



COLLEGE OF ENGINEERING & TECHNOLOGY

Department: Electronics and Communications Engineering, Cairo

Graduation Project Description Form

Project Title:

Design, Simulation and Implementation of the Physical Layer of WiMAX System

Project Supervisor(s):

Prof. Dr. Mohamed Aly Aboul-Dahab (EC Dept., College of Eng., AAST, Cairo)

Duration from mo/year 2/2013 till mo/year 2/2014

Product Category

Algorithm Hardware Software _____

Standards:

Safety: UL, CE _____ IEEE **IEEE 802.16** FCC _____ Other _____

Practical Realization Form

PCB _____ Firmware _____ Embedded CPU Kit (ARM, ..etc): _____

PC Software _____ Ready-made Package _____ DSP Kit _____ FPGA Kit

VLSI Schematics _____ VLSI Layout _____ VLSI Silicon (ASIC) _____

Language

VHDL/Verilog Matlab C/C++/Java _____

Productization

Finished Product Form: _____ Possible Commercialization _____

Amount of funds needed for buying components: _____

IEEE GOLD Made-In-Egypt/Engineering Day: _____

ITAC (ITIDA) or NTRA Funding Application: _____

Testing

Functional Simulation Parameters _____ Final Hardware Other: _____

Lab Test Setup

EMC _____ Environmental _____ Microwave _____ Analog Lab _____ Other: _____

CAD Tools *(No unauthentic software is allowed):*

Elective Classes Required:



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Abstract

Design, Simulation and Implementation of the Physical Layer of WiMAX System

Prof. Dr. Mohamed Aly Aboul-Dahab

WiMAX, means “Worldwide Interoperability for Microwave Access” . It is a wireless telecommunication system that provides transmission of data via various modes, from point – to multipoint links, to portable and fully mobile internet access. The technology utilized in this system provides higher broadband speeds without the need for cables. The technical requirements of the system are based upon the IEEE 802.16 standard .The bandwidth and range of WiMAX make it suitable for potential applications such as connecting Wi-Fi hotspots to the Internet, providing a wireless alternative to cable and DSL for “last mile” broadband access and providing portable connectivity.

From the engineering point of view, WiMAX incorporates two significant layers, namely the Medium Access Control (MAC) layer and the Physical (PHY) layer. The MAC layer is characterized by a scheduling algorithm that allows the subscriber station to have access to the network with more efficient use of the available bandwidth. On the other hand, the physical layer uses a scalable orthogonal frequency division multiplexing (OFDM) and orthogonal frequency division multiple access (OFDMA) techniques, by which up to 256 subcarriers are used to handle the data. In addition, the use of multiple input- multiple output (MIMO) antennas provide more technical support to the system. *It is worth mentioning that the project mainly deals with the PHY layer.*

The project will cover the following topics:

- Investigating the differences between the WiMAX and other wireless systems.
- Reviewing the IEEE 802.16 standards
- Investigating the role of the MAC layer
- Investigating the technical aspects of the PHY layer
- Studying the different wave propagation models
- Designing, simulating and implementing some of the building blocks of the Indoors/outdoors equipment

The practical part of the project will depend upon the use of:

- Software packages that can provide simulation of circuit designs.
- FPGA chip that can be downloaded with the successful simulated designs.

Each student in the group will be responsible for:

- Investigating the technicalities of the WiMAX system.
- Designing and implementing one of the building blocks of the handheld equipment.

References and Links



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