Ain Shams University
Faculty of Engineering
Electronics and Communication Engineering Department

Performance of high data rate Mobile Communication Systems

A Thesis

Submitted in partial fulfillment for the requirement of the degree of Master of Science in Electrical Engineering

(Electronics and Communication Engineering)

Submitted by

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B.Sc. in Electrical Engineering
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Statement

This thesis is submitted as partial fulfillment of M.sc. degree in Electrical engineering, faculty of Engineering, Ain shams University.

The author carried out the work included in this thesis, and no part of it has been submitted for a degree or qualification at any other scientific entity

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Thesis Summary

As a new technology for mobile communication, LTE can achieve high data rates and the high capacity requirements. One of the major challenges facing any mobile operator in the initial launch of LTE network is to determine the number of LTE base stations needed to cover a certain area. The effect of radio propagation must be estimated in order to recover the transmitted information accurately. Therefore channel estimation is a vital part in the receiver designs of LTE. Also the effect of different channel models varies between pedestrian and vehicular mobiles which can affect the type of modulation technique used, hence affecting the user peak throughput.

In this thesis, a detailed study of standard channel models has been done. Channel estimation techniques such as Minimum Mean Square Channel Estimation and Least Square Channel have been evaluated. Different modulation schemes like QPSK, 16-QAM and 64-QAM are evaluated with reference to different mobile speeds. A link level simulator based on LTE physical layer specifications is used in this study using Matlab & Simulink. The outcome of the simulation is threshold parameters that can be used in the LTE planning tools to calculate the required new sites for LTE deployment.

Key Words

LTE, downlink, OFDM, channel estimation, Simulink, planning parameters

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3GPP	Third Generation Partnership Project
ACK	Acknowledgement (in ARQ protocols)
ARQ	Automatic Repeat-reQuest
AWGN	Additive White Gaussian Noise
BCH	Broadcast Channel
BER	Bit-Error Rate
BPSK	Binary Phase-Shift Keying
CDD	Cyclic-Delay Diversity
CP	Cyclic Prefix
CQI	Channel Quality Indication
CRC	Cyclic Redundancy Check
DFT	Discrete Fourier Transform
DL	Downlink
eNodeB	E-UTRAN NodeB
FDD	Frequency Division Duplex
FFT	Fast Fourier Transform
H-ARQ	Hybrid Automated Repeat Request
ICI	Inter Carrier Interference
IFFT	Inverse Fast Fourier Transform
ISI	Inter-Symbol Interference
LMMSE	Linear Minimum Mean-Square Error
LS	Least Squares
LTE	Long Term Evolution
MAC	Medium Access Control
MIMO	Multiple-Input Multiple-Output
OFDM	Orthogonal Frequency-Division Multiplexing
PCCC	Parallel Concatenated Convolutional Code
PDCCH	Physical downlink control channel
PDSCH	Physical downlink shared channel
PMI	Pre-coding Matrix Indicator
QAM	Quadrature Amplitude Modulation
QPSK	Quadrature Phase-Shift Keying
RB	Resource Block
RI	Rank Indicator

RS	Reference Symbol
SISO	Single-Input Single-Output
SNR	Signal-to-Noise Ratio
TBS	Transport Block Size
TTI	Transmission Time Interval
UE	User Equipment
W-CDMA	Wideband Code Division Multiple Access
WiMAX	Worldwide Inter-operability for Microwave Access