Performance Analysis of Modulation Scheme Based on WiMAX and LTE

Ankita D. Malkhede, Prof. T. Bhoskar, Prof. A. Manusmare

Abstract-**In the new communication era two mobile communication technologies WIMAX and LTE evolved rapid growth in last few years due to increasing demands in Internet Accessing Services. Both the technologies are considered as a candidate of 4th generation of mobile network. The IEEE 802.16 (WiMAX) and 3 GPP LTE are aim to provide better mobile voice, video and data. This paper introduceand compare two advanced technologies WiMAX and LTE in physical layers and also give the performance analysis of different modulationschemes like BPSK, QPSK. 16-QAM based on SNR and BER results are presented with different digital modulation schemes in AWGN channel.**

***Index Terms*—LTE, Wimax,Physical Layer, BER**.

INTRODUCTION

Over the past few decades there has been enormous growth in Telecommunication and ITC industry with mobile and wireless communications. Presently there are over seven million mobile subscriber over a world due to which it gives progressive drift from high capacity voice services to high speed and high capacity of data services. The WiMAX comes from IEEE protocols and extends the wireless access from Local Areato Metropolitan Area Network and Wide Area Network. For uplink and downlink WiMAX technology uses the new physical layer Radio Area Technology called OFDM. LTE is wireless data communication standards was developed by 3GPP and was first commercialized by TeliaSonera in 2009 named as 4G LTE. LTE is the evolution of GSM/UMTS standards and it increase the capacity, provide improved data rate, increase the speed of wireless data network usingDSP technique, cell throughput, power consumption etc.

Manuscript received May, 2017

***First Author Name**, Dept. Electronics and Communication Engg.,Gondwana University, Ballarpur, India, PH- 8275246240.*

***Second Author Name**, Dept. Electronics and Communication Engg., Gondwana university, Ballarpur, PH- 7387553052.*

***Third Author Name,** Dept. Electronics and Communication Engg.,Gondwana University, Ballarpur, India PH-9766495649.*

Separate wireless spectrum is required to implement LTE, LTEwireless interface is incompatible with 2G and 3G network, a separate wireless spectrum required to implement LTE. Rest of the paper organized as overview of WiMAX and LTE, Literature Survey, Block Diagram MIMO and finallyConclusion andFuture Work.

WIMAX

In late 90's WiMAX IEEE 802.46 designed to provide wireless and wired broadband access with QoS guarantees in Metropolitan Area Network and also introducing OFDM as transmission scheme and referred to as Fixed WiMAX [1]. This standard specified thefrequency of 10-66 GHz with bandwidth 120 Mbps and maximum range of 50 km over a light-of-sight transmission with these technological advantages of power, transmission range and versatility, WiMAX might be the strong competitorto WiFi and 3G. The capability of WiMAX network to providing high bandwidth QoS deployed over a large area. The system is capable of covering large area due to different modulation schemes adopted in the network i.e., BPSK, QPSK, 16-QAM. Authentications and Confidentiality are assured through the encryption and authentication protocols such as Advanced Encryption Standard (AES). Many WiMAX system designsinclude point to point and point to multipoint modes of operation. It also provides communication for different traffics including VoIP, Multimediaapplication and data which provide higher degree of QoS.

LTE

In the early 80's analog cellular system introduced which is called 1st generation after that digital cellular system introduced which is called 2nd generation. Long Term Evolution the next generation mobile communications are defined by the 3rdGeneration Partnership Project (3GPP) [1].Additional features of LTE are increased indata rates, better spectral efficiency and lower latencies. The purpose of LTE in present to provide an extremelyhigh performanceRadio Access Technologythat providesfull mobility speed with 100 Mbps downlink and50 Mbps of uplink speedwhen using 20 MHz bandwidth that can enable diverse mobile multimedia service provision which is called as E-UTRAN. The basic protocol structure ofLTE made up of Radio Link Control (RLC) and Medium Access Control (MAC)layers

which areresponsible forretransmission and multiplexing of data flow.

