ISSN XXXX XXXX © 2018 IJESC

Research Article Volume 8 Issue No.4

Optimization of Energy and Cost Effectiveness in MIMO Channel

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Abstract:
Energy and cost efficiencies will become even more critical considerations in 5G.A number of new waveforms are introduced through OFDM technique given to the MIMO channel. In OFDM peak to peak average power ratio is higher and cost is more due to equalization process.MIMO can provide energy savings in fading channels. But in MIMO by minimizing energy consumption in rayleigh fading channel may mislead transmission energy and circuit energy. Thus if we allow cooperative transmission among multiple nodes we can treat them as multiple antennas to the destination node. By optimizing the constellation size, increasing signal to noise ratio, decreasing bit error rate will decrease the total energy. Concurrently, decrease in energy will also decrease cost.

I. INTRODUCTION:

In 5G the cost and energy are higher because it needs to be a massive bandwidth, extreme base station, and universal high rate coverage and device densities. The total energy is mainly depend on transmission energy and circuit energy. In previous OFDM is used in 5G, but in OFDM peak to peak average power ratio is high and cost is more due to the equalization process. Each data packets made up of complex valued sinusoidal that are modulated by a information signal. The new waveform derived from the OFDM technique given to the MIMO channel and the output is taken from that. This will require more energy and high cost. MIMO can provide energy savings in fading channels. But in MIMO by minimizing energy consumption in Rayleigh fading channel may mislead transmission energy and circuit energy. Thus if we allow cooperative transmission among multiple nodes we can treat them as multiple antennas to the destination node. By optimizing the constellation size and antenna node, increasing signal to noise ratio, decreasing bit error rate will decrease the total energy. The energy decrease and reduction in nodes at the transmission can also reduce the cost.

II.GENERATION OF NEW WAVEFORM USING OFDM:

Orthogonal frequency division multiplexing (OFDM) is a multi-carrier modulation scheme that is especially suitable for high data rate transmission in a delay-dispersive environment. Its transmission bandwidth is divided into many narrow subcarriers which are then transmitted parallel. Here, high rate data stream is transmitted into ‘N’ parallel streams, then performs transmission by modulating N distinct lower data rate carriers.

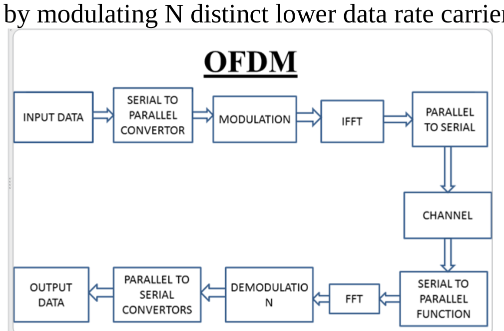

Figure.1.Block diagram for OFDM

Serial to parallel converter:
Conversion of a stream of data elements received in time sequence, i.e., one at a time, into a data stream consisting of multiple data elements transmitted simultaneously.

Modulation:
Modulation is the process of varying one or more properties of a periodic waveform called the carrier signal, with the modulating signal that typically contains information to be transmitted.

IFFT:
IFFT is a fast algorithm to perform inverse or backward fourier transform, which undoes the process of DFT.

$X(k)=\frac{1}{N}\sum_{0}^{N-1} x(n)^{*}\, e^{-i*2*pi*n*k/N}$

Parallel to serial conversion:
Conversion of a stream of multiple data elements, received simultaneously, into a stream of data elements transmitted in time sequence,i.e.,one at a time.

FFT:
A fast fouriertransform (FFT) is an algorithm that calculates the discrete fourier transform (DFT) of some sequence-the discrete fourier transform is a tool to convert specific type of sequences of function into other types of representation.

$X(k)=\sum_{0}^{N-1} x(n)^{*}\, e^{-i*2*pi*n*k/N}$

Demodulation:
Demodulation is extracting the original information-bearing signal from a carrier wave or it is the process of separating the information from the modulated carrier wave.

