ISSN: 2278-4632
Vol-10 Issue-5 No. 5 May 2020

DEVELOPING A IDWT-DWT OFDM WITH AWGN CHANNEL USING DIFFERNT MODULATION TECHNIQUES

P Srujana[1], S.S Kiran[2], B. Kiranmai[3]

[1]Assistant Professor, [2]Assistant Professor, [3]Professor
[1, 2, 3]Department of ECE, Lendi Institute of Engineering and Technology, Visakhapatnam, India
[1]p.srujana17@gmail.com, [2]sskiran88k@gmail.com,[3]kbabburu@gmail.com

Abstract*:*—In the present scenarios i.e., 5th Generation Communication plays a vital role for end to end data transferring like images, videos, audios, SMS, E-Mail information etc. In this paper, a binary data is used to evaluate the functionality by using a new method of evaluation for OFDM signal reception under AWGN channel. Proposed different configurations of modulation techniques such as QPSK, BPSK, PSK and 16-QAM are considered. The valid conclusions are made from the comparison of different modulation techniques of DWT based OFDM in terms of BER. Finally we compute that IDWT-DWT OFDM using QPSK modulation technique over AWGN channel is the more efficient one. In this paper we evaluate the following parameters like BER, EVM (Error Vector Magnitude) for efficient and reliable transmission of a signal.

Keywords: OFDM, Wavelet Transform, DWT, AWGN CHANNEL, QPSK, BPSK, PSK, 16-QAM

.

I. INTRODUCTION

Communication places a major role in this world .The main goal of wireless communication is to give a quality service to the customers. There are different methods for transmission here we prefer OFDM (Orthogonal Frequency Division Multiplexing).This method is used for modern digital transmission using multi level carrier technology. The main advantage of preferring OFDM it will reduces crosstalk in signal transmission, high efficiency, high bit rate, wide bandwidth, etc,

OFDM (Orthogonal Frequency Division Multiplexing) technique will convert signal into number of sub carrier signals before transmission [1]. These sub carriers are of different frequencies and are orthogonal to each other [2]. Orthoganlity means if those two signals are product each other and if their product is zero during an integral of an interval then it is a known as Orthogonality.Mathematically it is represented as follows:

Suppose if 'F' represents a set of signals, then the signals are said to be orthogonal if it satisfy below expression:

$\int_a^b F_p(t)\, F_q^*(t) = \{k$ for $p=q;$

$\{0$ for $p \neq q$ where F_p is pth element, F_q is q^{th} element, * is complex conjugate during interval [a,b].

It also require spacing between subcarriers is $\Delta f = k/T_v$, Where T_v is symbol duration, k=integer(equals=1 always) so, if N subcarriers are present then bandwidth B= $N*\Delta f$ (Hz).

Wavelet which transforms a signal into number of basis function where this basis function is called as wavelet. In DWT (Discrete Wavelet Transform) technique it converts the signal into different discrete wavelets.It provides high efficient multi resolution for the signal.DWT provides inherent multi resolution nature to the signal. DWT is having more applications in digital communication in which OFDM is one among them.[3] DWT is a flexible method and efficiently used for sub carrier decomposition of signals[4]. In this paper we propose different digital modulation techniques like PSK, BPSK, QPSK, 16-QAM for transmission of signal through DWT-OFDM using AWGN channel and we evaluated their performance on different parameters like BER, EVM (Error Vector Magnitude).

I. LITERATURE REVIEW

Feng Zhao Haixia Zhang Dongfeng Yuan authors proposed their work using different Frequency selective channels and proved that it is having high bandwidth and it reduces ISI (Inter Symbol Interferences) with Orthogonal Bases using AWGN [5].

