





THE STUDY OF THE ORTHOGONAL FREQUENCY DIVISION MULTIPLEXING-  
BASED PHYSICAL LAYER PERFORMANCE OF WiMAX

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A thesis submitted in partial fulfillment of  
the requirements for the award of the degree of  
Bachelor of Applied Science (Physics Electronics and Instrumentation)

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UNIVERSITI MALAYSIA TERENGGANU  
2009

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*The Study of the Orthogonal Frequency Division Multiplexing-  
Based Physical Layer Performance of WiMAX*

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## DECLARATION

I hereby declare that this thesis entitled **The Study of the Orthogonal Frequency Division Multiplexing-Based Physical Layer Performance of WiMAX** is the result of my own research except as cited in the references.

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## ACKNOWLEDGEMENTS

At the end of my thesis, I would like to express my greatest gratitude to all those who gave me the possibility to complete this thesis.

First of all, I am deeply indebted to my research project supervisor, Puan Wan Hafiza Wan Hassan for her guidance throughout my study and also writing of this thesis.

Secondly, I would like to express my sincere thanks to the Head of the Department of Physical Sciences, Dr. Mohd Ikmar Nizam Mohamad Isa and my research project coordinator, En. Engku Abd Ghapur Che Engku Ali who had given a lot of help on my research project.

Finally, I would like to express my deepest and utmost gratitude to my dearest family especially my mother, Ng Kek Lan who have been my definite source of motivation and encouragement.

## **THE STUDY OF THE ORTHOGONAL FREQUENCY DIVISION MULTIPLEXING-BASED PHYSICAL LAYER PERFORMANCE OF WiMAX**

### **ABSTRACT**

Within the last two decades, communication advances have reshaped the way we live our daily life. Wireless communications has grown from an obscure, unknown service to a ubiquitous technology that serves almost half of the people on earth. WiMAX, which stands for Worldwide Interoperability for Micro Wave Access is a new broadband wireless standard (IEEE 802.16) that provides Metropolitan Area Network broadband connectivity. OFDM is a technology that transmits multiple signals simultaneously over a single transmission path such as wireless network. It significantly increases the amount of information that can be carried over a wireless network. WiMAX PHY layer is based on OFDM modulation with a 256-FFT and designed for NLOS operation in the frequency bands between 2 GHz to 11 GHz. In this research, a preliminary basic simulation model OFDM is simulated by using Matlab/Simulink. Then, a simulation model of IEEE 802.16d-OFDM Physical Layer with QPSK modulation scheme and 1/2 coding rate is implemented and simulated as the enhancement from the preliminary basic OFDM model. From this study, the bit error rate is 0.22967 when SNR value is 10 dB. This system requires a SNR value of 18 dB to transmit an error free OFDM signal.

# KAJIAN PRESTASI LAPISAN FIZIKAL WiMAX YANG BERASASKAN PEMULTIPLEKSAN PEMBAHAGIAN FREKUENSI ORTOGONAL

## ABSTRAK

Sejak dua dekad yang lepas, kemajuan komunikasi telah mengubah kehidupan harian kita. Komunikasi tanpa wayar telah berkembang daripada satu perkhidmatan yang kurang dikenali kepada satu teknologi yang digunakan oleh hampir setengah penduduk di bumi. *Worldwide Interoperability for Micro Wave Access*, WiMAX adalah satu jalur lebar tanpa wayar standard (IEEE 802.16) yang menyediakan penyambungan jalur lebar kepada rangkaian kawasan metropolitan. Pemultipleksan Pembahagian Frekuensi orthogonal, OFDM adalah satu teknologi yang menghantar isyarat-isyarat berbilang secara serentak melalui satu media penghantar seperti rangkaian tanpa wayar. OFDM meningkatkan amaun maklumat yang boleh dihantar melalui rangkaian tanpa wayar secara nyata. Lapisan fizikal WiMAX adalah berdasarkan modulasi OFDM dengan satu 256-FFT dan direka untuk operasi NLOS dalam jejalar frekuensi antara 2 GHz kepada 11 GHz. Dalam kajian ini, satu asas model OFDM telah disimulasi pada peringkat awal dengan menggunakan Matlab/Simulink. Kemudian, satu lapisan fizikal IEEE 802.16d-OFDM model simulasi dengan skim modulasi QPSK dan 1/2 kadar coding telah disimulasikan sebagai model peningkatan daripada model simulasi asas OFDM. Melalui kajian ini, BER bernilai 0.22967 semasa SNR ditetapkan sebagai 10 dB. Sistem ini memerlukan nilai SNR 18 dB untuk menghantarkan OFDM isyarat yang tiada ralat.