Comparative Effective Estimation Of Stbc Coded Mimo-Ofdm System For Wimax Systems With DWT & FFT

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Abstract- *In today's wireless communication system need for higher data rates, higher payment capacity and improved quality of service is upgrade. These protest can be overcome by one of the key technology Orthogonal Frequency Division Multiplexing (OFDM).This paper prospect the multiple input multiple output (MIMO) space-time coded wireless systems. MIMO-OFDM system to upgrade the accuracy of the WiMAX system. This paper discusses the model building of MIMO-OFDM using MATLAB R2014a version. This model is a using gadget for BER (Bit Error Rate), PAPR (Peak Average Peak Ratio) and transmits spectrum performance assessment for signal & multiple input output port by the WiMAX (IEEE 802.16) system. The comparative performance resolution of OFDM system using FFT eke DWT is succeed with STBC-MIMO system. Modulation technique used is 16-QAM under Rayleigh & AWGN channel. DWT-OFDM is simulated using Haar wavelet. BER vs. SNR performance resolution is succeed using Mat lab Simulink.*

Keywords- WiMAX, OFDM, Rayleigh Channel, MIMO-OFDM, BER, PAPR

I. INTRODUCTION

Wireless communication environment is a demand for high data rate, accurate high speed is up grate rapidly. Wireless communication systems use many modulation technologies for the transmission, reception eke processing of signal. One such modulation technique is orthogonal frequency division multiplexing (OFDM). In OFDM, the data to be transmitted is divided in to a few number of parallel data streams (subcarriers) [2]. OFDM subcarriers are placed orthogonal to each other to preclude interference between them. Nowadays, the key goal in wireless communication is to increase data rate and upgrade transmission accuracy [19]. The upgrade demand for higher data rates, improved quality of service, fewer dropped calls, and higher network capacity requires upgrading spectral efficiency and link accuracy [5]. Therefore new technologies in wireless communication are Proposing day by day like OFDM, MIMO and MIMO OFDM[6].OFDM impair BER performance and ISI with using multiplexing and modulation techniques to get higher data rate over wireless channels, the use of multiple antennas at both ends of the wireless link provide better performance. The MIMO technique does not require extra transmission power and bandwidth. Therefore, the promising way to upgrade the spectral efficiency of a system, the combination of MIMO and OFDM is used over fading channels [10-11].This paper is organized as follows: In section II, the orthogonal frequency division multiplexing (OFDM) system and multiple inputs Multiple output OFDM (OFDM-MIMO) system is formulated. Space time block code is introduced in this Project based performance resolution of FFT-OFDM and DWT-OFDM is succeeding using 16QAM BPSK Modulated under AWGN channel.

II. EXISTING SYSTEMS

In FFT based OFDM system, outcome input signal is diagramed using digital modulation technique like QAM at transmitter side in which serial binary data are converted into complex symbols performing constellation units. One or more bits from the channel coding step are selected to each subcarrier. The FFT is applied at the receiver side to decode the signal. Then, each N symbols will be transmitted beyond N orthogonal subcarriers through the IFFT. The output of the IFFT block in discrete time domain with N used subcarriers is as follows, Behind the OFDM symbol being constructed, cyclic prefix is added at each OFDM symbol. This output signal is transmitted over Rayleigh channel. The basic block diagram of OFDM system using IFFT and FFT as shown below, at the receiver side, the data are reversely reconstructed using the FFT block in order to get the initial transmitted bit stream. Behind removing cyclic prefix data is demodulated and transmitted signal is reconstructed.

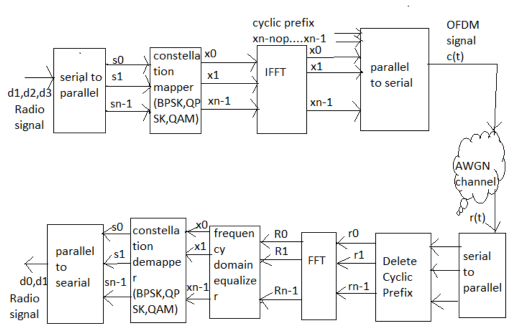


figure1: Existing system block diagram

Drawback:

- Transmit power High using network System.
- High Bit Error Rate, Window Size Big, High Cost.

