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Review on Performance Analysis of SNR Using BPSK

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Abstract: Relay technologies have been studied & considered in the standardization process of the next generation of MIMO system, such as LTE 8, Advance LTE 10, IEEE 802.16e, IEEE 802.16m. Presently two wireless technologies, WiMax & LTE both based on IEEE standard, are two rival technologies nevertheless, are technically very similar but deployment is differ. This introduces and compare features of two advance technologies in physical layer, and also gives performance analysis of different modulation schemes (BPSK, QPSK, and 16-QAM) in WiMAX & LTE technologies.

Keywords: BPSK, QPSK, 16-QAM, LTE 8, Advance LTE 10, IEEE 802.16e, IEEE 802.16m.

I. INTRODUCTION

The quick growth in multimedia controlled applications has triggered an insatiable thirst for high data rates and resulted in an increased demand for technologies that support very high speed transmission rates, mobility and efficiently utilize the available spectrum & network resources. OFDM is one of the paramount resolutions to achieve this goal and it offers a promising choice for future high speed data rate systems.
A number of attractive approaches have been proposed & implemented to reduce PAPR with the expense of increase transmit signal power, bit error rate (BER), computational complexity anddata rate loss etc. So, a system trade-off is required. These reduction techniques are basically divided into three types of classes such as signal distortion, multiple signalling & probabilistic and coding. In this paper, amplitude clipping & filtering based design (signal distortion) is used to reduce PAPR with a little compromise of BER. The main objective of this paper is to investigate the comparative performance analysis of different higher order modulation technique on that particular design.
IEEE 802.16e is a mobile version of Worldwide Interoperability for Microwave Access (WiMAX) that plays an important role in the evolution towards 4G. In this study, we focus on multimedia performance measurement for the purpose of a more realistic mobile WiMAX network test. This study aims to make a contribution in better understanding the mobile WiMAX performance for multimedia applications. For that purpose, we employ Voiceover Internet Protocol (VoIP) and video streaming to test the network performance, where two distinct evaluation systems are used, professional and user-friendly. Our test results show that the mobile WiMAX network can support well the bandwidth-intense and delay-sensitive multimedia application.
The use of specialized mathematical tools such as MATLAB/Simulink or Mathematica is widely extended to perform such simulations. These tools provide a wide set of built-in libraries that allow a rapid development of prototypes. There are other simulation tools like Visual System Simulator (VSS) or Ptolemy II that include standard building blocks to model and simulate complex communication systems. However, the performance evaluation of LTE technology requires specific MIMO-OFDM-based simulators to minimize the simulation time. An open-source MATLAB based LTE physical layer simulator is presented in nevertheless, it is proved that general purpose simulation platforms like MATLAB lead to very long execution times. Other works are only focused on the LTE simulation results under different MIMO-configurations, but no details on the employed simulator are provided.
We find that the VoIP quality at the cell center is perfect, where the value of Perceptual Evaluation of Speech Quality exceeds 4. At the cell edge, the quality is degraded but still adequate. We also observe that the downlink of mobile WiMAX network can support video streaming up to 4 Mbps with the Mean Opinion Score (MOS) value of 4.5. On the uplink, the bitrate of 1Mbps is supported with MOS 4.5 at the cell center and with MOS 3.2 at the cell edge, respectively. On the uplink, the bitrate of 1 Mbps is supported with MOS 4.5 at the cell center and with MOS 3.2 at the cell edge, respectively. Our experiments further indicate that a smooth playback of YouTube 480P video is consistently provided. Finally, the handover case has very limited impact to the overall quality degradation of both VoIP and video streaming.
With the increasing popularity of networked applications, multimedia traffics are expected to account for a large portion in the next-generation mobile communication systems. Many technologies are being developed to support broadband wireless communication, among which Worldwide Interoperability for Microwave Access (WiMAX) and

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Long-Term Evolution (LTE) are prominent on the aspects of high-data rate and long-range coverage. Both WiMAX and LTE are playing an important role in the evolution towards 4G. As a mobile version of WiMAX, mobile WiMAX uses similar technologies and has comparable performance to LTE.some offer speed from 100Mbps to 1Gbps providing enormous data rate for bandwidth intensive services and applications.Since the standardization of mobile WiMAX is a little earlier than that of LTE, most of pilots are based on the WiMAX technology. Besides the standardizations of radio interfaces, many projects are launched to enhancethe performance of mobile communication systems.

