in sharing some antenna design knowledge and locating software that could be utilised to build my project. Also not forgotten to my special friends Muhammad A'mmar and Wan Nurliyana for helping me in preparing and share info about this project.

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LIST OF SYMBOLS AND ABBREVIATIONS

For examples:

CC	:	Central canal
DAB	:	3,3’-diaminobenzidine
HRP	:	Horseradish peroxidase
MS222	:	Tricaine methanesulfonate
DGS	:	Defected Ground Structure
UWB	:	Ultra-Wide Band
5G		Fifth Generation
4G		Fourth Generation
LTE		Long Term Evolution
dB		Decible
CST		Computer Simulation Technology
Vswr		Voltage Standing Wave Ratio
S11		S-Parameter
Ghz		Giga Hertz
Hz		Hertz
Fr4		Flame Retardant
EM		Electromagnetic
SMA		SubMiniature Version A

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FCC	Federal Communication Commission
CPW	Coplanar Waveguide
FSS	Frequency Selective Surface
SRR	Split Ring Resonator
DSRR	Double Split Ring Resonator
RT - Duriod	Roger 5580
EBG	Electromagnetic Band Gap
PBG	Photonic Band Gap
Si Unit	System International Unit
Sl	Substrate Length
Sw	Substrate Width
Pw	Patch Width
Pl	Patch Length
Fw	Feed line Width
Fl	Feed Line Length
Gw	Ground Width
Gl	Ground Length
VNA	Vector Network Analyzer
Fr	Resonant Frequency

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