EXISTING SYSTEM ALGORITHEM

Step 1: Write the given sequence in bit reversal order
Step 2: Divide the sequence into two-points and perform 2-point DFT
Step 3: Divide the sequence into 4 by combining two 2-point DFT and performance 4-point DFT
Step 4: Divide the sequence into 8 by combining two 4-points DFT and perform 8-point DFT
Step 5: Write the output sequence X (K) as unpaid order III,

III. PROPOSED SYSTEMS

In this paper, performance resolution of DWT-OFDM is succeed using 16QAM under AWGN channel. Further STBC-MIMO system is implemented for two transmitter antennas and two receiver antennas. Simulation results show that BER vs SNR performance of DWT-OFDM system is improved than FFT-OFDM system. In STBC-MIMO system as we increase number of receive antennas BER performance of system is upgraded. OFDM system is combined with STBC-MIMO system and comparative resolution of MIMO-OFDM system with FFT and DWT has been succeed. MIMO-OFDM systems are simulated by antenna order 2x2. From simulation results it is found that performance of OFDM system is upgraded by combining with MIMO system, and BER vs SNR performance of DWT-OFDM system. System complexity of DWT-OFDM system is reduces and the transmission rate increases.

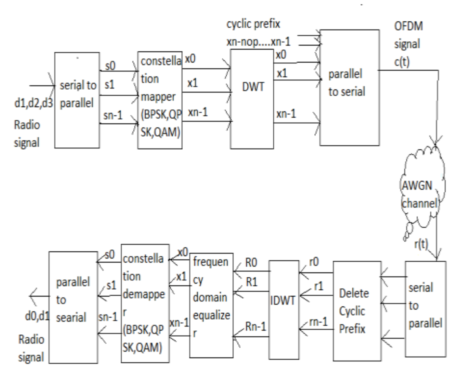


figure2: proposed system block diagram

Operation Of Block Diagram:
Serial To Parallel:

Data coming from the input are put in order into vectors with number of elements equal to the number of carriers. All components are composed by a number of bits susceptible on the alphabet of the modulation scheme used on the next stage [20]. For example, if we use a 1024 carriers system with PSK &QAM, we'll have vectors of 1024 component each one composed by 1 bit (PSK &QAM is 2-ary).

Psk And Qam Modulation Technique:

Each component (group of bits) is diagramed into a complicate symbol depending on the alphabet of the modulation scheme used. For example, with PSK &QAM the alphabet is {-1; +1} [20].

Fast Fourier Transform:

The FFT operates by decomposing an *N* point time domain signal into *N* time domain signals each composed of a single point. The second step is to calculate the *N* frequency spectra corresponding to these *N* time domain signals. Lastly, the *N* spectra are synthesized into a single frequency spectrum [13]. The Fast Fourier Transform is an algorithm optimization of the DFT—Discrete Fourier Transform. The "discrete" part just means that it's an adaptation of the Fourier Transform, a continuous process for the analog world, to make it suitable for the sampled digital world. Most of the discussion here addresses the Fourier Transform and its adaptation to the DFT. When it's time for you to implement the transform in a program, you'll use the FFT for efficiency [12-15]. The results of the FFT are the same as with the DFT; the only difference is that the algorithm is optimized to remove redundant calculations. In general, the FFT can make these optimizations when the number of samples to be transformed is an exact power of two, for which it can eliminate many unnecessary operations [12-13].

