BER ANALYSIS OF COMMUNICATION SYSTEM THROUGH AWGN CHANNEL

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***Abstract*— In this paper it describe about transmission of signal through AWGN channel. It consists of transmitter at one end and receiver at another end, this experiment is carried out using MATLAB tool. Digital modulation technique like BPSK is used for modulating the source signal before transmission it is encoded and at the receiver is decoded to obtain the actual output. Data signal which is transmitted is in the decimal form which is converted into binary form and after modulation is transmitted and received at the receiver.BER (Bit error rate) of each signal is checked to obtain the original source signal by reducing the error rate. Signal at the output received should be the same as that of the signal send from transmitter.**

***Index Terms*—system structure; Block diagram; Matlab, modulation**

I. INTRODUCTION

In this system it consists of Transmitter and Receiver for transmission and reception. A duplex system shown in this paper. A duplex communication is a point to point system composed of two connected Parties or devices that can communicate with one another in both directions simultaneously. A full duplex (FDX) system called a double duplex system unlike half duplex it allows simultaneously but they transmit at such a higher rate of speed appears to be full duplex. There are several benefits to using full duplex over half duplex as the full data capacity is available in both the direction because the send and receive functions are separated, stations do not have to wait until their transmission, since there is only one transmitter for each which will improvers the efficiency rate of the system. Digital modulation technique like BPSK is used for modulating the signal; BPSK is the simplest form of phase shift keying (PSK). It uses two phases which are separated by 180^0 and can be termed as 2- PSK. Phase-shift keying (PSK) is a digital modulation scheme that conveys data by changing, or modulating, the phase of a reference signal. The signal is converted from decimal form into binary form then modulating the signal through BPSK. It become simpler using software instead of hardware as software gives the accurate information about the amount of data which is transmitted and the amount of data received which also reduced the handling of hardware and cost. It enhances the efficiency of the Communication system. It gives the comparison between Transmitter and receiver.

II. BASIC COMMUNICATION SYSTEM

It gives the overview of our proposed model is shown in Fig 1.1.

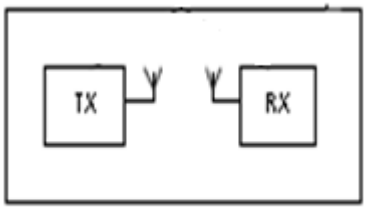


Fig 1.1

It consists of basic model of communication system comprises of transmitter and receiver.

III. MATH

It describe about the procedure of transmission and reception which is shown in Fig 1.2

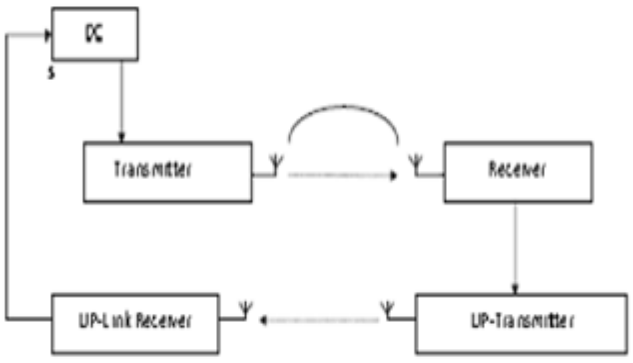


Fig 1.2

It consists of uplink and downlink transmitter and uplink and downlink receiver, Data bits which is transmitted from transmitter through AWGN channel which is received at the

receiver, where uplink receiver will send a feedback to uplink transmitter.

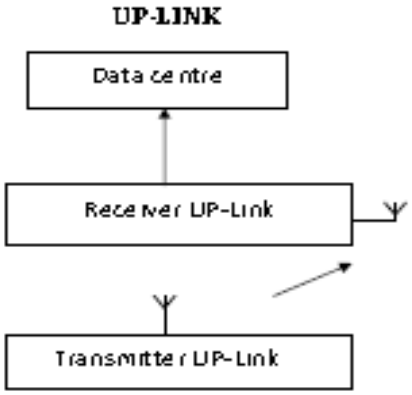


Fig 1.3

In the Fig 1.3 it shows the uplink transmitter and receiver function once a feedback is received it is give to uplink receiver which is then given to data centre.