LITERATURE SURVEY

[1] Patidar, M.,;Dubey, R; Jain, N.K.; Kulpariya, S.,[10] in 2012, "Performance Analysis of WiMAX 802.16e physical layer model",. This work discussed about the model building of WiMAX physical layer using simulink in MATLAB. This model is a useful tool for BER (bit error rate) performance evolution for real time audio data communication by the WiMAX physical layer, under different channel encoding rate and digital modulation schemes and channel conditions. In this paper transmitter and receiver model are simulated according to the parameters established by the standard, to evaluate the performance. Also convolution coding is used to improve the system performance. The performance analysis is being done by studying the bit loss and packet losses occurred during transmission channel.

[2] Guerin and Peris [5] studied basic mechanisms and direction for providing Quality of Services in packet networks. They have investigated control path mechanisms that are needed to allow as well as network to agree on service definition and data path mechanisms which will enable to provision of differentiated services. These concepts have been adopted into IEEE 802.16 standard in providing the QoS support.

[3] Askar, S.; Al-Raweshidy, H.S. [9] in 2011 worked on, "Performance evaluation of IEEE802.16-2004 WiMAX with fixed high fading channels,", WiMAX (Worldwide Interoperability for Microwave Access) is a promising technology which can offer high speed data, voice and video service to the customer end, which is presently, dominated by the cable and digital subscriber line (DSL) technologies. The performance assessment of WiMAX systems is dealt with. The biggest advantage of Broadband wireless application (BWA) over its wired competitors is its increased capacity and ease of deployment. This work are to model and simulate the fixed OFDM IEEE 802.16d physical layer under variant combinations of digital modulation (BPSK, QPSK, and 16-QAM) over diverse combination of fading channels

[4] Nair et al. [6] present MAC protocols used in WiMAX networks and discuss the types of provisioning and Quality of Service (QoS) that can achieved using the features of this MAC protocols to facilitate the WiMAX deployments. They cover implementation challenges of the WiMAX MAC to achieve QoS goals.

[5] Paz Portela, N.A., Rodriguez Diaz, B., in 2013 evaluated that "Performance Comparison between the Aim Interfaces of LTE and WiMAX" shown that there is no doubt that nowadays that Orthogonal Frequency Division Multiplexing (OFDM) is the dominant technology in wireless access. The objective of this work is to analyze and compare the performance and spectral efficiency of 3GPP Long Term Evolution (LTE) and Mobile Worldwide Interoperability for Microwave Access (WiMAX). Both technologies are the dominant options to provides mobile broadband access today and in near future.

DIAGRAM AND FUNDAMENTS OF MULTIPLEXING AND MODULATION

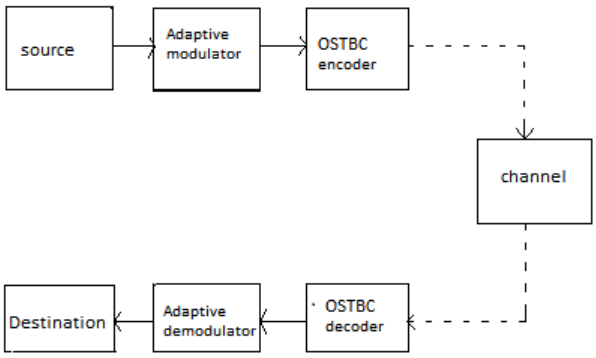

Fig.1 Block Diagram of MIMO System

Figure shows the Block Diagram of Multiple Input Multiple Output (MIMO). As shown in fig. we apply image file as input signal to the source block, the purpose of Adaptive Modulation block is to convert digital message into continuous signal, Adaptive Modulator modulate the data bit and then forwarded to OSTBC encoder in which the signals are encoded and these encoded signals are transfer through the channel to receiver section i.e., to OSTBC decoder. Here we work on the AWGN channel and Rayleigh channel to takes into account of fading [7].