Discrete Wavelet Transform:

The discrete wavelet transform (DWT) is an implementation of the wavelet transform using a discrete confederacy of the wavelet scales and translations accepting some defined rules [14]. The wavelet can be constructed from a scaling function which defines its scaling possession. The confinement that the scaling functions should be orthogonal to its discrete translations implies some mathematical conditions on them which are mentioned everywhere, e.g. the dilation Operation. When threshold for given scale is known, we can eliminate all the coefficients smaller than threshold value (hard thresholding)[15] .The DWT low pass filter coefficients is called as approximated coefficients along with the high pass filter coefficients is called as detailed coefficients The input is first passed through the low pass filter g (n) and its output is the approximated coefficient eke the same input passed through the high pass filter h (n) produces the output as the detailed coefficient[16]. This is how the signal is decomposed at the wavelet. The mathematical expression for this decomposition is described below.

$$\mathrm{F1}(K) = \sum_{n=0}^{\infty} \mathrm{x[n]g[2K - n]}$$

$$F2(K) = \sum_{n=0}^{\infty} \mathrm{x[n]h[2K - n]}$$

The guard interval is added at the beginning of the vector by reappearing the elements of the end. Vectors are integrated to form a time signal (parallel/serial conversion) Windowing the signal is crucial to limit the bandwidth. Most used window is the raised cosine.

Cyclic Prefix

In the post on Cyclic Prefix in OFDM, we analyzed the need for cyclic prefix and how it plays the role of a buffer region where delayed information from the bygone symbols can get stored [17]. Yonder, since addition of sinusoidal with a delayed version of the sinusoidal does not change the frequency of the sinusoidal (affects only the amplitude and phase); the orthogonality over subcarriers is not lost even in presence of multipath.

Channel

The signal is then passed via the channel. AWGN and Ray length Channel is modeled by a linear system with frequency response c (t) together with a source of additive Gaussian noise [18].

Demodulation

(IDWT) is computed in order to get back the complex vector of symbols. At the reception, signal is repute in order again into vectors (parallel/ serial conversion) and guard interval is dropped.

Advantages:

- Accuracy Output Demodulated Data Using DWT Transfer Function,
- High Speed,
- Low Bit Error Rate,
- High Signal to Noise Ratio,
- Good efficiency.

Proposed System Algorithm

Step 1: The DWT consists of $\log_2 N$ stages at most.

Step 2: Starting from *s*, the first step produces two sets of coefficients: approximation coefficients cA_1, and detail coefficients cD_1.

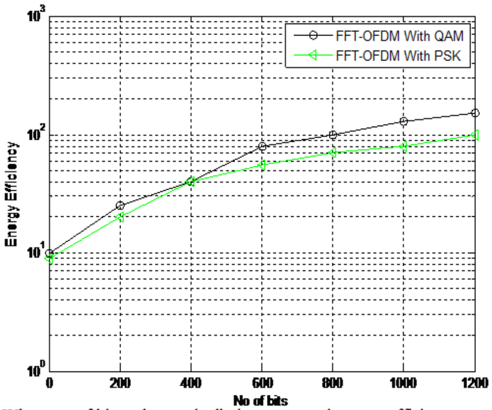
Step 3: These vectors are obtained by convolving *s* with the low-pass filter Lo_D for approximation, and with the high-pass filter Hi_D for detail, followed by dyadic decimation.

Step 4: The length of each filter is equal to $2L$. The result of convolving a length N signal with a length $2L$ filter is $N+2L–1$. Therefore, the signals F and G are of length $N + 2L – 1$. After down sampling by 2, the coefficient vectors cA_1 and cD_1 are of length [N-1/2+L].

Step 5: The next step splits the approximation coefficients cA_1 in two parts using the same scheme, replacing *s* by cA_1 and producing cA_2 and cD_2, and so on.

IV. SIMULATION RESULTS

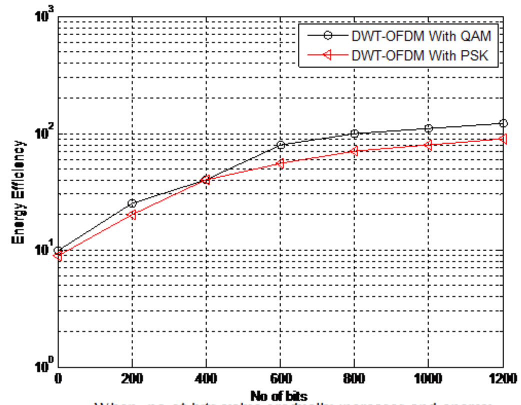
Simulation experiments are conducted to evaluated BER, PAPR, MSE and SNR abatement performance of the proposed scheme and the OFDM scheme. In addition, it is assumed that the Data are PSK, 16-QAM modulated and are transmitted using N = 100 sub-carriers.



