International Journal of Power Control Signal and Computation (IJPCSC)
Vol. 4 No. 2 April- June -2012
©gopalax journals,singapore
ISSN:0976-268X
Available at : http://ijcns.com

SNR AND BER ANALYSIS OF 256-QAM FOR OFDM SYSTEM

A. Raja, Dr.V.ThulasiBai
Email: meetmeraja@gmail.com

Abstract-- **In this paper, we proposed an analysis of M-QAM for hybrid OFDM system in AWGN channel. The proposed scheme is shown to achieve lower bit error rate (BER). Selecting a fraction of the subcarriers with highest channel gain. Simulation results show that system utilizes the proposed scheme can achieve higher PSNR, especially at low SNR. We set N = 64 and NCP = 16. 10 OFDM symbols per transmission frame were used. A bandwidth of 20 MHz was employed.**

I. INTRODUCTION

MOBILE wireless communications are in constant evolution due to the continuously evolving requirements and expectations of both users and operators. The wireless communication has entered into its fourth generation (4G). One of the main differerence between wireless cellular and wired networks is the inherent mobility of the terminals. In recent years, Orthogonal Frequency Division Multiplexing (OFDM) has been proposed for high-speed transmission over optical fiber due to the ease of equalization of the group velocity dispersion dominated optical channel. Orthogonal Frequency Division Multiplexing (OFDM) is a multicarrier transmission technique, which divides the available spectrum into many carriers, each one being modulated by a low rate data stream. OFDM is similar to FDMA in that the multiple user access is achieved by subdividing the available bandwidth into multiple channels, which are then allocated to users. However, OFDM uses the spectrum much more efficiently by spacing the channels much closer together. This is achieved by making all the carriers orthogonal to one another, preventing Interference between the closely spaced carriers.

Orthogonal Frequency Division Multiplexing (OFDM) is an effective technique for combating frequency selective fading caused by multi-path fading channel. It achieves the minimum overall transmit power while not violating the constraints on user's data rate [1-2].Multiple access schemes are used to allow many simultaneous users to use the same fixed bandwidth radio spectrum. In any radio system, the bandwidth that is allocated to it is always limited. For mobile phone systems the total bandwidth is typically 50 MHz, which is split in half to provide the forward and reverse links of the system. Sharing of the spectrum is required in order increase the user capacity of any wireless network. To generate OFDM successfully the relationship between all the carriers must be carefully controlled to maintain the orthogonality of the carriers. For this reason, OFDM is generated by firstly choosing the spectrum required, based on the input data and modulation scheme used. Each carrier to be produced is assigned some data to transmit. The required amplitude and phase of the carrier is then calculated based on the modulation scheme (typically differential BPSK, QPSK, or QAM).

The required spectrum is then converted back to its time domain signal using an Inverse Fourier Transform. In most applications, an Inverse Fast Fourier Transform (IFFT) is used. The IFFT performs the transformation very efficiently, and provides a simple way of ensuring the carrier signals produced are orthogonal.

II. BLOCK DIAGRAM

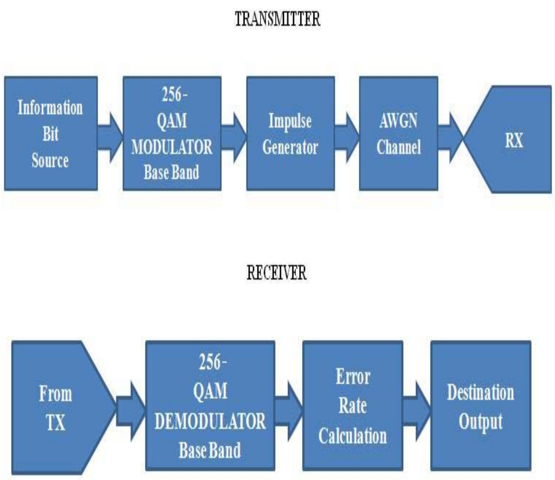

Figure.1. OFDM cooperative communication system with M-QAM

International Journal of Power Control Signal and Computation (IJPCSC)
Vol. 4 No. 2 April- June -2012
©gopalax journals,singapore
ISSN:0976-268X
Available at : http://ijcns.com