The data is received at receiver and OSTBC decoder decoded further [8]. Then we used the demodulator block to demodulate the modulate signals comes from OSTBC decoder.Digital wireless communicationnetwork uses different modulation schemes to transfer data over the "air interface", WiMAX and LTE uses different modulation schemes such as BPSK, QPSK, 16-QAM and multiplexing scheme such as OFDM. In various wireless communication technologies BPSK, QPSK proves their abilities in different demands such as high range or high throughput. OFDM is relatively new approach used in digital wireless communication it allows a good utilization of the frequency bands. OFDM can also be implemented by using digital as well as analog modulation technique but, digital modulation

technique offers additional information carrying capacity, data security and compatibility with digital data services.

CONCLUSION

To improve the performance of present WiMAX and LTE standards, we studied major area in evolution of WiMAX and LTE technology. It is expected that in future WiMAX and LTE evolved with their forum's and provide greater throughput and spectral effectiveness compared to 3G CDMA based technologies planned i.e., HSPA and EVDO. These advantages will provide operators with additional network capacity for the support of value added services with fewer base stations. Technical differences reviewed between WiMAX and LTE are spectral allocation, inter-carrier spacing, frames/sub-frames and access technology in uplink, generally the impact of each of these on the prospects of two technologies made LTE provides more throughput and capacity and better mobility.A lot of work can be done for future optimization of wireless communication in WiMAX and LTE, are to improve coverage, to provide much higher stable data rates, and to meet the expected high traffic demand. It can be said that LTE technology will prevail as one standard in the near future for serving public networks while WiMAX has good opportunities in dedicated segments.

ACKNOWLEGDMENT

I want to thank Prof. TruptiBhoskar and Prof. AshishManusmare for their guidance and support.

REFERENCES

[1] R.Pazhyannur,"Comparisons of LTE and WiMAX," in IP NGN Architecture Leadership Journal Q, 2010.

[2] Charles U. Ndujiuba, Oluyinka Oni and Augustus E. Ibhaze, "ComparativeAnalysis of Digital Modulation Techniques in LTE 4G systems", Journal of wireless Networking and Communications, 5(2),60-66, 2015.

[3] Yang Yang, Honglin Hu, Jing Xu, and Guaquing Mao, "Relay Technologies for WiMAX and LTE- Advanced Mobiles Systems", IEEE commu. Mag.,vol. 47 no. October pp.100-105,2009.

[4] Sara Riahi 1, Ali E1 Hore 2 and Jamal E,Study Of The OFDM Modulation for the Use in Wireless Communication Systems of the 4G", International Research Journal of Engineering and Technology (IRJET), volume: 02,2013.

[5] R.Guerin and V. Peris,"Quality of Service in Packet Networks:Basic Mechanisms and Directions", Computer Networks, vol. 31, no.3, pp. 169-189, February 1999.

[5] G. Nair, J. Chou, T. M adejski, K. Perycz, D. Putzolu and J. Sydir, "IEEE 802.16 Medium Access Control and Service Provisioning", Intel Technology Journal, vol Issue 03, pp, 213-28, August 2004.

[7] R. Prasad, Universal Wireless Personal Communication Boston. London: Artech House Publisher, 1998.

[8] W. Su, S. N. Batalama and D. A. Pados, "On Orthogonal Space-Time Block Codes and Transceiver Signal Linearization",IEEE commun. Lett, vol 10, n

[9] Askar, S.; Al-Raweshidy, H.S.,"Performance evaluation of IEEE802.16-2004 Wi-MAX with fixed high fading channels," Wireless and Microwave Technology Conference (WAMICON), 2011 IEEE 12th Annual , vol., no., pp.1,6, 18-19 April 2011. 0.2,pp. 91-93, 2006.