ISSN (Online) : 2319 - 8753
ISSN (Print) : 2347 - 6710

International Journal of Innovative Research in Science, Engineering and Technology

An ISO 3297: 2007 Certified Organization, Volume 3, Special Issue 1, January 2014

International Conference on Engineering Technology and Science-(ICETS'14)

On 10th & 11th February Organized by

Department of CIVIL, CSE, ECE, EEE, MECHNICAL Engg. and S&H of Muthayammal College of Engineering, Rasipuram, Tamilnadu, India

Performance Analysis of the Combined AMC-Multiuser MIMO LTE-Advanced System

P. Anand[1], S. P. Shally[2]

PG Student, Department of ECE, DMI College of Engineering, Chennai-600123, India. [1]

Assistant Professor Department of ECE, DMI College of Engineering, Chennai-600123, India [2]

Abstract- The growth of wireless networks in recent years coupled with applications demanding high data rates. This paper considers feedback and pre-coding design for multi-user MIMO in LTE-Advanced systems. LTE aims to provide improved service quality over 3G systems in terms of throughput, spectral efficiency, latency, and peak data rate, and the MIMO technique is one of the key enablers of the LTE system for achieving these diverse goals. In this paper, we propose a AMC based pre-coding for multiuser multi-input multi-output (MIMO) systems. Adaptive modulation and coding (AMC) is a powerful technique to enhance the link performance by adjusting the transmission power, channel coding rates and modulation levels according to channel state information.

Keywords- LTE, AMC, STC, STBC, STTC

I. INTRODUCTION

In telecommunications, 4G is the fourth generation of cellular wireless standards. It is a successor to 3G and 2G families of standards. Speed requirements for 4G service set the peak download speed at 100 Mbit/s for high mobility communication (such as from trains and cars) and 1 Gbit/s for low mobility communication (such as pedestrians and stationary users).[1]

A 4G system is expected to provide a comprehensive and secure all-IP based mobile broadband solution to laptop computer wireless modems, smart phones, and other mobile devices. Facilities such as ultra-broadband Internet access, IP telephony, gaming services, and streamed multimedia may be provided to users.

Pre-4G technologies such as mobile WiMAX and first-release 3G Long term evolution (LTE) have been on the market since 2006[2] and 2009[3][4][5] respectively, and are often branded as 4G. The current versions of these technologies did not fulfill the original ITU-R requirements of data rates approximately up to 1 Gbit/s for 4G systems. Marketing materials use 4G as a description for Mobile-WiMAX and LTE in their current forms.

IMT-Advanced compliant versions of the above two standards are under development and called "LTE Advanced" and "Wireless MAN" respectively. ITU has decided that "LTE Advanced" and "WirelessMAN-Advanced" should be accorded the official designation of IMT-Advanced. On December 6, 2010, ITU announced that current versions of LTE, WiMax and other evolved 3G technologies that do not fulfill "IMT-Advanced" requirements could be considered "4G", provided they represent forerunners to IMT-Advanced and "a substantial level of improvement in performance and capabilities with respect to the initial third generation systems now deployed." [6]

In all suggestions for 4G, the CDMA spread spectrum radio technology used in 3G systems and IS-95 is abandoned and replaced by OFDM and other frequency-domain equalization schemes. This is combined with MIMO (Multiple In Multiple Out), e.g., multiple antennas, dynamic channel allocation and channel-dependent scheduling.

I. MIMO:

In point-to-point multiple-input multiple-output (MIMO) systems, a transmitter equipped with multiple antennas communicates with a receiver that has multiple antennas. Most classic pre coding results assume narrowband, slowly fading channels, meaning that

ISSN (Online) : 2319 - 8753
ISSN (Print) : 2347 - 6710

International Journal of Innovative Research in Science, Engineering and Technology

An ISO 3297: 2007 Certified Organization, Volume 3, Special Issue 1, January 2014

International Conference on Engineering Technology and Science-(ICETS'14)

On 10th & 11th February Organized by

Department of CIVIL, CSE, ECE, EEE, MECHNICAL Engg. and S&H of Muthayammal College of Engineering, Rasipuram, Tamilnadu, India

the channel for a certain period of time can be described by a single channel matrix which does not change faster. In practice, such channels can be achieved, for example, through OFDM.

