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Hybrid Adaptive Antenna Design for Comparison Analysis of Different Technology Using BPSK, QPSK and QAM

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Abstract— As we know with time there is huge development in wireless communication and with pace of time traffic congestion problem arise and also ISP are unable to provide good quality of service. In our research paper we implemented simulation result CDMA, OFDM and UWB for different band pass technique for example BPSK, QPSK, QAM, 16 QAM, 64QAM etc. We calculated Transmitter and receiver message of CDMA, OFDM and UWB for BPSK QPSK, QAM 16, QAM, 64 and QAM 256 modulation technique. Bit Error Rate (BER) and Signal-to-Noise ratio (SNR) for BPSK QPSK, QAM 16, QAM, 64 and QAM 256 modulation technique. MSE Equalizer for BPSK QPSK, QAM 16, QAM, 64 and QAM 256 modulation technique. It is impossible without smart antenna 4 by 8 means 4 transmitter and 8 receivers. Earlier we use only single or dual antenna now we use array of antenna to provide much efficient and good quality of service or we can say MIMO (Multi input Multi Output)

Keywords— Modulation, BPSK, UVB, QAM, OFDM, AWGN, BER, SNR, MIMO, Transmitter.

I. INTRODUCTION

CDMA (code division multiple access), OFDM (orthogonal frequency division multiplexing) and UWB (ultra wide band) the system which simulink with communication and DSP signal library with smart antennas for multiple transmits and receives system. Most third generation mobile communication systems are using CDMA as their modulation technique. Prior to the recent industry boom, the most common UWB system implementation is impulse radio, where ultra-short baseband pulses are used with a variety of modulation schemes to transfer data. Impulse radio has various advantages over OFDM, with its ability to penetrate through materials and resolve multipath with path length differences on the order of a foot or less.

II. LITERATURE SURVEY

CDMA (code division multiple access), OFDM (orthogonal frequency division multiplexing) and UWB (ultra-wide band) are the most developing technologies in modern mobile communication. OFDM is a parallel transmission scheme, where a high – rate serial data stream is split up into a set of low – rate sub streams, each of which is modulated on a separate subcarrier. For this research a lot of research paper studied because there are two main problems. First one was that there is no such type of research paper found in which all of CDMA, OFDM and UWB are depicted so it's very tedious task to analyse these techniques and second problem was to design simulation blocks and especially adaptive antenna. During 1980 we have limited resources to transmit information via space with help of electromagnetic waves. Few technology are listed which are used during earlier like aloha (Aloha is of two type slotted and pure aloha and throughput of both techniques are different and slotted is superior to pure aloha), packet radio, carrier sense technology. With time new research came into existent TDMA, FDMA with help of TDD and FDD concept transmission executed. Thereafter a tremendous research carried out by scientist and more advance technology came into existent. MC-CDMA could provide that qualities of service that the other system may not able to support. UWB system suitable for indoor wireless

environment and due to it a problem arises that channel suffers from frequency-selective fading. OFDM system is not so much complex as compared with the DS-CDMA, but it also unable to resolve power problem. Because MC-CDMA does not require RAKE receiver and it is very simple as compared to DS-CDMA and its output or efficiency is better than OFDM at low signal power. The bit error rate performance of each system in downlink channel with S-V channel is analysed by computer simulation [14]. Indeed, the proposed techniques divide UWB channels into a set of parallel channels. UWB signals are multipath rich, we have used orthogonal frequency division multiplexing ultra wide band. OFDM gives superior resolution than the single carrier UWB. Now addition of iterative turbo decoding increases performance of the receiver. Our research work is focused on the performance evaluation of UWB receivers. Thus, rake filtering is also included for optimal multipath diversity which improves the overall performance. Cognitive Radio plays a very crucial role in our cross-layer ultra wide band receiver architecture where it send and receive information with the physical layer for probable channel conditions before allocating links dynamically for its data transmission.

III. METHODOLOGY/PLANNING OF WORK

In our research work our main task is to develop simulation block diagram which are backbone of this work. First of all we have to design smart antenna 4*8 which is very tedious task. Now a day's smart antenna also known as MIMO or array of antenna to boost up performances and if we increase order then complexity increase so much so we have to maintain trade off between cost and complexity.