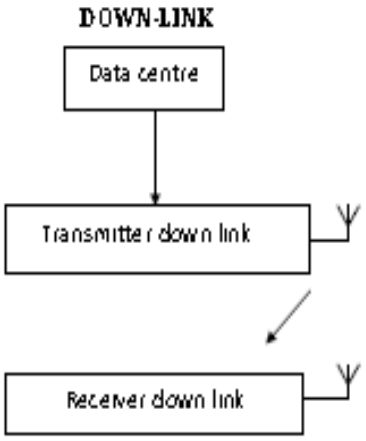


Fig 1.4

In the above figure it shows once a feedback is received from receiver, Data centre will verify the sent signal and received signal ,if it found the incorrect data bits it will resend it to transmitter for correction and then send it to receiver ,if the data bits received is correct then it will shows the result.

IV. BLOCK DIAGRAM

It shows the functional implementation operation flow of the project .It is divided into various stages of transmitter and receiver it consists of data source from where data bits is send to the process of encoding which will convert the decimal bits to binary bits and then it is modulated using digital modulation technique like BPSK which modulate the signal and bring it into suitable form for transmission, the modulated bits is converted from serial to parallel convertor then it is given to IFFT (Inverse Fourier transform) it will bring into discrete form by using the IFFT equation which is converted from parallel to serial convertor ant transmitted through AWGN channel in the below Fig 1.5 it shows.

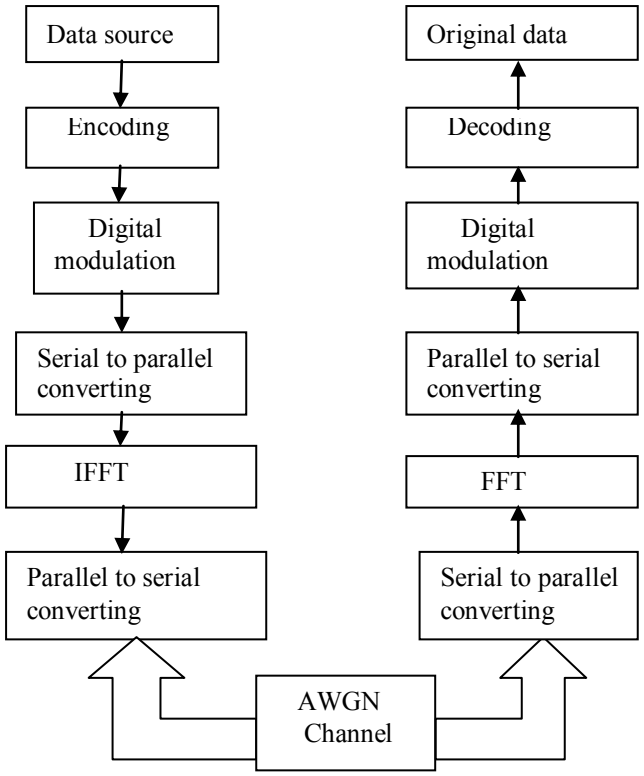


Fig 1.5

Through AWGN channel which act as a medium of transmission data is reached to the receiver, here this channel is used instead of wireless Antenna as it is a software based project AWGN channel is used the function of this channel is shown in the Fig 1.6.

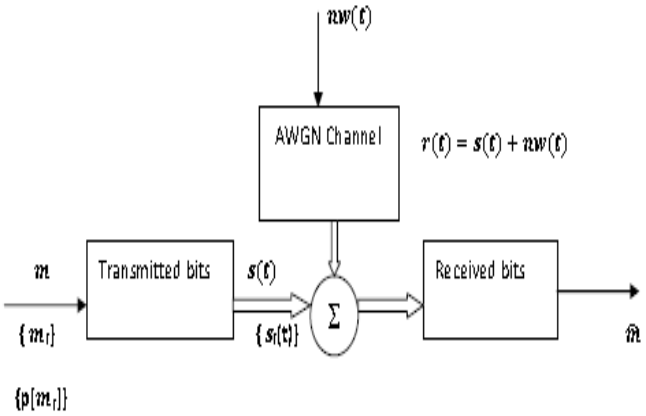


Fig 1.6

Additive white Gaussian noise (AWGN) is a channel mode in which the impairment to communication is a linear addition of wideband or white noise with a constant spectral density and a Gaussian distribution of amplitude. AWGN is commonly used to simulate background noise of the channel. It act as a medium between transmitter and receiver, the output of AWGN is converted into parallel form by serial to parallel