A. System Description

The block diagram of a MIMO-LTE system is shown in Fig1. Basically, the MIMO transmitter has NT parallel transmission paths which are very similar to the single antenna system, each branch performing serial-to-parallel conversion, pilot insertion, N-point IFFT and cyclic extension before the final TX signals are up-converted to RF and transmitted. It is worth noting that the channel encoder and the digital modulation, in some spatial multiplexing systems can also be done per branch, not necessarily implemented jointly over all the NT branches. The receiver first must estimate and correct the possible symbol timing error and frequency offsets, e.g., by using some training symbols in the preamble as standardized in [7]. Subsequently, the CP is removed and N-point FFT is performed per receiver branch. In this thesis, the channel estimation algorithm we proposed is based on single carrier processing that implies MIMO detection has to be done per subcarrier. Therefore, the received signals of subcarrier k are routed to the kth MIMO detector to recover all the NT data signals transmitted on that subcarrier. Next, the transmitted symbol per TX antenna is combined and outputted for the subsequent operations like digital demodulation and decoding. Finally all the input binary data are recovered with certain BER.

B. Space Time Coding For MIMO

A space–time code (STC) is a method employed to improve the reliability of data transmission in wireless communication systems using multiple transmit antennas. STCs rely on transmitting multiple, redundant copies of a data stream to the receiver in the hope that at least some of them may survive the physical path between transmission and reception in a good enough state to allow reliable decoding. Space time codes may be split into two main types:

Space time trellis codes (STTCs) distribute a trellis code over multiple antennas and multiple time-slots and provide both coding gain and diversity gain.

Space time block code (STBC) act on a block of data at once (similarly to block codes) and provide only diversity gain, but are much less complex in implementation terms than STTCs.

II. MULTI-USER – MIMO

This is the variant antenna technology that enhances the communication capabilities of the individual radio terminal used by radios in the network by introducing multiple independent radio terminals. This allows transmission and reception to and from multiple users using the same band

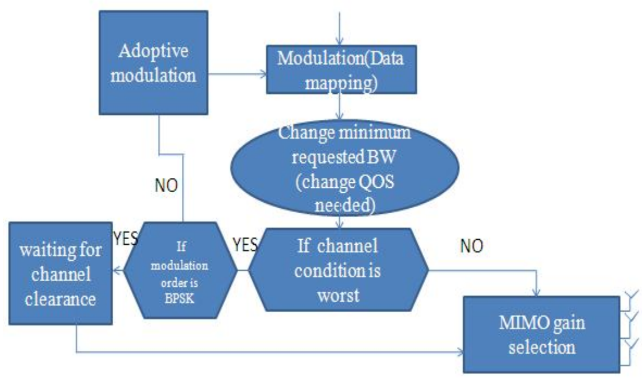

Fig 1 MU- MIMO Blocks Diagram:

IV. PERFORMANCE RESULTS

From Fig 2 with MIMO BER is reduced considerably. When number of antennas increased BER will be reduced considerably. Diversity gain can be increased by increasing antennas. When number of antennas increased BER will be reduced considerably. If we use high end mapping we need to use maximum antennas then only BER will be reduced considerably.

ISSN (Online) : 2319 - 8753
ISSN (Print) : 2347 - 6710

IJIRSET

International Journal of Innovative Research in Science, Engineering and Technology

An ISO 3297: 2007 Certified Organization, Volume 3, Special Issue 1, January 2014

International Conference on Engineering Technology and Science-(ICETS'14)

On 10th & 11th February Organized by

Department of CIVIL, CSE, ECE, EEE, MECHNICAL Engg. and S&H of Muthayammal College of Engineering, Rasipuram, Tamilnadu, India