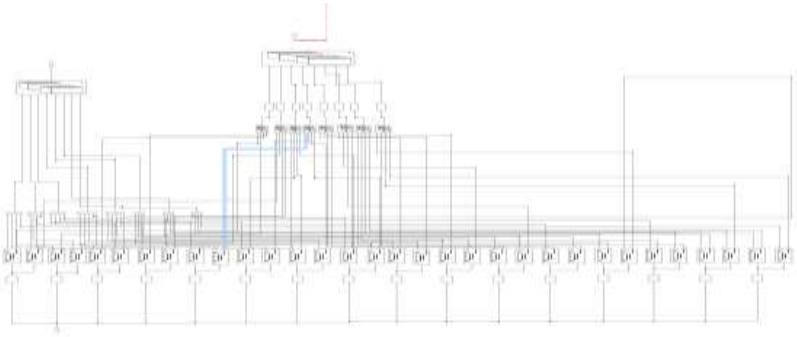

Figure 1 Smart Antenna 4*8

(a) CDMA:

In our research work we concerned with to calculate performance of a CDMA in a multipath fading and AWGN channels that is modelled by a discrete set of Rayleigh faded paths.

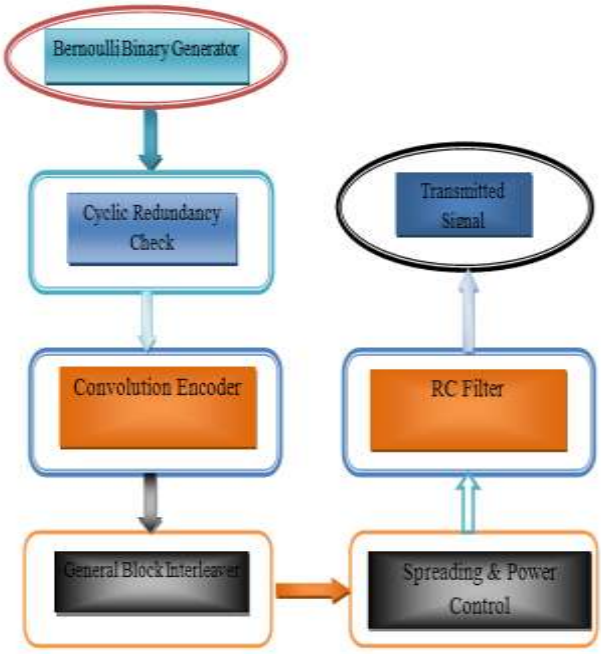

Figure 2 CDMA Transmitter

The received signal is first filtered and then digitally converted with a sampling rate. It is followed by a rake receiver. The rake receiver is necessary to combat multipath. After correlation, the power of all detected paths is combined and, finally, the de-mapping and FEC decoding are performed to assure the data integrity.

(b) OFDM:

OFDM is preferably used for the uplink in a multiuser environment; low-order modulation such as QPSK with Gray mapping is preferred. However, we can also use high-order modulation can also be employed. The sub- carrier assignment can be of two types that are fixed and dynamic. In order to improve the system robustness a dynamic assignment of sub-carriers for each user is preferable.

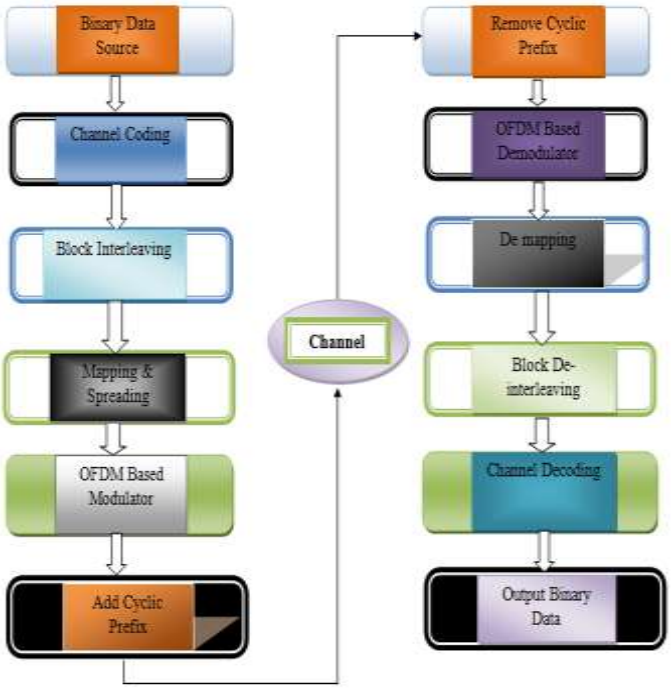

Figure 3 System Model of OFDM System

(c) UVB:

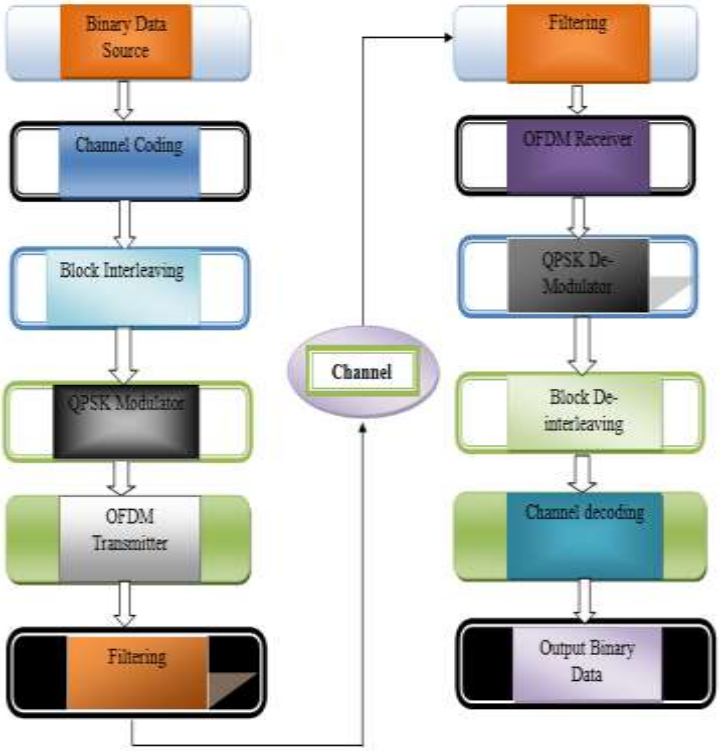

Figure 4 System Model of UWB System

IV. **RESULT**

Software Requirement: MATLAB Version R2013a

It is powerful software that provides an environment for numerical computation as well as graphical display of outputs. In Matlab the data input is in the ASCII format as well as binary format. It is high-performance language for technical computing integrates computation, visualization, and programming in a simple way where problems and solutions are expressed in familiar mathematical notation. Matlab consist following important parameters for example Acquisition, Data Exploration, Analysing &Visualization, Engineering complex drawing and scientific graphics, Analysing of algorithmic designing, Mathematical and Computational functions, Modelling and simulating problems prototyping, GUI (graphical user interface) building environment but in our research work we implemented simulation library from a lot of simulation toolboxes and main toolbox used is communication toolbox. Now we put simulation result of different technology and then compare their respective result and after that we reach at a conclusion out of these technologies which one is superior.

Simulation Block of CDMA: CDMA performance analysis presented in this section is based on computer simulations. The basic scenario of our simulation is represented by CDMA transmission system performing through multipath fading and AWGN transmission channel. The simulation results of CDMA are shown here:

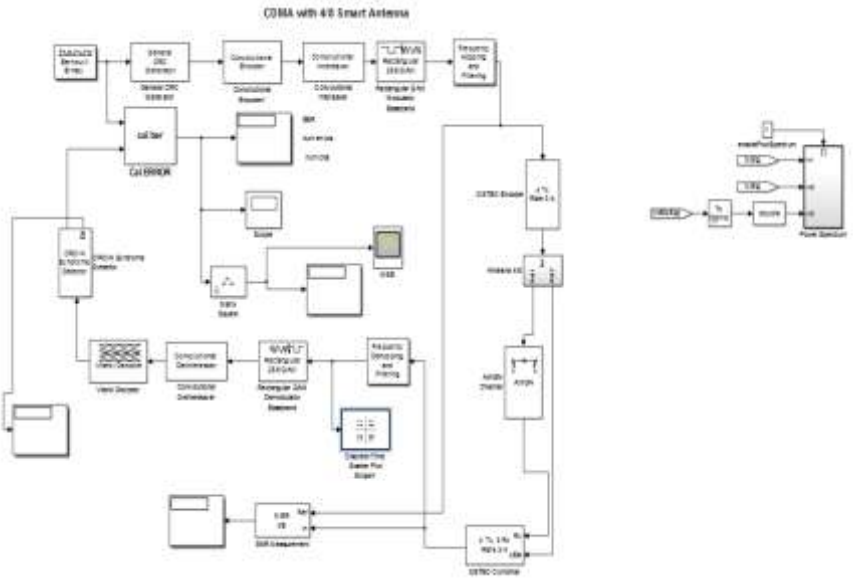

Figure 5 Simulation block of CDMA System using QAM 256 modulation

Performance analysis of CDMA:

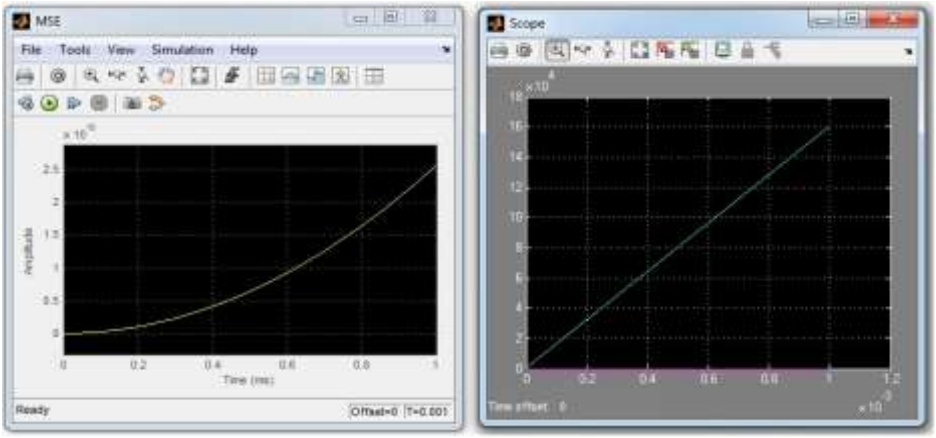

Figure 6 CDMA Mean Square Error (MSE) left & Total Bits (Blue), number of error (Magenta) and Bit error rate (yellow) in right side using QAM 256 Modulation

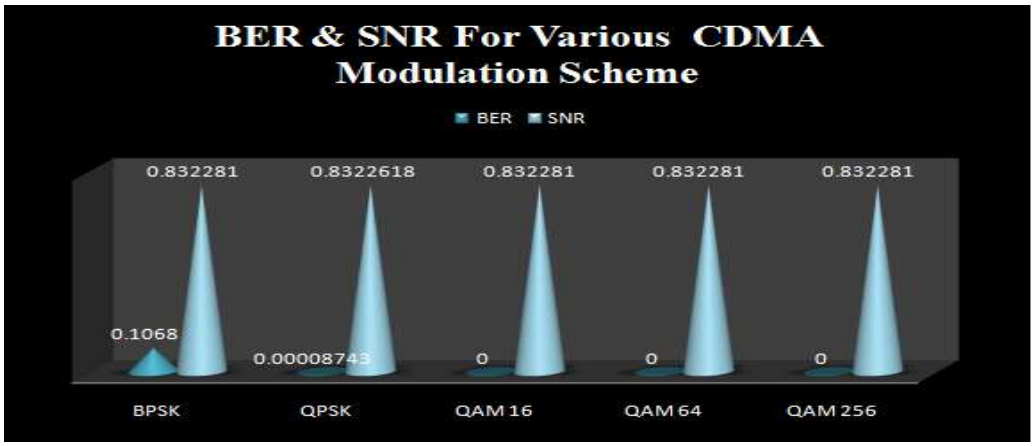

Figure 7 BER and SNR value representation of CDMA

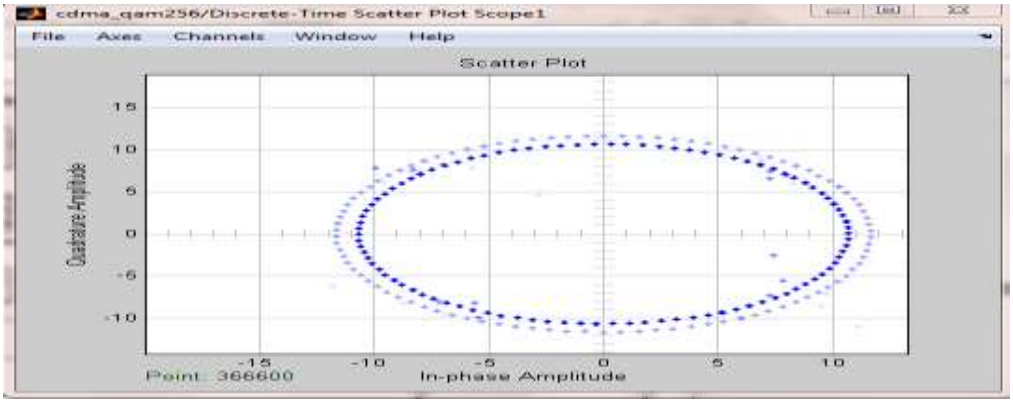

Figure 8 CDMA QAM 256 Signal Constellations

The CDMA transmitted signal to the channel. This signal passed through the multipath fading and additive white Gaussian noise channel. After passing this signal from channel we get the CDMA received signal. The scatter plot illustrates the effect of fading on the signal constellation. For all the interleaving schemes the transmitted and received signal has same bandwidth but these schemes affect the transmission rate and bit error rate of CDMA system.