III. OFDM WAVEFORM:

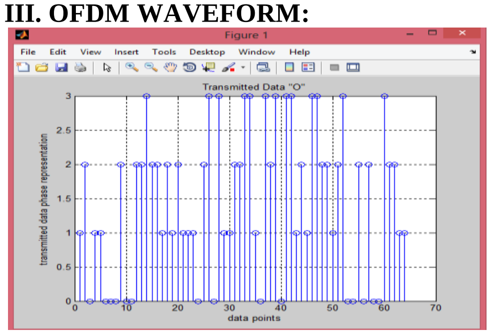

Figure.2.The transmitted data phase representation of 64 bit input data

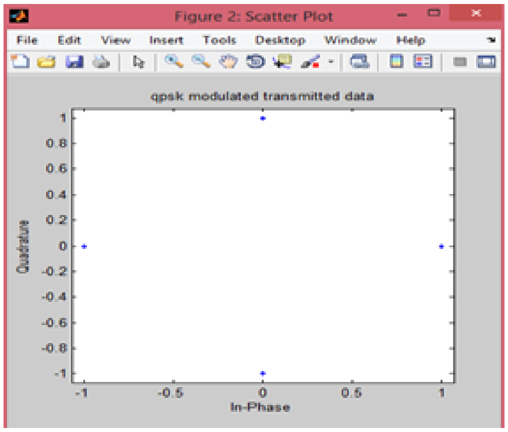

Figure.3.QPSK modulated transmitted data represented in In-phase and quadrature

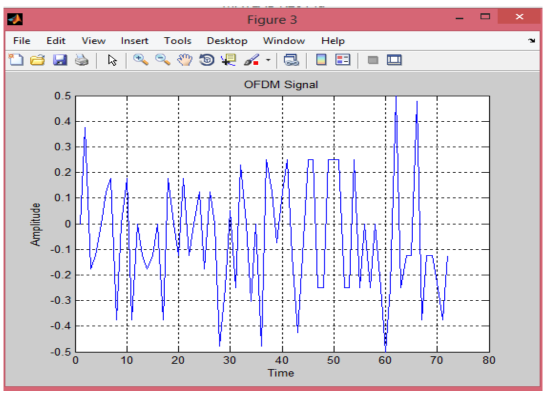

Figure.4.The OFDM signal generated for the given 64 bits data

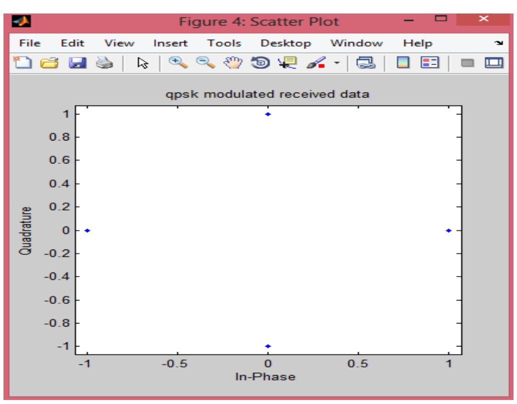

Figure.5.QPSK modulated received data represented in terms of In-phase and quadrature

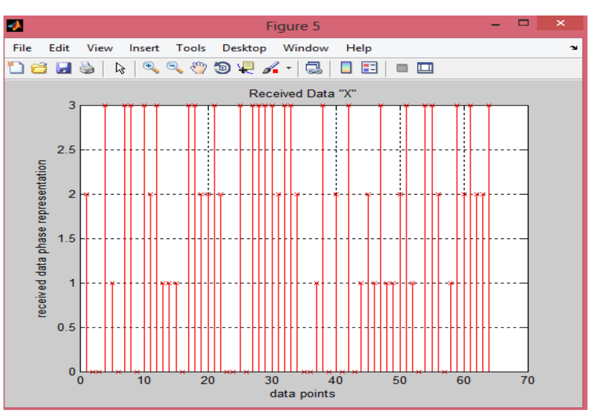

Figure.6.64bit received data represented in data points and received data phase representation.

IV. MIMO:

MIMO (multiple Input Multiple Output) is a technology for wireless communication in which multiple antennas are used at both the source (transmitter) and the destination. (Receiver).The antennas at each end of the communications circuit are combined to minimize errors and optimized data speed.

MIMO:

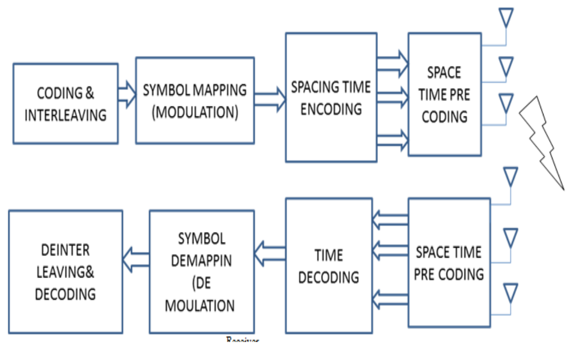

Figure.7.Block diagram for MIMO

Coding and interleaving:
The process of converting a message from one symbolic into another usually in an encoded or unreadable form. Interleaving is the process to make data retrival more efficient by rearranging or renumbering.