P.K.Joshi, M.K.N. Umaria proposed their work in high bit rate wireless communication services like data with high speed voice signals, bits, video, and image. OFDM method provides high speed data for different multipath fading environment [6] Rohit Satish Narkhede, Bodhe, Shirish Joshi, these authors proposed their work on DWT-IDWT OFDM Technique is highly efficient than the FFT-IFFT OFDM. In their proposed work they prove that bit error rate, efficiency is better [7]. Dr. Saad Saffah Hreshee Defaf Talal Shakir, these authors proposed their work on wavelet transform and compare different FFT OFDM, DWT OFDM on different Fading Channels, AWGN Channel etc., [8-9].

ISSN: 2278-4632
Vol-10 Issue-5 No. 5 May 2020

III. SYSTEM MODEL OR PROPOSED SYSTEM

To transmit data like image, first it is converted into bits then it is modulated then it is transmitted through channel and at receiver it is again reconvert from bits to image and the image is perfectly reconstructed without any distortion.

In this paper we use Orthogonal Frequency Division Multiplexing (OFDM) method for transmit an input signal through IDWT-OFDM and transmit through AWGN channel and at receiver vice versa will do and the input is reconstructed at receiver accurately. DWT-OFDM based system converts discrete time signals into carriers i.e., Wavelets at different position and scales. In FFT based OFDM complexity is more and efficiency of signal filtering is difficult so we prefer DWT based OFDM System. Wavelet transform is more advantage because it does not require cyclic prefix before transmission.

Input data processing is done with DWT/IDWT OFDM Technique using different digital modulation techniques like PSK, BPSK, QPSK, 16-QAM through an AWGN channel, the results are compared among these modulation techniques.

A.PSK Modulation

PSK (Phase Shift Keying) it is one of the digital modulation techniques, here the signal is transmitted using phase shift keying method. It is used in different applications like LAN, Bluetooth etc..,

In PSK system, for any signal the amplitude remains constant but phase wills changes. For each different phase we will allot a binary bit. At demodulator section the transmitted symbol or data will reconstructed without any errors. From the fig 6 we can observe different phases of bits i.e., constellation diagram, here we use 8 bit PSK so all the points are represented in the form of circle as shown in fig 6.There is 90 degrees phase shift between two that is between real and imaginary axes in the plane.

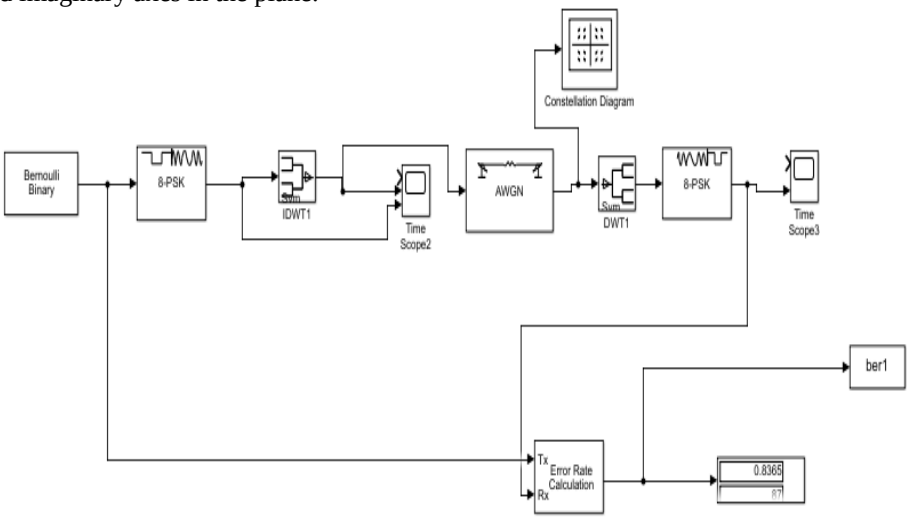

Fig 1: block diagram of IDWT/DWT-OFDM of 8-PSK modulation.

From the above fig 1 block diagram, it is clear that the bernoulli binary data is given to the 8-PSK modulate since any input signal should be modulated. The signal is passed through IDWT (Inverse Discrete Wavelet Transform) the output of this section is applied to AWGN channel.