The increased utilization of data websites such as Facebook and You tube ignite the need for higher capacity and higher data rate supported technology.Wireless Initiative New Radio (WINNER) was a research project funded by the European Union 6th Framework.Interoperability is the key objective of WiMAX whichensures that, equipment from different vendors interoperates in the framework without difficulty. able. This is the first industry wide standard that can be used for both fixed and mobile wireless access with substantially higher bandwidth than most cellular networks. In addition to, WiMAX represents a serious competitor to 3G (Third Generation) cellular systems as high speed mobile data applications is achieved with the 802.16e specification. The objective of WINNER is to develop a ubiquitous radio interface for Beyond 3rd Generation.

The development of the 4G (4th generation) Orthogonal Frequency division multiple access (OFDMA) based wireless technologies such as Mobile WiMAX (Worldwide Interoperability for Microwave Access) and 3GPP (3rd Generation Partnership Project) LTE (Long Term Evolution) which have been identified as promising, permitting higher data rate in wireless broadband access.The concept of WiMAX is based on the Open Systems Interconnections (OSI) reference model which has the lowest layer as the physical layer which is based on OFDM technology.

The specification of the bandwidth, modulation and coding scheme, data rate, multiplexing, error correction, transmitting data in frames, synchronization between transmitter and receiver. The arrival of sophisticated mobile devices and the tremendous bandwidth requirement of certain services and applications such as video calls, video conferencing, online games.

Interoperability is the key objective of WiMAX which ensures that, equipment from different vendors interoperates in the framework without difficulty. International standards do not define boundaries for subscriber module usage.Additionally, dead spot and areas of poor reception caused due to fading and blocking within coverage further reduce the efficiency of this standard. Conversely, one of the salient efforts to solve this problem has been to deploy relatively more base stations (BS) within a geographical area.

International standards do not define boundaries for subscriber module usage. It supports scalable OFDMA, QPSK, 16QAM and 64QAM with channel bandwidth selection within the range of 1.75MHz to 20MHz.The WiMAX physicallayer is capable of supporting MIMO system which allows the WiMAX architecture to adapt the use of multiple antenna techniques for example beam forming, space time coding and spatial multiplexing.Resource allocation for both uplink and downlink are controlled by a scheduler in the base station.The most innovative security features that are presently used wireless access schemes are integrated in Mobile WiMAX for voice, data and multimedia services. Such features comprise, Advance Encryption Standard (AES) based authentication and encryption, Cipher-based Message Authentication Code (CMAC) and Hashed Message Authentication Code (HMAC) based control message protection schemes and Extensible Authentication Protocol (EAP) based authentication.WiMAX defines a WMAN, a kind of a huge hotspot that provides interoperable broadband wireless connectivity to fixed, portable, and nomadic users. It allows communications which have no direct visibility, coming up as an alternative connection for cable, DSL, and T1/E1 systems, as well as a possible transport network for Wi-Fi hot-spots.User integrity, authentication and confidentiality areNassured through encryption and authentication protocols such as AES adopted by the WiMAX standard. Numerous system designs including Point-to-Point, Point to Multipoint and Permeating coverage is permissible. It provides communication for different traffic including VoIP, multimedia applications and data, whiles ensuring a higher degree of QoS.

Thus supporting varied user credentials such as digital certificates, username and user password schemes, smart cards and SIM/USIM cards. The systems is capable of covering large areas due to various modulation schemes adopted such as QPSK, 16 – QAM and 64 – QAM. The MAC layer of WiMAX supports not only fixed bit rates but also variable bit rates, real-time and non-real-time traffic flows and also supports the best effort data traffic.

It is capable of providing enormous capacity for bandwidth intensive applications compared to Universal Mobile Telecommunication System (UMTS) and Global System for Mobile communication (GSM).Mobility is the key feature of the IEEE 802.16e and IEEE 802.16j standards due to Scalable Orthogonal Frequency Division Multiple Access (SOFDMA) and Multiple Input and Multiple Output (MIMO) techniques adopted at the physical layer. It is intended to be a complement or a competitor to cellular technologies such as LTE and UMTS. It provides communication for different traffic including VoIP, multimedia applications and data, whiles ensuring a higher degree of QoS.

