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**PERFORMANCE EVALUATION OF
OFDM CHANNEL FOR FIXED WIMAX
SYSTEM**

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ABSTRACT

WiMAX operates on the same general principles as WiFi; it sends data from one computer to another via [radio](#) signals. A computer (either a desktop or a laptop) equipped with WiMAX card would receive data from the WiMAX transmitting station. WiMAX should be able to handle up to 70 Mbps. And will blanket a radius of 30 miles (50 km) with wireless access. The increased range is due to the frequencies used and the power of the transmitter. So these features make WiMAX system very suitable for work in Sudan, because Sudan has a very large area and the distribution of the population is rural rather than urban.

This thesis is to evaluate and investigate the effects of few radio channel impairment factors such as AWGN, and multipath to the performance of OFDM channel.

Also in this thesis the estimation of SNR was done under the effects of noise and multipath for the four recommended modulation techniques; BPSK, QPSK, 16-QAM, 64-QAM for different cyclic prefix lengths, and calculated BER.

The evaluation was done in simulation developed using MATLAB 7.8.

ملخص

يعمل النظام واي ماكس بنفس المبدأ العام الذي يعمل به الـ wifi، حيث يرسل البيانات من كمبيوتر لآخر من خلال إثيرات الراديو. فالكمبيوتر (بوصفها كـ كمبيوتر مكتب شخصي أو محمول) الذي يحتوي على كرت الواي ماكس يستطيع إستقبال البيانات من محطة إرسال الواي ماكس. كل يستطيع النظام واي ماكس إرسال البيانات بسرعة تصل إلى 70Mbps.

و سيغطي النظام واي ماكس مساحة نصف قطرها 30 ميل (50 كلم) لا سلكياً. زيادة المدى ناتجة عن الترددات التي يستخدمها نظام الواي ماكس وقدرته المرسل. هذه الخاصية للنظام واي ماكس جعلته مناسب جداً للعمل في السودان، وذلك لأن السودان له مساحات شاسعة جداً من الصحب تغطيها بواسطة الأنظمة الأخرى، كل إن توزيع السكان في السودان ريفي أكثر من انه حضري.

هذه الاطروحة تدرس وتفحص تأثير بعض عوامل ضعف القناة الراديوية مثل الـ AWGN والإنتلر المتعدد علي أداء التنصت بتقسيم التردد العودي (OFDM). أيضاً في هذه الرسالة تم تخمين قيمة نسبة الإشارة الي الضجيج (SNR) مقابل قيم (BER) محسوبة. تحت تأثير الضجيج والارسال المتعدد المسارات (multipath) لتقنيات التعديل المختلفة الموصي بها (BPSK, QPSK, 16-QAM, 64-QAM)، لأطوال بادئة دورية (cyclic prefix) مختلفة.

تم تقييم الأداء عن طريق النمذجة والمحاكاة (Simulation) بإستخدام برنامج MATLAB 7.8

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ABBREVIATIONS

AMPS	Advanced Mobile Phone Service
ASN	access service network
AWGN	Additive White Gaussian Noise
BER	Bit Error Rate
BPSK	Binary Phase Shift Keying
BS	Base station
BTC	Block turbo coding
BWA	broadband wireless access
CDMA	Code Division Multiple Access
CP	Cyclic Prefix
CPE	Customer Premises Equipment
CSN	connectivity service network
CTC	Convolutional turbo codes
DSL	Digital Subscriber line
DSSS	Direct Sequence Spread Spectrum
FDD	Frequency Division Duplexing
FDMA	Frequency Division Multiple Access
FEC	Forward Error Coding
FFT	Fast Fourier Transform
FSK	frequency shift keying modulation
GSM	global system for mobile
HSDPA	high speed downlink packet access

ICI	Inter-Carrier Interference
ISI	Inter Symbol Interference
LAN	local area network
LLC	Logical link control
LOS	Line of Sight
MAC	Medium Access Control
MAN	Metropolitan area network
MCM	Multi-Carrier Modulation
MIB	Management Information Base
MIMO	multiple-input multiple-output
NLOS	Non Line of Sight
NMT	Nordic Mobile Telephone
OFDMA	Orthogonal Frequency Division Multiple Access
OSI	Open Systems Interconnection
PRBS	point-to-multipoint
PTP	point-to-point
PMP	pseudorandom bit sequence
QAM	Quadrature Amplitude Modulation
QoS	Quality of Service
QPSK	Quadrature Phase Shift keying
R-S	Reed-Solomon
SOFDMA	Scalable Orthogonal Frequency Division Multiple Access
SDMA	Space division multiple access
SNR	Signal to Noise Ratio
TDMA	Time Division Multiple Access
TACS	Total Access Communications System
TDD	Time Division Duplexing
UMTS	universal mobile telephone system
Wi-Fi	Wireless Fidelity
WiMAX	Worldwide Interoperability for Microwave Access