Symbol Mapping(Modulation):
Symbol mapping is a universal symbol name translation tool between data feeds and brokers have different names for the same symbol and orders can get rejected because of incorrect symbol reference.

Space time encoding:
It is a method employed to improve the reliability of data transmission in wireless communication systems using multiple transmit antennas.

Space time precoding:
It is generalization of beam forming to support multi-stream transmission in multi-antenna wireless communications.

Deinter leaving and decoding:
In digital audio retrieving discrete channels from an interleaved representation. Also called reverse multiplexing.

Symbol demapping(demodulation):
Subcarrier demapping is performed to extract data mapped on the assigned subcarriers.

Time decoding:
Decoding time is the amount of elapsed time a computer takes to perform the decoding.

4.b.Program:

Clc

clear all

close all

```
Transmitter and Reciever for users %%%%
Nt=2; %%TX
Nr=2; %%RX
N=Nt*Nr;
SNR=[-2:0.5:2]; %%%Noise Variation for X-axis
numC=100*ones(1,length(SNR));
nFFT = 64; % fft size
nDSC = 52; % number of data subcarriers
nBitPerSym = 52; % number of bits per OFDM symbol (same as the number of subcarriers for BPSK)
nSym = 10^4; % number of symbols
totalBits = 2*nBitPerSym*nSym; % total number of Data Bits
bitsPerBranch = nBitPerSym*nSym; % total number of data Bits in each of the two branches
EsN0dB=10;
M = 64; % number of constellation points
k = sqrt(1/((2/3)*(M-1))); % normalizing factor
m = [1:sqrt(M)/2]; % alphabets range definition
alphaMqam = [-(2*m-1) 2*m-1];
Es_N0_dB = [-2:0.5:2]; % multiple Es/N0 values
ipHat = zeros(1,N); % initiating the output matrix
Nb=800000;
disp(numC);
error_mmselinp=zeros(1,length(SNR));
error_mmselinpx=zeros(1,length(SNR));
error_mmselinpy=zeros(1,length(SNR));
error_zflinp=zeros(1,length(SNR));
error_zflinpx=zeros(1,length(SNR));
error_zflinpy=zeros(1,length(SNR));
for loop_ebno=1:length(SNR) bit Error(Eb) for Noise
snr=10.^(SNR(loop_ebno)/10);%%moise variation for Bit wise changing
sd=1/snr;
Mod=16; %%16QAM Modulation
es=Mod*Nt;%%transmitter to Outage are of air