When no of bits value gradually increases and energy efficiency performance also increases.

X-axis (No of bits) ;Y-axis (Energy Efficiency)

figure3: Existing no of bits Vs energy efficiency



When no of bits value gradually increases and energy efficiency performance was decreases.

X-axis (No of bits) ;Y-axis (Energy Efficiency)

figure4: proposed no of bits Vs energy efficiency

Comparision Table For Fft-Dwt With Qam For Energy Efficiency:

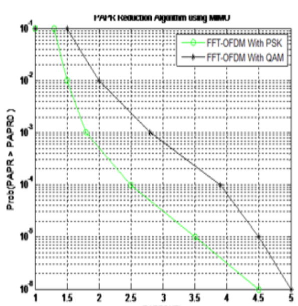
FFT-OFDM with QAM			DWT-OFDM with QAM	
S.NO	X-No of bits	Y-energy efficiency	X-No of bits	Y-energy efficiency
1	0	10^{1}	0	10^{1}
2	200	$10^{1.35}$	200	$10^{1.4}$
3	400	$10^{1.5}$	400	$10^{1.5}$
4	600	$10^{1.8}$	600	$10^{1.8}$
5	800	10^{2}	800	10^{2}
6	1000	$10^{2.1}$	1000	$10^{2.1}$
7	1200	$10^{2.2}$	1200	$10^{2.2}$

TABLE: 1

Comparision Table For Fft-Dwt With Psk For Energy Efficiency:

FFT-OFDM with PSK			DWT-OFDM with PSK	
S.NO	X-No of bits	Y-energy efficiency	X-No of bits	Y-energy efficiency
1	0	$10^{0.9}$	0	$10^{0.9}$
2	200	$10^{1.3}$	200	$10^{1.3}$
3	400	$10^{1.5}$	400	$10^{1.5}$
4	600	$10^{1.6}$	600	$10^{1.6}$
5	800	$10^{1.7}$	800	$10^{1.7}$
6	1000	$10^{1.8}$	1000	$10^{1.8}$
7	1200	10^{2}	1200	$10^{1.9}$

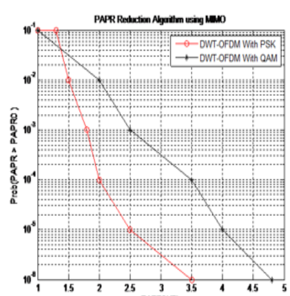
TABLE: 2



When PAPR value gradually increases and probapility performance was decreses.

X-axis (PAPR) ;Y-axis (probapility)

Figure5: Existing PAPR performance



When PAPR value gradually increases and probapility performance was decreses.

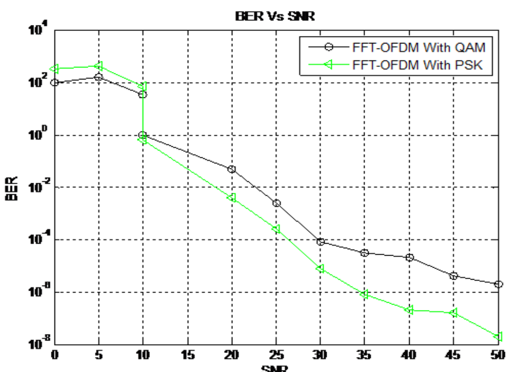
X-axis (PAPR) ;Y-axis (probapility)

Figure6: Proposed PAPR performance

Comparision Table For Fft-Dwt With Qam For Papr:

FFT-OFDM with QAM			DWT-OFDM with QAM	
S.NO	X-PAPR	Y-PBY	X-PAPR	Y-PBY
1	1	10^{-1}	1	10^{-1}
2	1.5	10^{-1}	2	10^{-2}
3	2	10^{-2}	2.5	10^{-3}
4	2.7	10^{-3}	3.5	10^{-4}
5	3.8	10^{-4}	4	10^{-5}
6	4.5	10^{-5}	4.5	$10^{-5.8}$
7	5	10^{-6}	4.7	10^{-6}

TABLE: 3



When SNR value gradually increases and BER performance was decreases.