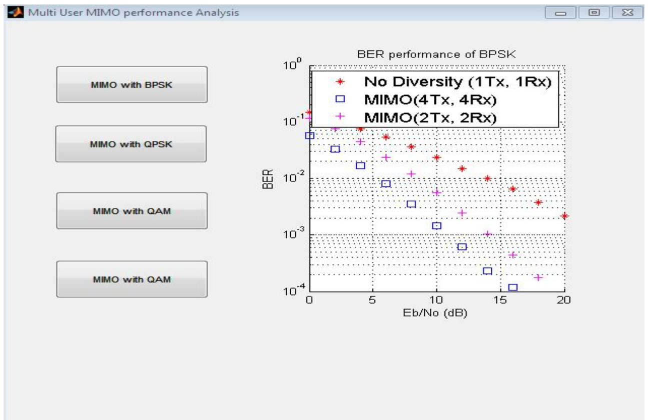

Fig 2. MIMO in BPSK

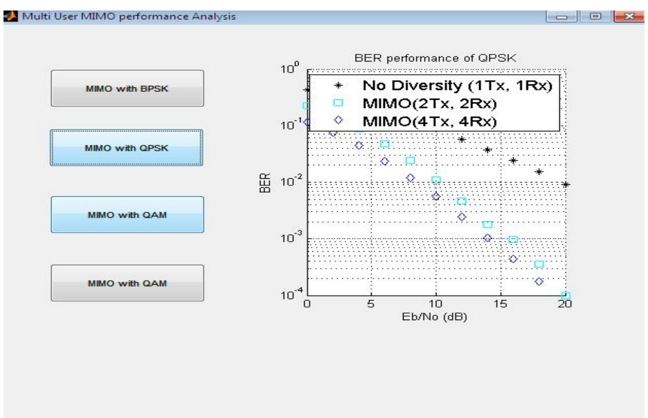

Fig 3.MIMO in QPSK

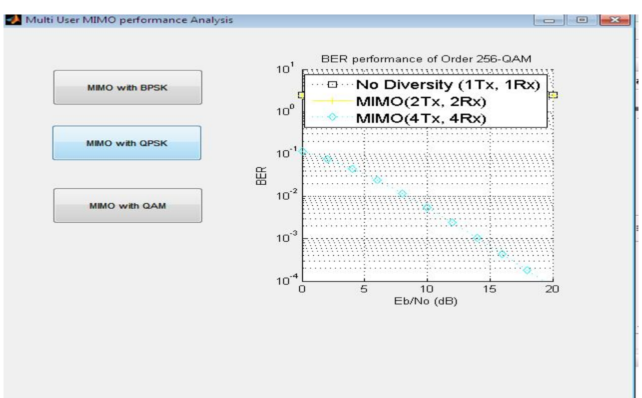

Fig 4 MIMO in 256-QAM

V. CONCLUSION

From computer simulations, it is shown that the proposed SNR representation allows us to achieve better system throughput as compared to conventional systems with reduced complexity.

REFERENCES

[1] CHAO-WANG HUANG, PANG-AN TING, AND CHIA-CHI HUANG "A Novel Message Passing Based MIMO-OFDM Data Detector with a Progressive Parallel ICI Canceller." IEEE TRANSACTIONS ON WIRELESS COMMUNICATIONS, VOL. 10, NO. 4, APRIL 2011.

[2] V. Tarokh, H. Jafarkhani, and A. R. Calderbank, "Space-time block codes from orthogonal designs," *IEEE Trans. Inf. Theory*, vol. 45, pp. 1456-1467, July 1999.

[3] H. Jafarkhani, "A quasi-orthogonal space-time block code," *IEEE Trans. Commun.*, vol 49, no. 1, pp. 1-4, Jan. 2001.

[4] V. Tarokh, A. Naguib, N. Seshadri, and A. R. Calderbank, "Combined array processing and space-time coding," *IEEE Trans. Inf. Theory*, vol. 45. pp. 1121-1128, May 1999.

[5] A. F. Naguib, N. Seshadri, and A. R. Calderbank, "Applications of space-time block codes and interference suppression for high capacity and high data rate wireless systems," in *Proc. 32nd Asilomar Conf. Signals, Syst. Comput.*, pp. 1803-1810, 1998

[6] A. Stamoulis, N. Al-Dhahir and A. R. Calderbank, "Further results on interference cancellation and space-time block codes," in *Proc. 35th Asilomar Conf. Signals, Syst. Comput.*, pp. 257-262, Oct. 2001.

[7] J. Kazemitabar and H. Jafarkhani, "Multiuser interference cancellation and detection for users with more than two transmit antennas," *IEEE Trans. Commun.*, vol. 56, no. 4, pp. 574-583, Apr. 2008.

[8] J. Kazemitabar and H. Jafarkhani, "Performance analysis of multiple antenna multi-user detection," in *Proc. 2009 Workshop Inf. Theory Applications*, Feb. 2009.

[9] A. Scaglione, P. Stoica, S. Barbarossa, G. Giannakis, and H. Sampath, "Optimal designs for space-time linear precoders and decoders," *IEEE Trans. Signal Process.*, vol. 50, no. 5, pp. 1051-1064, 2002.

[10] D. Love and R. J. Heath, "Limited feedback unitary precoding for orthogonal space-time block codes," *IEEE Trans. Signal Process.*, vol. 53, no. 1, pp. 64-73, 2005.

[11] A. Ghaderipoor and C. Tellambura, "Optimal precoder for rate less than one space-time block codes," in *Proc. IEEE International Conf. Commun.*, Glasgow, Scotland, June 2007.

[12] H. Sampath and A. Paulraj, "Linear precoding for space-time coded systems with known fading correlations," *IEEE Commun. Lett.*, vol. 6, no. 6, pp. 239-241, June 2002.