ipBit = rand(1,totalBits) > 0.5; % random 1's and 0's , multiplied by 2 for the two branches of the transmitting Antennas.
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OUTPUT:

Comparison between 2x2 MIMO system using MMSE-SIC and ZF-SIC

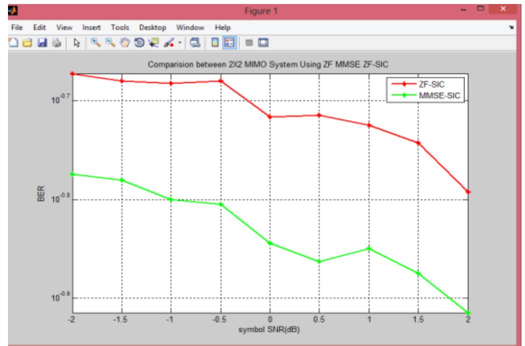

Figure.8.2x2 MIMO system using ZF-SIC and MMSE-SIC

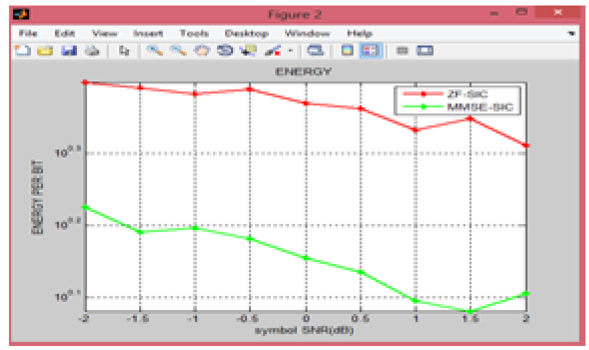

Figure.9.Energy versus SNR in terms of ZF-SIC and MMSE-SIC

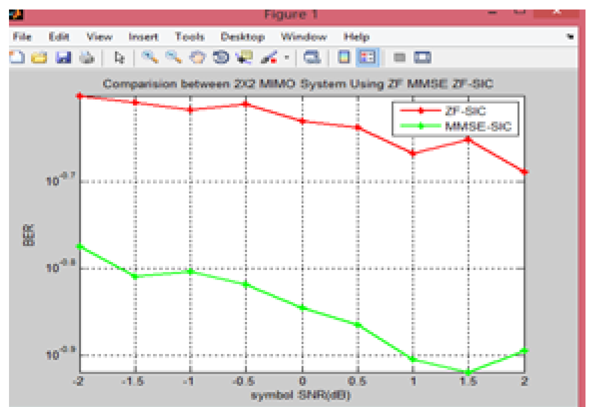

Figure.10.Decreasing the constellation size will decrease the BER as shown in the above graph

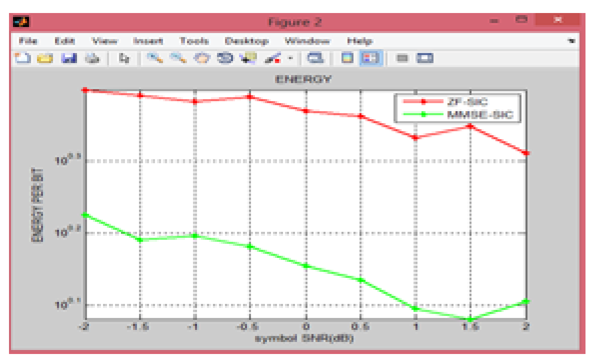

Figure.11.Decreasing constellation size will further decrease the energy as shown.

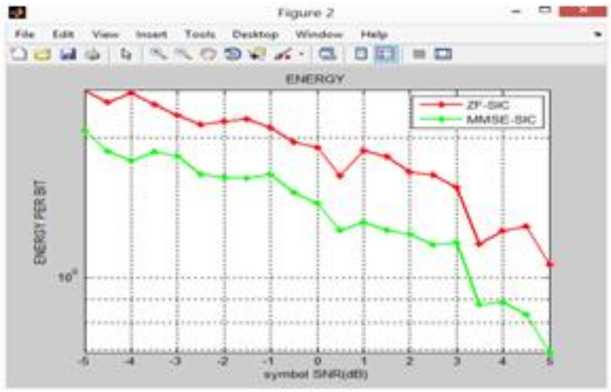

Figure.12.The Energy per bits for SNR Ranges from -5 to 5.

V. CONCLUSION:

Thus, the energy can be decreases with decrease in constellation size and increase in SNR. The signal to noise ratio can be improved by decrease in Bit error rate. The mean square error of zero forcing and sequence interference cancellation can be ploted in the graph and the cost also decreases with decrease in energy efficiency and decreasing number of node.

VI. REFERENCE:

[1].Jeffrey G.Andrews, fellow IEEE, Stefano Buzzi, Senior member, IEEE Wan choi, Senior member IEEE, Stephen V.Handy, Member IEEE, Angelo Lozano, Fellow, IEEE, Anthony C.K.soong, Fellow, IEEE,& Jianhong Charlie Zhang, Senior member, IEEE. "What will 5G be?" June 2014.
[2].Behrouz Farhang-Boroujeny and Hussein Moradi "OFDM inspired waveforms for 5G"

[3].Shuguang cui,Student Member,IEEE,Andrea J.Goldsmith, Senior Member, IEEE, and Ahmad Bahai, Member, IEEE. "Energy- efficiency of MIMO and cooperative MIMO Techniques in Sensor Networks." 2004.

[4].K.N.R.Surya vara Prasad, Ekram Hossain, Vijay K.Bhargava "Energy Efficiency in Massive MIMO-Based 5G Networks: Opportunities and challenges" 2017.

[5].Chunlong He, Geoffrey Ye Li,Fu-chun Zheng, Xiaohu You "Energy Efficiency of distributed MIMO systems." 2015.

[6].S.Ajey,B.Srivalli,G.V.Rangaraj "On performance of MIMO-OFDM based LTE systems." 2010.