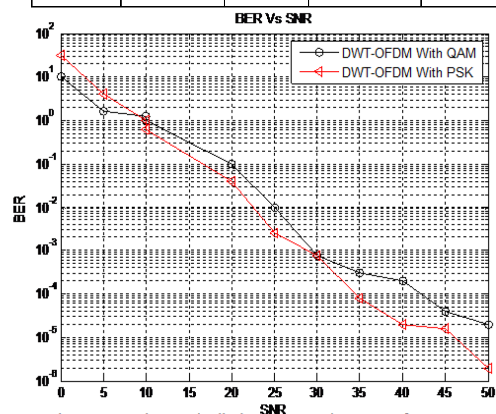
X-axis (SNR) ;Y-axis (BER)

figure7: Existing SNR Vs BER

Comparision Table For Fft-Dwt With Psk For Papr:

TABLE: 4

FFT-OFDM with PSK			DWT-OFDM with PSK	
S.NO	X-PAPR	Y-PBY	X-PAPR	Y-PBY
1	1	10^{-1}	1	10^{-1}
2	1.3	10^{-1}	1.3	10^{-1}
3	1.5	10^{-2}	1.5	10^{-2}
4	1.7	10^{-3}	1.7	10^{-3}
5	2.5	10^{-4}	2	10^{-4}
6	3.5	10^{-5}	2.5	10^{-5}
7	4.5	10^{-6}	3.5	10^{-6}



When SNR value gradually increases and BER performance was decreases.

X-axis (SNR) ;Y-axis (BER)

figure8: proposed SNR Vs BER

Comparision Tabulation For Fft-Dwt With Qam For Snr&Ber:

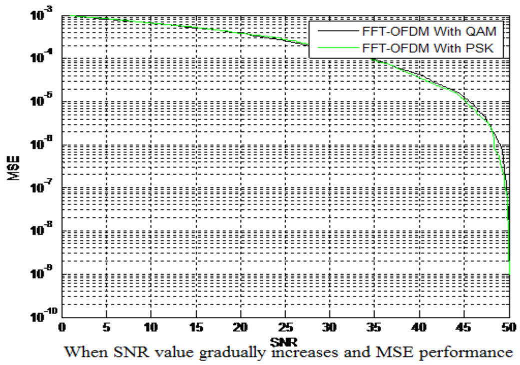
FFT-OFDM with QAM			DWT-OFDM with QAM	
S.NO	X-SNR	Y-BER	X-SNR	Y-BER
1	0	10^{2}	0	10^{1}
2	5	$10^{2.2}$	5	$10^{0.2}$
3	10	$10^{1.8}$	10	$10^{0.1}$
4	10	10^{0}	20	10^{-1}
5	20	$10^{-1.6}$	25	10^{-2}
6	25	$10^{-3.6}$	30	$10-^{3.2}$
7	30	10^{-4}	35	$10^{-3.7}$
8	35	$10^{-4.4}$	40	$10^{-3.8}$
9	40	$10^{-4.8}$	45	$10^{-4.5}$
10	45	$10^{-5.6}$	50	$10^{-4.8}$

TABLE: 5

Comparision Tabulation For Fft-Dwt With Psk For Snr&Ber:

FFT-OFDM with PSK			DWT-OFDM with PSK	
S.NO	X-SNR	Y-BER	X-SNR	Y-BER
1	0	$10^{2.4}$	0	$10^{1.5}$
2	5	$10^{2.5}$	5	$10^{0.5}$
3	10	$10^{1.9}$	10	$10^{-0.8}$
4	10	$10^{-1.9}$	20	$10^{-1.4}$
5	20	$10^{-2.4}$	25	$10^{-2.5}$
6	25	$10^{-3.8}$	30	$10^{-3.2}$
7	30	10^{-5}	35	$10^{-4.2}$
8	35	10^{-6}	40	$10^{-4.8}$
9	40	$10^{-6.8}$	45	$10^{-4.85}$
10	45	10^{-7}	50	$10^{-5.8}$