Simulation Block of OFDM: The mapping of OFDM system uses different type of modulation schemes such as QPSK and QAM (4-QAM, 16-QAM, 32-QAM). First compare all these modulation schemes on basis of BER and then uses the best modulation scheme with encoding schemes. The encoder of OFDM system uses CRC and RS Encoder [13]. Then compare the performance analysis of OFDM system by using these encoding schemes. The simulation results of OFDM system is shown below:

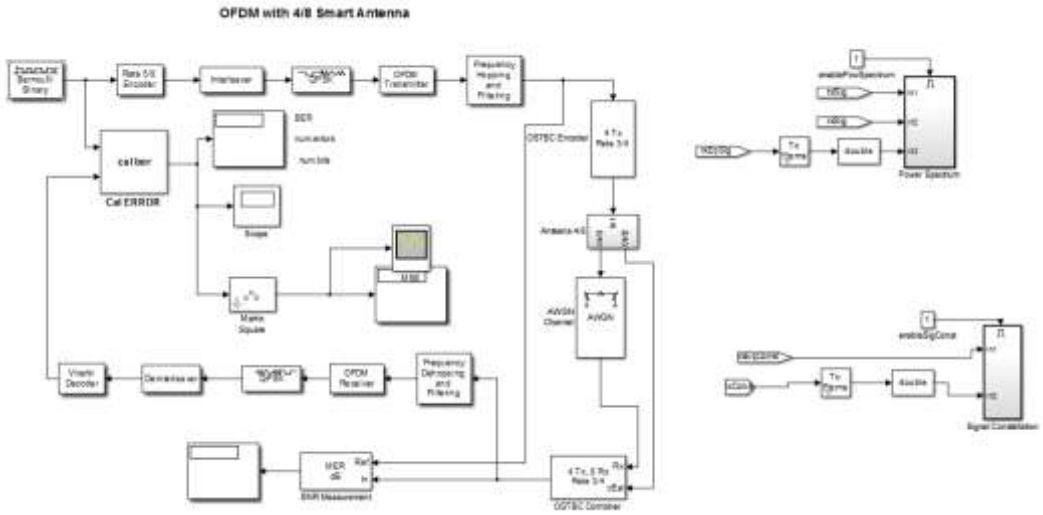

Figure 9 Simulation block of OFDM System using QPSK modulation

Performance analysis of OFDM:

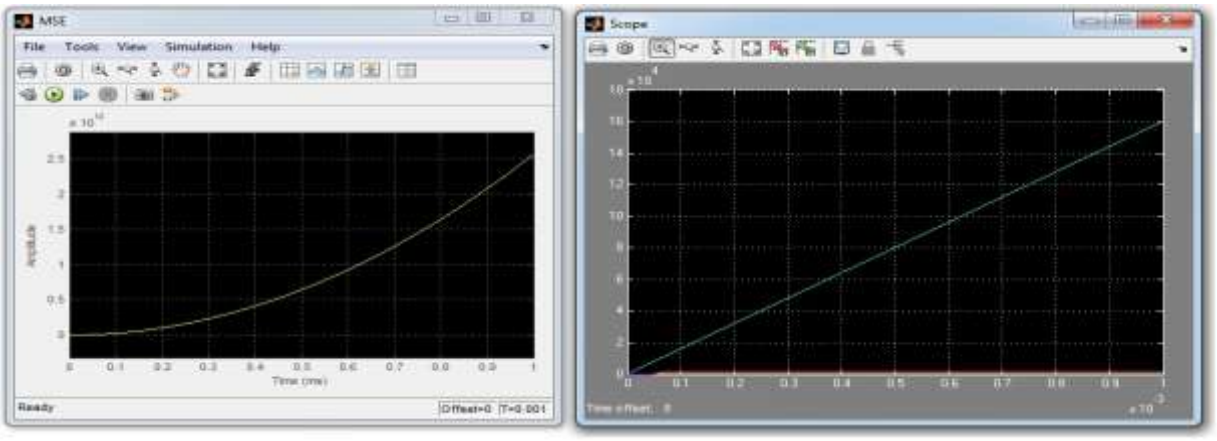

Figure 10 OFDM Mean Square Error (MSE) left & Total Bits (Blue), number of error (Magenta) and Bit error rate (yellow) in right side using QPSK Modulation.