In Demodulator section signal from channel is applied to DWT (Discrete Wavelet Transform) through which it is given to PSK demodulator from which the original signal is received.

B. BPSK Modulation

BPSK (Binary Phase Shift Keying) is also known as Phase Reversal Keying (PRK). In BPSK technique there is 180 degrees phase shift which is twice the PSK technique that is why it is also known as 2PSK technique.

From the below fig 2 it is clear that data is given to BPSK modulator where modulation is done and given to Inverse Discrete Wavelet Transform section and the output of this is given to AWGN Channel.

At the receiver section data is passing through discrete wavelet transform and then through BPSK demodulator Baseband section from where we will regenerate the original transmitted signal.

ISSN: 2278-4632
Vol-10 Issue-5 No. 5 May 2020

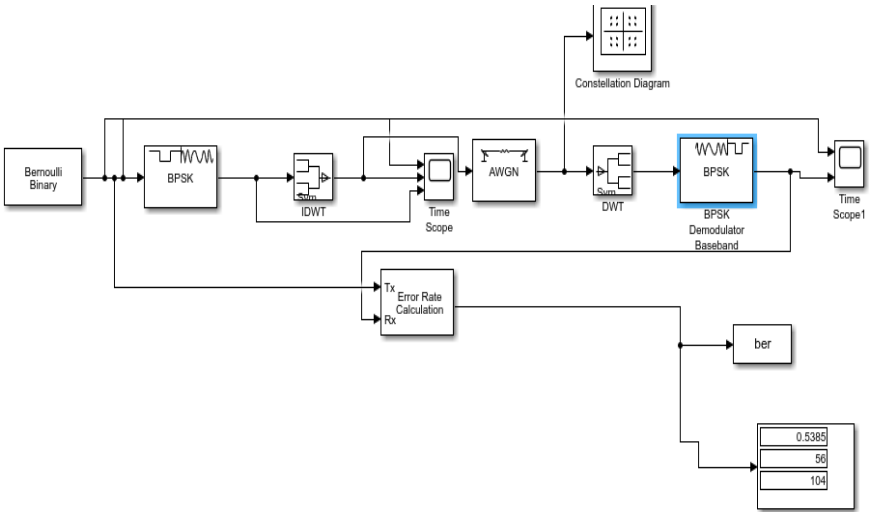

Fig 2: Block diagram of IDWT/DWT-OFDM of BPSK modulation.

C.QPSK Modulation

In Fig 8 Constellation diagram of QPSK all the bits are equi spaced and form as a circle. It has 4 phases for bits. In BPSK we have two two phases but in QPSK it has two bits per symbol and having four phases so that it can reduce bit error rate.

By keeping the same bandwidth of the signal, this method is used to improve data rate, high efficiency, less Bandwidth when compare to all other modulation techniques.

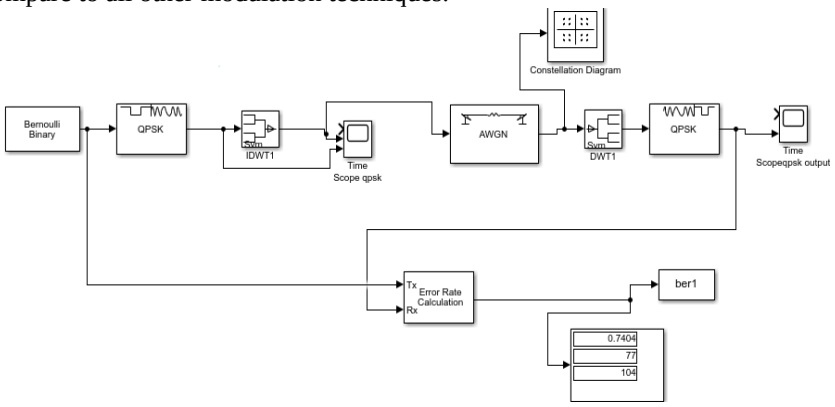

Fig 3: Block Diagram of IDWT/DWT-OFDM of QPSK modulation.