1.1 Evolution of IEEE standard for

WiMAX (Worldwide Interoperability for Microwave Access) is based on the IEEE 802.16 standard, formulated to offer a shared basis for wireless connectivity in fixed, portable, and mobile environment. WiMAX is a scalable digital

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wireless access 4G technology intended to deliver high throughput over long distances “wireless metropolitan area networks” WMAN .The effort was welcomed in IEEE 802, which led to formation ofthe 802.16 Working Group. Since then, the Working Group members have been working a lot to develop standards for fixed and mobile BWA.Although in late 90’s many telecommunication equipment manufacturers started to develop and offer products for BWA but the industry badly needed an interoperable standard. With the need of a standard, The National Wireless Electronics Systems Testbed (NWEST) of the U.S National Institute of Standards and Technology (NIST) called a meeting to discuss the topic in August 1998.
The use of Multiple -Output(MIMO) technology in combination with OFDM increases the diversity gain and/or the system capacity by exploiting spatial domain. Hence, MIMO-OFDM is an attractive solution for future broadband wireless systems like 3GPP Long-Term Evolution(LTE) and it will surely be aserious candidate for future 4G technologies. The evaluation of the physical layer performance under “realistic” varying channel conditions requires extremely time-consuming simulations. Besides, realistic assumptions such as user mobility, antenna correlation, or bandwidth limited feedback channel are often simplified or even omitted in some of previous works. This presents a new simulator for next generation MIMO-OFDM-based wireless systems.
The recent demand for higher data rate services from wireless network users is overwhelming. Social media influx as well as the proliferation of broadband enabled smart-phones, tablet computers and other newly improved wireless devices has erupted a new trend in wireless network traffic need where average capacity and speed is no longer appreciable. In order to cope with this trend in traffic requirement, wireless network operators are considering a gradual rollover of an existing third generation (3G) network to a fourth generation (4G) network with orthogonal frequency division multiple access (OFDMA) based technologies such as Fourth Generation Long Term Evolution (4G LTE) and Worldwide Interoperability for Microwave Access (WiMAX).
This paper is devoted to the performance evaluation of Adaptive Modulation and Coding (AMC) in downlink of an orthogonal frequency division multiple access (OFDMA) network, considering Partial Usage of Sub-channels (PUSC). By using MATLAB Simulink and Origin 61, the performance of Bit Error Rate (BER) and Spectral Efficiency in two channel environments, i.e. non-fading and fading channels were examined. Results suggest better performance for AMC over individual MCS in all channel environments. standard specifies the air interface for fixed BWA systems supporting multimedia services in licensee and licensed exempt spectrum.The Working Group approved the amendment IEEE 802.16e2005 to IEEE802.162004 on February 2006. To understand the development ofthe standard to its current stage.

1.2. IEEE 802.16 2001

This first issue of the standard specifies a set of
MAC and PHY layer standards intended to providefixed broadband wireless access in a point to point(PTP) or point to multipoint (PMP) topology. The PHY layer uses single carrier modulation in the 10–66 GHz frequency range. Standard is presented here.Moreover, non-fading Addictive White Gaussian Noise (AWGN) channels significantly perform better than fading (Rayleigh and Rician) channels. In Rician channel environment, however, flat fading Rician channels perform better than frequency selective Rician channel which interestingly records a degraded performance against Rayleigh channels.
Wi-Max used for high data rate over the large areas for a large number of users where broadband is not available. This is the first standard which can be used for fixed wireless access with effective higher bandwidth than the various cellular networks. Wireless broadband systems are basically used for many years but the main development of this standard enables economy of scale to bring down the cost of equipment, and decreases the envelop risk for operators.
The 1st version of the IEEE 802.16 standard operates on 10–66GHz frequency band also requires line of sight (LOS) towers. But later the standard extended its operation of specification to 2-11 GHz frequency band for non line of sight (NLOS). The aim of this paper is to transmit the data in WIMAX with low bit error rate and high efficient data with noisy area where we have to using Forward Error Correction method as Reed Solomon code and Convolution code. These methods are useful to decreases the BER and improve its Vefficiency. To reduce the noise these two error correction and error detection codes Reed Solomon coding and Convolution coding are used.