III. M-QAM CONSTELLATION

In this analysis, it is desirable to restrict b to be an even number for the following reasons:

1. Half the bits are represented on the real axis and half the bits are represented on imaginary axis. The in-phase and quadrature signals are independent $b/2$ level Pulse Amplitude Modulation (PAM) signals. This simplifies the design of mapper.
2. For decoding, symbol decisions may be applied independently on the real and imaginary axis, simplifying the receiver implementation.

The table below gives a summary of the bit rates of different forms of QAM and PSK:

Table 1: Bit rates of QAM AND PSK

Modulation	Bits per symbol	Symbol Rate
BPSK	1	1 x bit rate
QPSK	2	1/2 bit rate
8PSK	3	1/3 bit rate
16QAM	4	1/4 bit rate
32QAM	5	1/5 bit rate
64QAM	6	1/6 bit rate

IV. OFDMA BASED-STANDARDS AND SIMULATION PARAMETERS

In OFDMA-based networks can be designed to fully exploit multiuser and channel diversities in both time and frequency to maximize the total cell capacity at the expense of fairness among users. From a roaming user's perspective, the inability to maintain fairness User fairness expectations would be even higher in modern relay networks, where service providers advertise outstanding QoS based on the new architecture widely adopted by the state-of-the-art standards.

Subcarriers are ordered in the decreasing order of their channel gains and all the data is transmitted only on a fraction of the available subcarriers. For the Guard carriers, representing respectively the left and right number of subcarrier parameters are given below in table 2 and simulation parameters in table 3.

Table 2: The IEEE 802.16a subcarrier specification.

Parameters Down	link Up	link
Number of FFT points	2048	2048
Usable carriers	1702	1702
Number of sub channels	32	32
Number carriers per sub channels	48	53 (5 pilots)
Data carriers	1536	1536
Number of Pilots	166	160
Guard carriers	173, 172	176, 175

Table 3 - Simulation Parameters

OFDM Symbol Duration	250ms
No Of Nodes	03
No Of Bits/Symbol	1024
No Of Subcarriers	256
No Of Users	04
No Of Transmit Antenna	01
BER Requirement	10^{-3}
Max Transmission Rate Requirement (Max Back off)	08
Carrier Frequency	2.0GHZ
Bandwidth	5.0MHZ

V. NUMERICAL AND SIMULATION RESULTS

Matlab script compares the theoretical and the simulated symbol error rate for 16QAM, 64QAM and 256QAM over OFDM in AWGN channel. Quadrature Amplitude Modulation (QAM) schemes like 16-QAM, 64-QAM are used in typical wireless digital communications specifications like IEEE802.11a, IEEE802.16d. In this post let us derive the equation for probability of symbol being in error for a general M-QAM constellation, given that the signal (symbol) to noise ratio is $\frac{E_s}{N_0}$.

The number of points in the constellation is defined as, $M = 2^b$ where b is the number of bits in each constellation symbol.