D.16-QAM Modulation

Quadrature Amplitude Modulation (QAM) is one of the Digital Amplitude Modulation Technique.The below fig 4 represents block diagram of IDWT/DWT-OFDM of 16-QAM modulation. In the below figure the data is given to 16-QAM and it is send through DWT and AWGN channel. At receiver the vice versa operation will do.

ISSN: 2278-4632
Vol-10 Issue-5 No. 5 May 2020

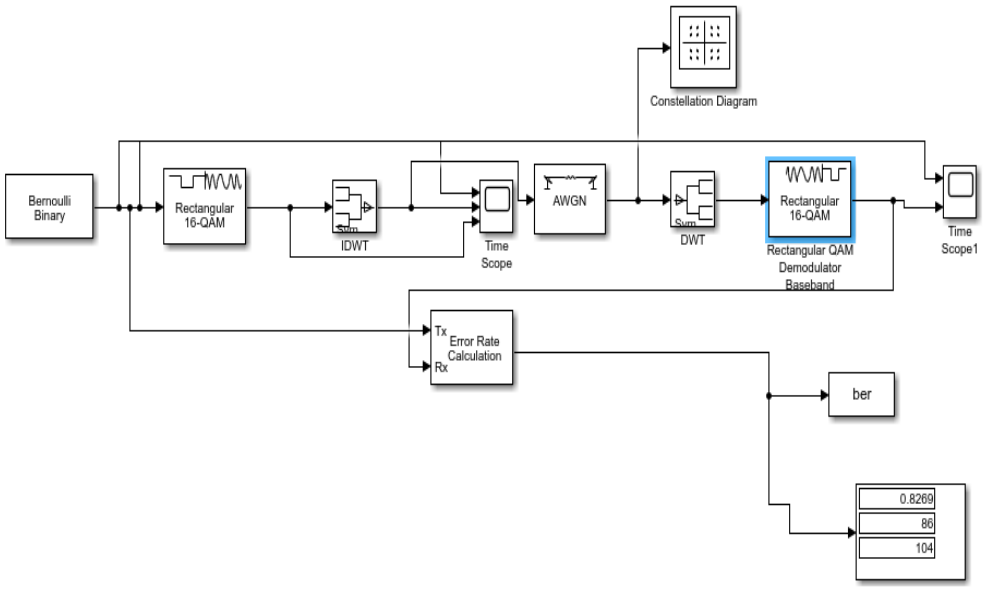

FIg 4: Block Diagram of IDWT/DWT-OFDM of 16-QAM modulation.

In 16-QAM all the bits lie on straight line which resembles like a square as shown in Fig 7