Table 1. WiMAX service classes

QoS Classes	Designation Defining QoS Parameters	Application Examples
Unsolicited grant services (UGS)	Maximum sustained rate Depends on delay Jitter tolerance	Voice over IP (VoIP) without silence suppression
Real-time Polling service (rtPS)	Minimum reserved rate Delay dependent Traffic priority	Streaming audio and video, MPEG (Motion Picture Experts Group) encoded

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Non-real-time Polling service (nrtPS)	Minimum reserved rate Traffic priority	File Transfer Protocol (FTP) TFTP HTTP
Best-effort service (BE)	Maximum sustained rate Traffic priority	Web browsing Data transfer Email
Extended realtime Polling service (ErtPS)	Minimum reserved rate, Maximum sustained rate, Maximum latency tolerance, Jitter tolerance, Traffic priority	VoIP with silence suppression and activity detection

Aforestated users are getting more interested in broadband applications that requires guarantee in terms of throughputand packet delay for better performance [10]. Broadbandapplications such as video conferencing whose property In WiMAX is functionally realized which consist of mainly twolayers i.e. MAC and Physical layer.

1.3 STIMULATION

```
clc
close all
clear all
warning('off');
opt=6;
G= 1/16;  %% [1/4 1/8 1/16 1/32]
no= 200; %% [50 100 200 ..]
disp('simulation started... Please wait...');
bit_error_rate=[0 0 0 0 0 0 0 0 0 0 0 0 0 0 0];
for q=1:no
%%% data generation
data_get =data_gen(opt);
%%% data randomization
data_rand=randomizer(data_get);
%%% FEC ENCODER
data_rscoded=rsencodecod(data_rand,opt,10);
%%% convolution encoder
data_coded=convolution(data_rscoded,opt,10);
%%% INTERLEAVING
data_interleav=interleav_d(data_coded,opt);
%%% Digital modulator
data_mod=mod_d(data_interleav,opt);
%%% IFFT modulator
data_tx=ofdmsymbol_fft_cp(data_mod,G,10);
SNR=[1 2 3 5 7 9 10 12 18 17 20 23 25 27 30]; % specify SNR
for p=1:1:15
  snr=SNR(p);
%%% channel
  data_rx=channel_d(data_tx,snr);
%%% FFT demodulator
data_rxp=ofdmsymbol_fft_cp(data_rx,G,01);
%%% Digital demodulator SYMBOL DEMEPPER
  data_demod=demod_d(data_rxp,opt);
%%% DEINTERLEAVING
data_deinterleav=deinterleav_d(data_demod,opt);
% %%% FEC DECODER
%%% convolution decoder
data_decoded=convolution(data_deinterleav,opt,01);
%%% RSdecoder
  data_rsdecoded=rsencodecod(data_decoded,opt,01); % removing added tail bits
%%%  Data Derandomizer
data_unrand=randomizer(data_rsdecoded);
%%% BER calculation
 [noerr(p),ber(p)] = biterr(data_unrand,data_get);
end
bit_error_rate=bit_error_rate+ber;
```


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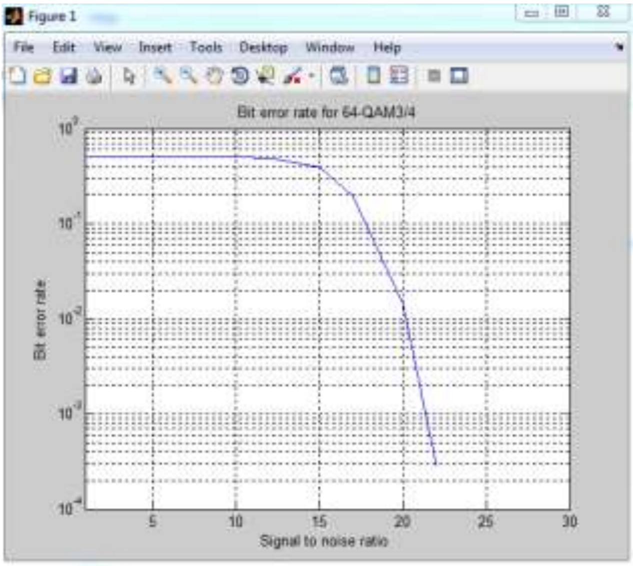
```
fprintf('.')
end
bit_error_rate=bit_error_rate/no
%%plot the grapgh
result=berplot(SNR,bit_error_rate,opt)
```

1.4 RESULT



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