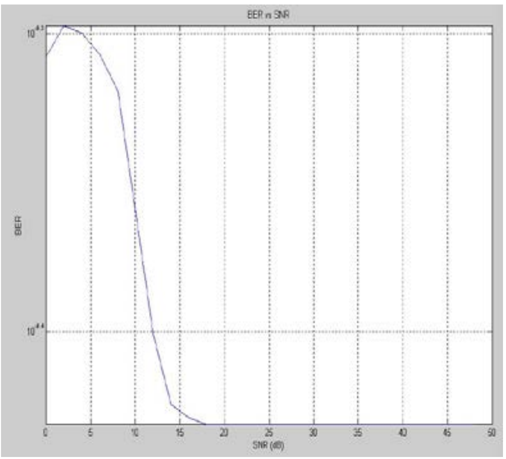

Figure 3. SNR VS BER 64-QAM

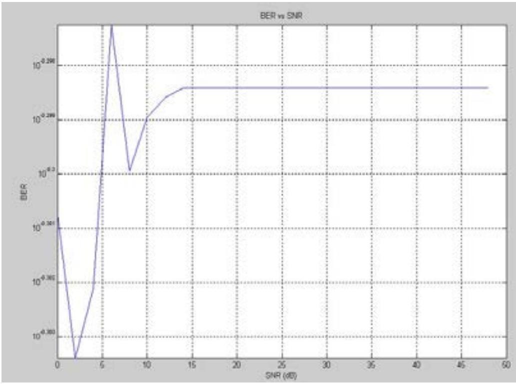

Figure.4 SNR VS BER 256-QAM

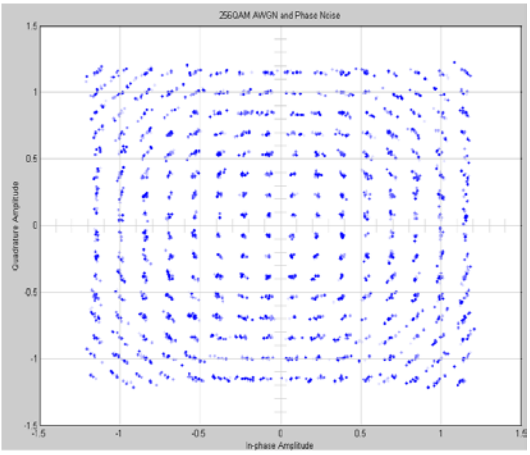

Figure 5. CONSTELLATION OF 256- QAM

VI. CONCLUSION

In all of the simulations, we set N = 64 and NCP = 16. 10 OFDM symbols per transmission frame were used. A bandwidth of 20 MHz was employed. (i.e. channel order ≤ *NCP)* so that no ISI and ICI are incurred. The modulation level is 256- QAM. But there is a problem of BER (bit error rate) which increases as the order of the modulation increases. The solution to this problem is to increase the value of the SNR so, that the effect of the distortions introduced by the channel will also goes on decreasing, as a result of this, the BER will also decreases at higher values of the SNR for high order modulations considering the advantages in scalability, throughput, and fairness, our scheme can be utilized by current HYBRID OFDMA network standards, such as the IEEE 802.16, so that spectrum efficiency and flexibility can be improved.

REFERENCES

[1] Khalid El Baamrani, Abdellah Ait Ouahman, Victor P. Gil Jim ´Enez, Ana Garcia Armada and Said Allaki, "Subcarrier and Power Allocation for the Downlink of Multiuser OFDM Transmission," Wireless Personal Communications (2006) 39: 457–465.

[2] Cheong Yui Wong, Roger S. Cheng, Khaled Ben Letaief, and Ross D.Murch, "Multiuser OFDM with Adaptive Subcarrier, Bit, and Power Allocation," IEEE JOURNAL ON SELECTED AREAS IN COMMUNICATIONS, VOL. 17, NO. 10, OCTOBER 1999.

[3] Guanding Yu · Zhaoyang Zhang · Peiliang Qiu, "Adaptive subcarrier and bit allocation in OFDMA systems supporting heterogeneous services," Wireless Personal Communications (2007) 43:1057–1070.

[4] J.G. Proakis, Digital Communications. McGraw Hill, 2001.

[5] W. Stallings, *Data and Computer Communications*, Prentice Hall, 2007.

[6] Y. Zhou and H. Sethu, "On the relationship between absolute and relative Fairness bounds," *IEEE Commun. Lett*, vol. 6, no. 1, pp. 37–39, Jan. 2002.

[7] H. Sari, "A review of OFDMA and SC-FDMA and some recent Results,"WICAT SC-FDMA Workshop, March 2009.

[8] http://scfdmaworkshop.googlepages.com/.

[9] www.dsplog.com