converter then FFT operation is performed to obtained into

the original form of data bit streams which is the converted into serial form by parallel to serial converter which is given to digital modulation which will sampled the signal and thus the sampled is then fed to decoder to obtained into original form of signal where data centre it will compare the signal received at the receiver with the transmitted bits, if the data which is send is different at the output error is occurred which is corrected using viterbi decoding At the receiver which will find the error and correct it to obtained the original bits.

V. SOFTWARE TOOL

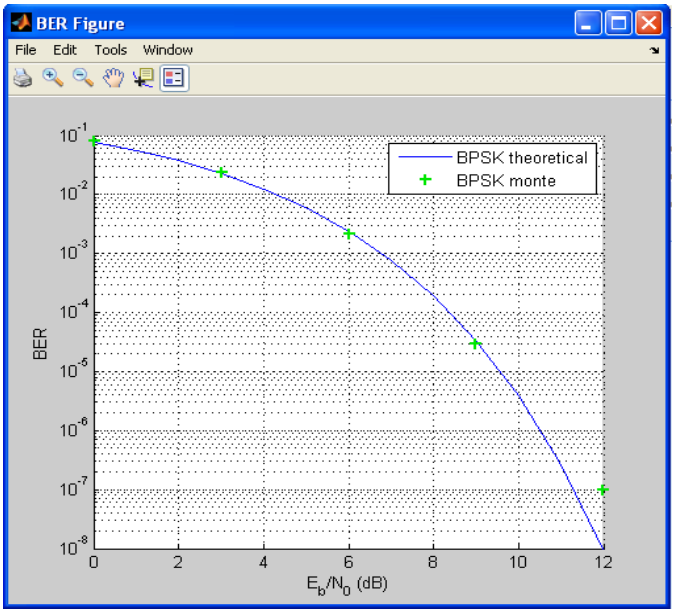
Tool used to perform this communication is MATLAB is software that makes it possible for transmitting a data and receiving the data very easily without any complication and use of hardware. MATLAB can perform much operation, and it allows matrix manipulation, plotting of functions and data implementations of algorithm, creation of user interface. It is built around MATLAB language which includes code in the command window or executing text files containing codes including scripts and functions. MATLAB has structure data type. Since all the variables are arrays where each element of the array has the same field names. It supports developing applications with graphical user interface, using this tool separate codes are generate for each transmitter and receiver section.

VI. BER (BIT ERROR RATE)

BER which is the number of bits error is the number of received bits of a data stream over a communication channel that have been altered due to noise interference so the Bit error rate (BER) is the number of bit error divided by the total number of transmitted bits .It is expressed as shown

$$BER = \frac{1}{2} erfc(\sqrt{Eb/No})$$

BER shows exactly the error occurred in the bits transmitted and received by decreasing bit error rate and thus increasing the signal to noise ratio. If the medium between the transmitter and receiver is good and the signal to noise ratio is high, then the bit error rate will be very small possibly insignificant and having no noticeable effect on the overall system However if noise can be detected, then there is chance that the bit error rate will need to be considered. Although there are some differences in the way these systems work and the way in which bit error rate is affected, the basics of bit error rate itself are still the same. BER is noise and changes to the propagation path (where radio signal paths are used). Both effects have a random element to them, the noise following a Gaussian probability function while the propagation model follows a Rayleigh model [8]. To calculate the BER of the BPSK system using the Graphical User Interface (BER Tool) we can proceed with two ways. One is theoretical and the other is Monte Carlo simulation. So, both the ways are simulated and compared. It consists of a gold code generator which generates a binary gold code sequence, baseband BPSK modulator, channel, baseband BPSK demodulator. To calculate the number of bit errors a block called error rate calculation is used. The values are shifted to workspace by using 'to workspace' block [10].



In the above figure the theoretical and the Monte Carlo simulations are plotted.

VII. CONCLUSION

As a result it analyze both output, if it found incorrect it will request to resend the data with correct bits This process will continue till both transmitter and received bits matched with each other. It is then compared through graph analysis.

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