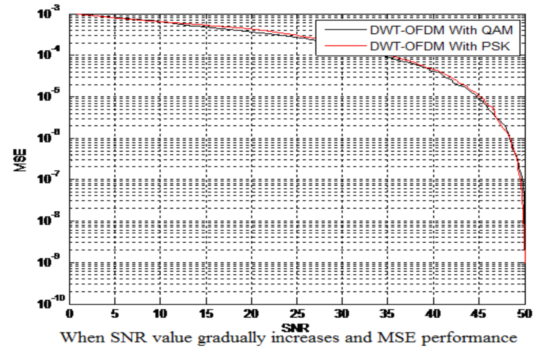
TABLE: 6



When SNR value gradually increases and MSE performance was decreases.

X-axis (SNR) ;Y-axis (MSE)

figure9: Existing SNR Vs MSE



When SNR value gradually increases and MSE performance was decreases.

X-axis (SNR) ;Y-axis (MSE)

figure10: proposed SNR Vs MSE

Comparision Table For Fft-Dwt With Qam For Snr&Mse:

FFT-OFDM with QAM			DWT-OFDM with QAM	
S.NO	X-SNR	Y-MSE*10-3	X-SNR	Y-MSE*10-3
1	0	10^{-3}	0	10^{-3}
2	5	$10^{-3.1}$	5	$10^{-3.1}$
3	10	$10^{-3.3}$	10	$10^{-3.3}$
4	20	$10^{-3.6}$	20	$10^{-3.4}$
5	30	$10^{-3.8}$	30	$10^{-3.7}$
6	40	$10^{-4.4}$	40	$10^{-4.4}$
7	45	10^{-5}	45	10^{-5}
8	50	10^{-9}	50	10^{-9}

TABLE: 7

Comparision Table For Fft-Dwt With Psk For Snr&Mse:

FFT-OFDM with PSK			DWT-OFDM with PSK	
S.NO	X-SNR	Y-MSE	X-SNR	Y-MSE
1	0	10^{-3}	0	10^{-31}
2	5	$10^{-3.1}$	5	$10^{-3.11}$
3	10	$10^{-3.3}$	10	$10^{-3.31}$
4	20	$10^{-3.6}$	20	$10^{-3.41}$
5	35	$10^{-4.1}$	30	$10^{-3.71}$
6	40	$10^{-4.3}$	40	$10^{-4.41}$
7	45	10^{-5}	45	$10^{-4.9}$
8	50	$10^{-8.8}$	50	$10^{-8.5}$

TABLE: 8

V. CONCLUSION

In this paper, effectiveness estimation of FFT-OFDM and DWT-OFDM is done using 16QAM under AWGN channel; we know that a settlement between peak power peak ratio (PAPR) and bit error rate for WiMAX IEEE 802.16. In this paper broached low-complexity transmitter architecture for STBC MIMO-OFDM system. The proposed SBTC MIMO OFDM 2*1 including MIMO-OFDM 2*2 scheme could offer better PAPR abatement, which is usually the same as that of OFDM system. The bygone scheme used only single input single output. However, the proposed scheme designs for multiple inputs and multiple outputs. Therefore, the proposed SBTC MIMO-OFDM scheme has excellent bandwidth efficiency and BER performance compared with the bygone scheme. In BPSK system shows BER and SNR improvement in WiMAX 802.16 based MIMO-OFDM system. MIMO-OFDM systems are simulated by antenna order 2x2. From simulation results it is found that effectiveness of OFDM system is bettered by combining with MIMO system, and BER vs. SNR performance of DWT-OFDM system is excellent than FFT-OFDM system. System complexity of DWT-OFDM system is abate and the transmission rate upgraded. So, the combination of MIMO system and DWT-OFDM system will upgrade the BER performance of wireless communication system.

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