IV. SIMULATION RESULTS

A. Constellation Diagrams:

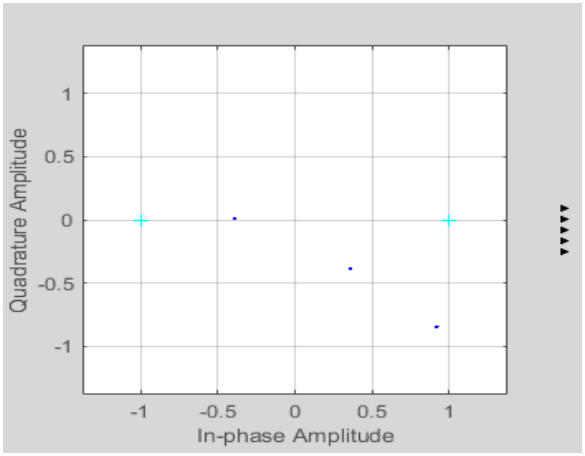

Fig:5 Constellation Diagram of IDWT-DWT OFDM using BPSK Modulation

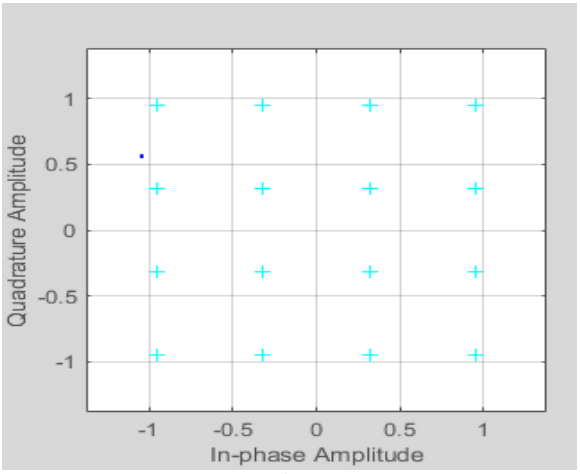

Fig 7: Constellation Diagram of IDWT/DWT OFDM using 16-QAM

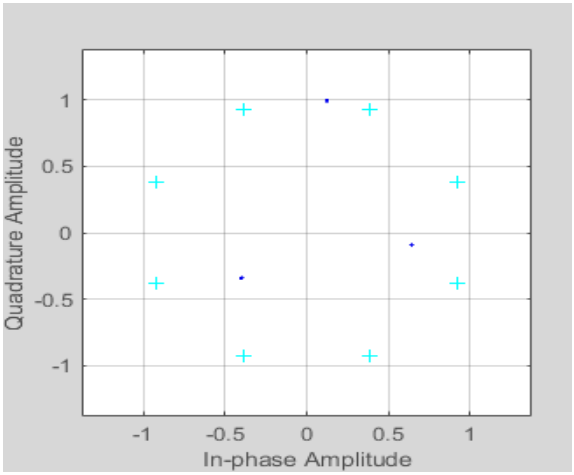

Fig 6: Constellation Diagram of IDWT/DWT OFDM using 8-PSK modulation

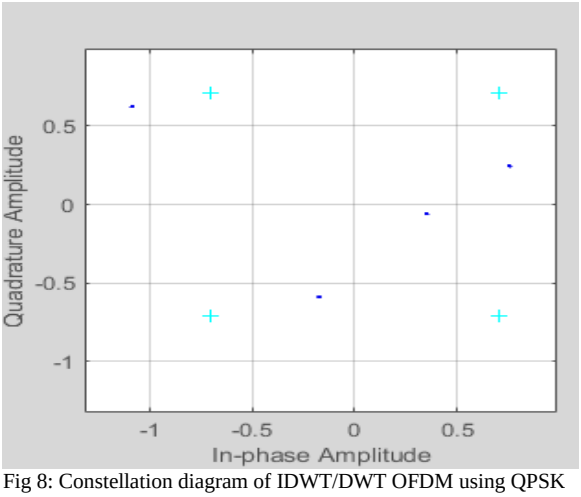

Fig 8: Constellation diagram of IDWT/DWT OFDM using QPSK modulation

ISSN: 2278-4632
Vol-10 Issue-5 No. 5 May 2020

B.BER Performance of DWT-OFDM:

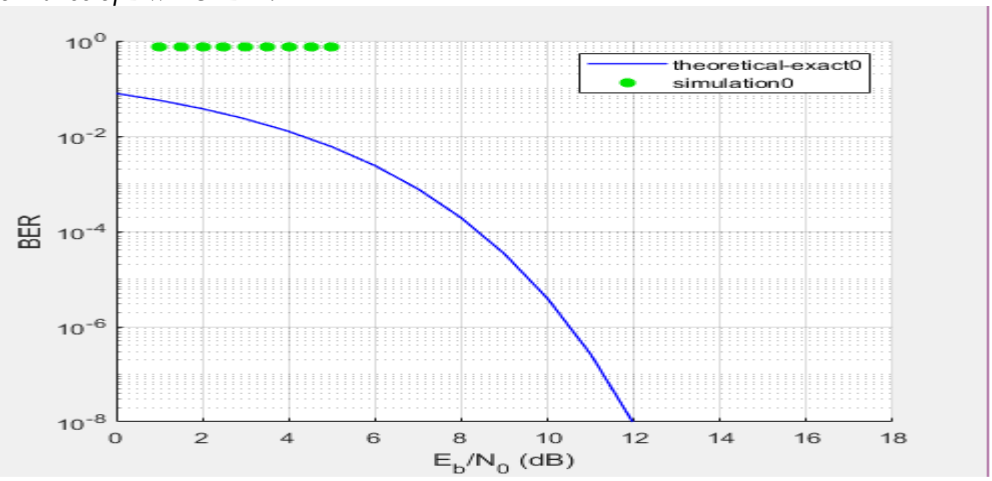

Fig 9: BER diagram of IDWT-DWT OFDM using QPSK

C. Comparison of DWT-OFDM for Different Modulation Techniques:

TABLE I
Comparison of Different Modulation Techniques

S.NO	MODULATION TECHNIQUE	BER	EVM
1	QPSK	0.538/56	427
2	BPSK	0.78/71	410
3	16-QAM	0.826/86	377
4	PSK	0.734/87	408

From the above table 1 we compute different parameters for different modulation techniques and we conclude that QPSK DWT OFDM method is better than other modulation techniques.

V. CONCULSION

In this paper we have a tendency to used simulink simulation approach.we compare the performance of BER and EVM (Error Vector Magnitude) of DWT-OFDM for different modulation techniques using AWGN channel. Thus from the above simulation results we can conclude that the QPSK is better than all other modulation techniques like PSK, BPSK, 16-QAM and made computations in terms of BER,EVM by comparing all these techniques using AWGN channel for a better efficient result and finally concluded that IDWT-DWT OFDM using QPSK modulation is the more efficient one.

REFERNCES

[1] Al-Dhahir N. and Cioffi J., “Optimum Finite-Length Equalization for Multicarrier Transceivers,” Computer Journal of IEEE Transactions Communications, vol.44, no. 1, pp. 56-64, 1996.
[2] Dilmirghani R., Ghavami M., “Wavelet vs. Fourier Based UWB Systems”, IEEE International Symposium on Personal, Indoor and Mobile Radio Communications, pp.1-5, 2007.
[3]Sharma v,Shrivastav A, Jain authors “BER performance of OFDM BPSK QPSK QAM over AWGN channel using forward error correcting code”, International Journal of Engineering Research and Applications, Vol 2, Issue 3, pp.1619-1624, 2012.
[4] Veena M.B., M. N. Shanmukha Swamy, “Performance analysis of DWT based OFDM over FFT based OFDM and Implementing on FPGA”, International Journal of VLSI design & Communication Systems, Vol.2, No.3, 2011.
[5] Feng Zhao Haixia, Zhang, Dongfeng Yuan, “Performance of COFDM with Different Orthogonal Bases on AWGN and Frequency Selective Channel,” IEEE 6th CAS Symposium on Emerging Technologies: Mobile and Wireless Comm. Shanghai, China, 2004.
[6] M. K. N. Umaria and P. K. Joshi, "Comparative analysis of BER Performance of DWT based OFDM system with conventional FFT based OFDM system", International Conference on Emerging Technology Trends in Electronics, Communication and Networking, 2012.
[7] Rohit Bodhe, Satish Narkhede, Shirish Joshi, “Design of Simulink Model for OFDM and Comparison of FFT OFDM and DWT OFDM”, International Journal of Engineering Science and Technology, Vol. 4, No. 5, 2012.
[8] Dr. Saad Saffah, Hreshee Defaf Talal Shakir, “Design and Simulation of a Coded OFDM Modulation Technique based on Discrete Wavelet Transform”, European Journal of Scientific Research, July 2013.
[9] Kataria J., Kumar P. and Raj T, “A Study and Survey of OFDM versus COFDM”, International Journal of Science and Modern Engineering, Volume 1, Issue 5, 2013.
[10] B. Kiranmai, V. Lavanya and S. S. Kiran, “An energy efficient resource allocation system using OFDM DAS Model for LTE applications”, International Conference on Information System Design and Intelligent Applications, Springer LNEE series, 2019.

