COLLEGE OF ENGINEERING & TECHNOLOGY

Department: Electronics and Communications Engineering, Cairo

Graduation Project Description Form

Project Title: WiMAX Design, Simulation and Implementation of the Baseband Module of Physical Layer

Duration from mo/year_____till mo/year _____
Project Supervisor(s): Prof. Dr. Mohamed Aly Aboul-Dahab

Product Category
Algorithm_____   Hardware_____   Software_____
Standards:
Safety: UL, CE_____   IEEE _____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

WiMAX Design, Simulation and Implementation of the Baseband Module of Physical Layer 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 subcarrires are used to handle the data.. *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

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- 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 baseband module of the indoors/outdoors equipment.
- Writing down his /her own project thesis

Prerequisites

Each student has to study a VHDL course

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References and Links