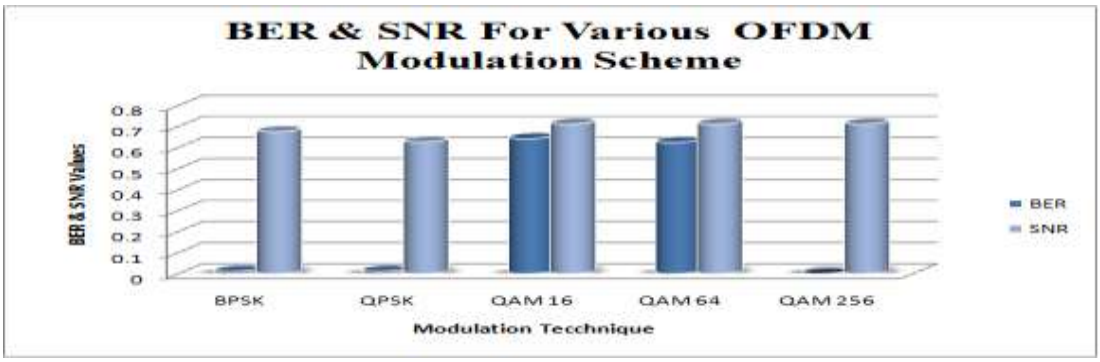

Figure 11 BER and SNR value representation of UWB

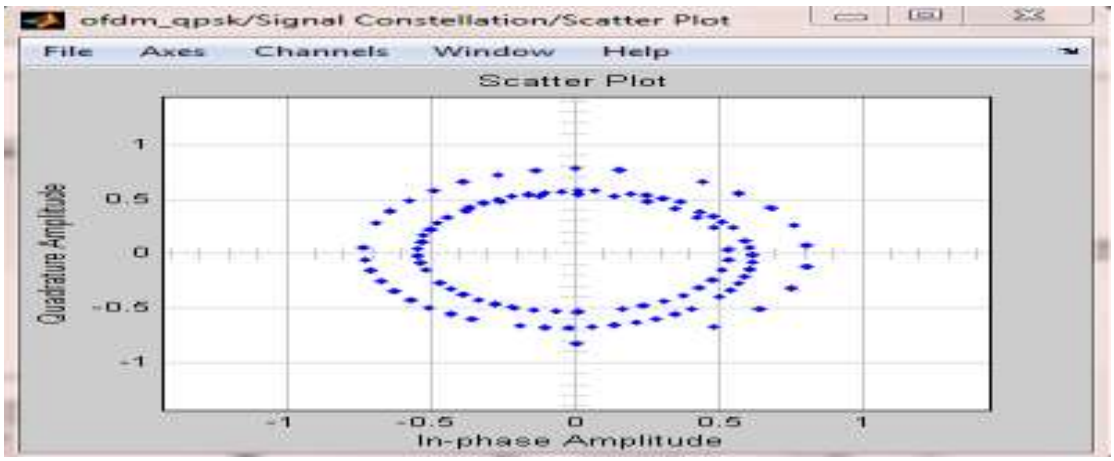

Figure 12 OFDM QPSK Signal Constellations

The Bit Error Rates (BER) of these performance analysis is shown below: First, simple OFDM system is modelled then we compare different type of modulation schemes with this system and get QPSK modulation scheme is best for OFDM system on the basis of BER as below.

Simulation Block of UVB: The basic scenario of our simulation is represented by the UWB transmission system performing through multipath fading and AWGN transmission channel. The encoder of UWB system uses CRC and RS Encoder schemes. The simulation results of UWB system is shown below:

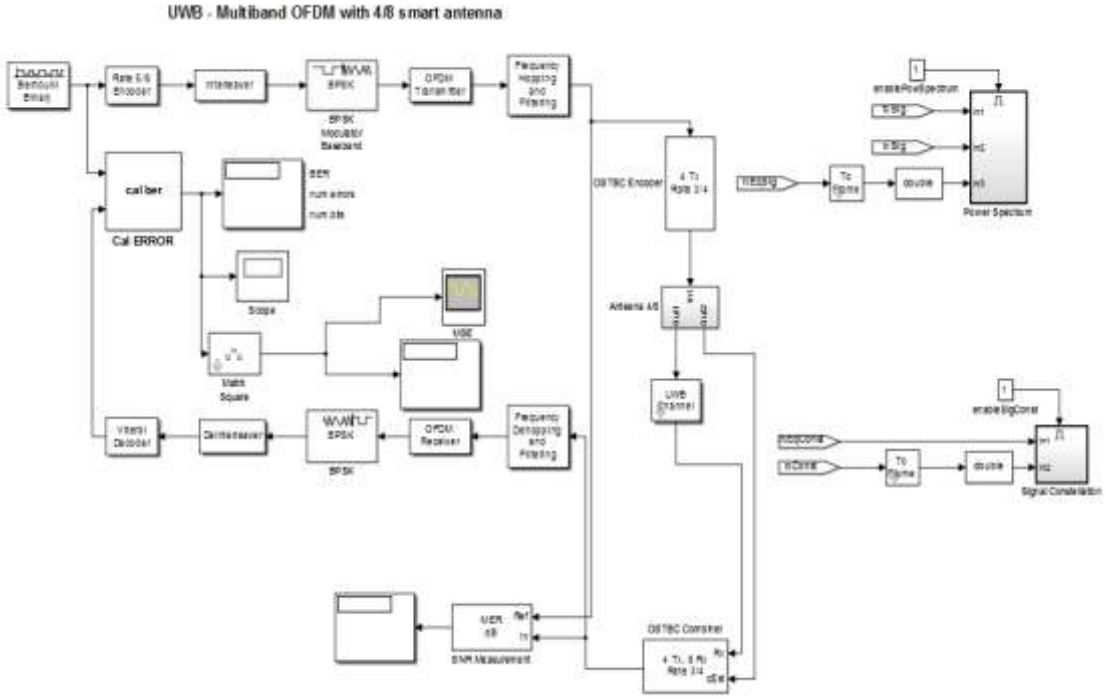

Figure 13 Simulation block of UVB System using BPSK modulation

Performance analysis of UWB:.

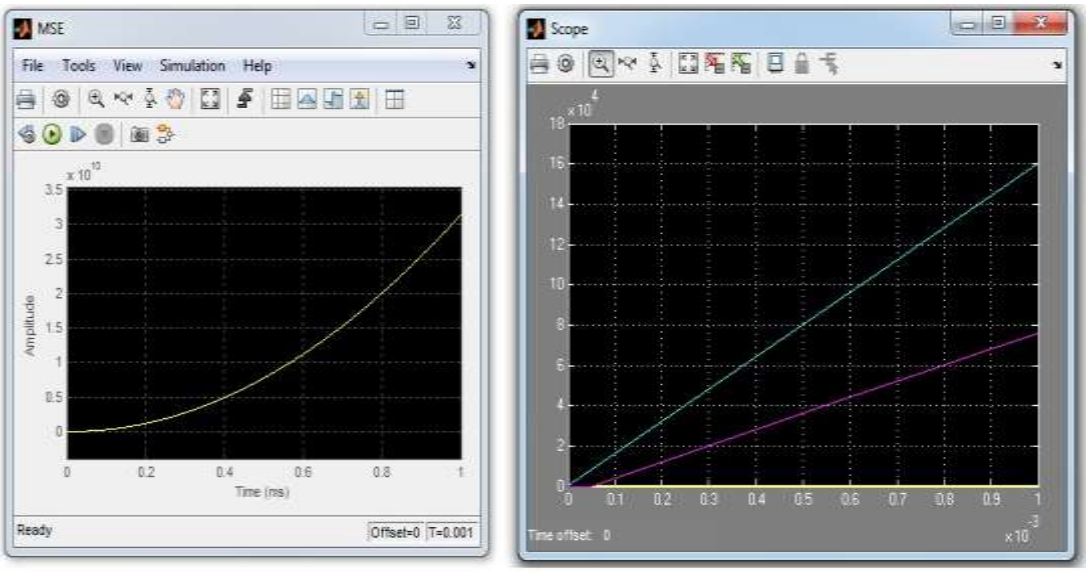

Figure 14 UWB Mean Square Error (MSE) left & Total Bits (Blue), number of error (Magenta) and Bit error rate (yellow) in right side using BPSK Modulation.

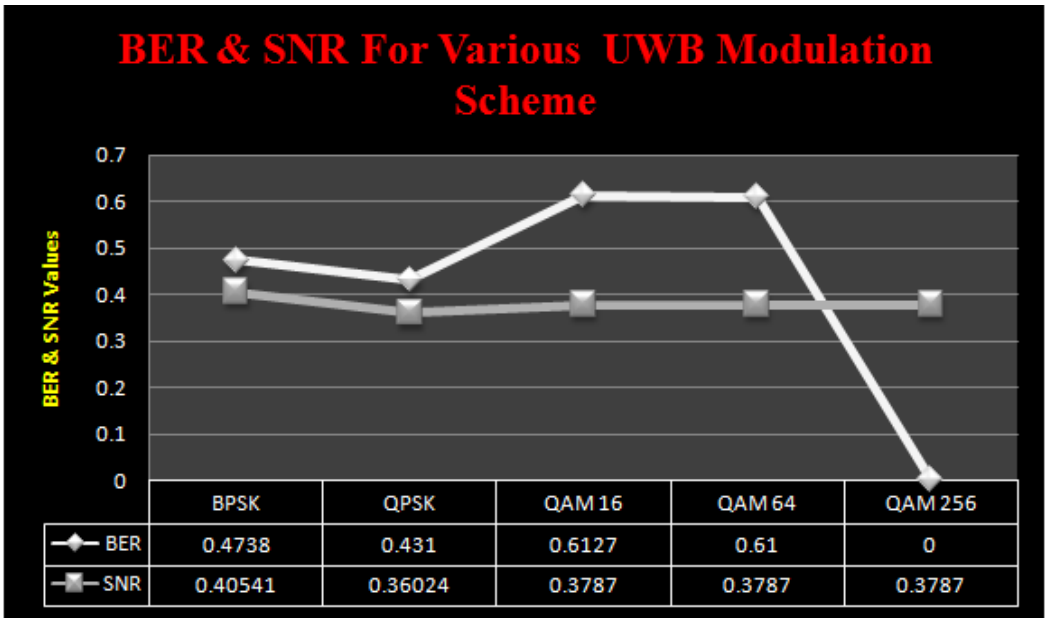

Figure 15 BER and SNR value representation of UWB

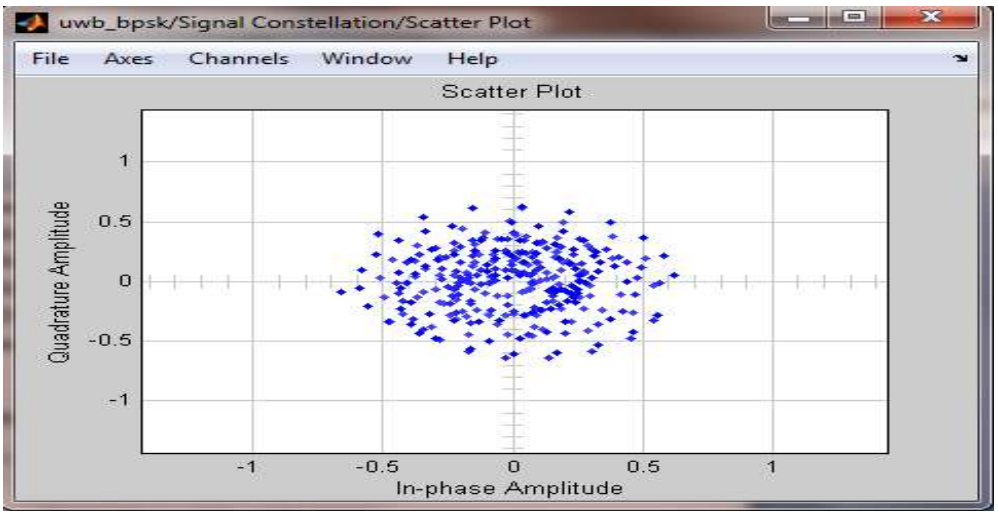

Figure 16 UVB BPSK Signal Constellations

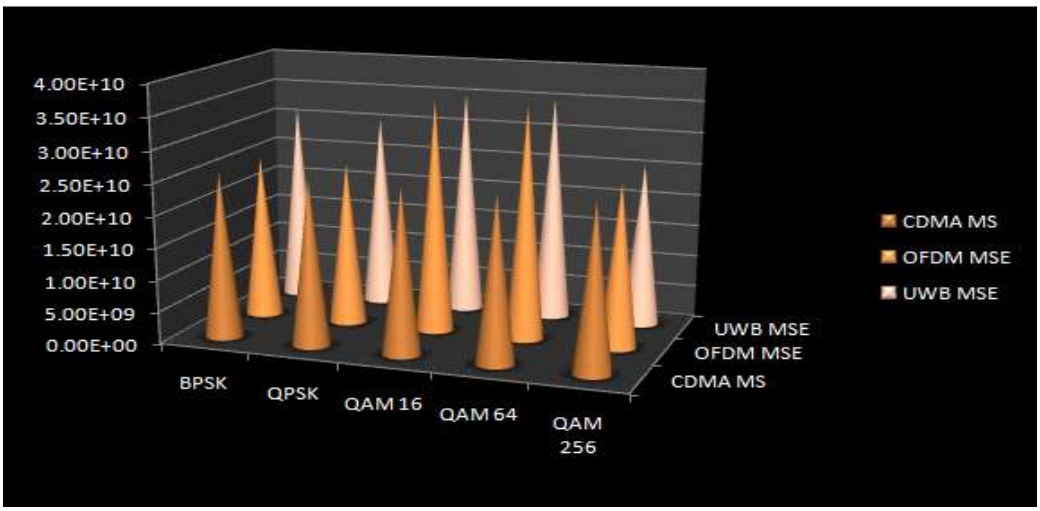

Figure 17 MSE of Different Modulation Schemes for CDMA, OFDM and UWB System

CONCLUSION

In our research there are two important parameters. First one is to design smart antenna which consist 4 transmitter and 8 receiver and second one is to modelled basic modulation technique for example CDMA BPSK, UWB BPSK and OFDM BPSK encoding techniques and after that to design their advance configuration in MATLAB simulink library. Now our main focus is to analyse the performance of different type of modulation schemes with these systems for different parameters like BER, SNR, Constellation graph and MSE and then finally reach to a conclusion which modulation scheme is best one. QPSK modulation is best for OFDM and QAM is best for CDMA and UWB system with less BER. CDMA, OFDM and UWB are the well-known air interface technologies in modern mobile communication.

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