PHYSICAL LAYER DESIGN USING MATLAB

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Abstract*—Wireless communication is confronting one of the fastest advancements in the fields of innovation and computer science on the planet. Nowadays the world is absolutely reliant on internet. In fact there are numerous things which we cannot do without internet but the fundamental issue is of the network which is not good in numerous territories like towns, mountains, sea side. In this project Physical layer of WIFI is designed using OFDM Technique which is used to transmit signals simultaneously. OFDM is used so as to minimize the noise as well as fading effect.

***IndexTerms*—Physical layer, WARP v3, constellation diagrams.**

I. INTRODUCTION

The utilization of mobile phones has significantly influenced the way people convey. Other gadgets, for example, smart phones, laptops have likewise turned into a vital part of our lives. The need and advantages of these gadgets helped the mobile companies to accomplish a level in the field of advancement in the workspace. The advancement of remote systems administration speaks to a critical developmental in this field, as devices would now be able to be completely organized despite the fact that they are not physically associated with cables.

When the wireless system comes in account, it is wireless local area network (WLAN) which interfaces PCs together through radio technology utilizing the standard guidelines or **protocols and without the use of cables to associate the PCs together.**

In our project physical layer of WIFI is designed using the Orthogonal Frequency Division Multiplexing (OFDM) technology. While using Frequency Division Multiplexing (FDM) technique the problem we face is that the signals correlate and overlap with each other and the signals get distorted. So our project is on improving the quality of WIFI signals using OFDM technique. Each and every signal travels within its range of frequency. We created the signal which consists of preamble, the payload data, pilots and cyclic prefix. When the signal is received by the receiver node it consists of noise which is to be minimized. The whole programming is done in MATLAB and WARP v3 kit is used for hardware testing.

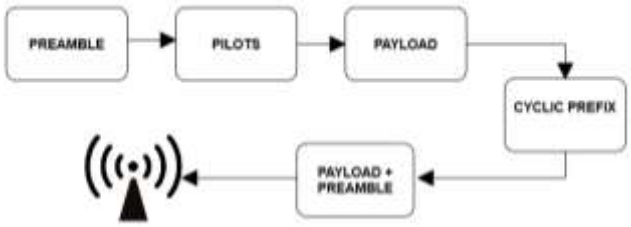


Figure 1 Transmitter

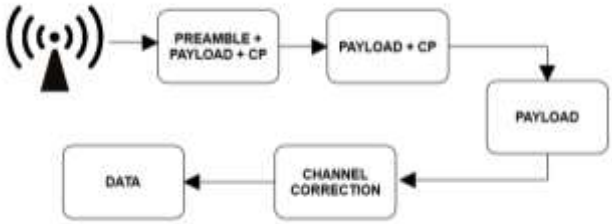


Figure 2 Receiver

II. PROPOSED MODEL

Here in our project firstly the Preamble and the main data called payload is created followed by the pilot insertion. Preamble is a section of data at the head of a packet and payload is the only data received by the destination system.

Pilots are inserted to ensure phase noise correction as well as frequency offset correction at the receiver. They could be either 1 or -1 and are equally spaced. The signal is provided with the cyclic prefix (C.P.) which acts as a guard band. After that the preamble is combined with the payload data and transmitted with the help of a transmitter.

Fig.1 depicts the block diagram of a transmitter. At the receiver end the payload is separated from preamble and C.P. for getting actual data. Fig.2 shows the block diagram of a receiver.

The OFDM technology helps us in the way that signals are orthogonal through which the noise and fading effect is reduced. Figure 3, Fig.4, Fig.5 shows the preamble, Payload and the actual data which is transmitted respectively.

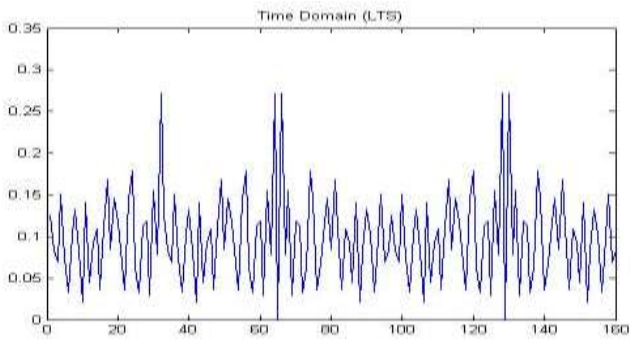


Figure 3 Preamble

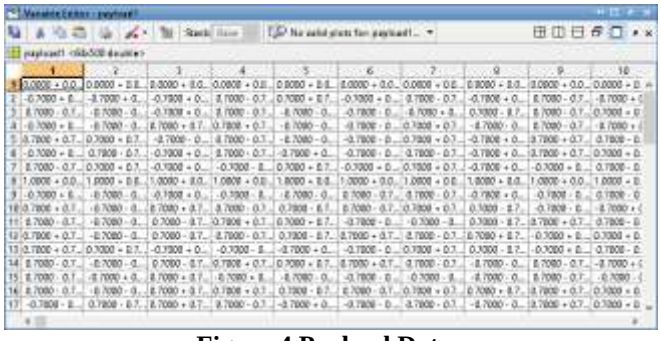


Figure 4 Payload Data

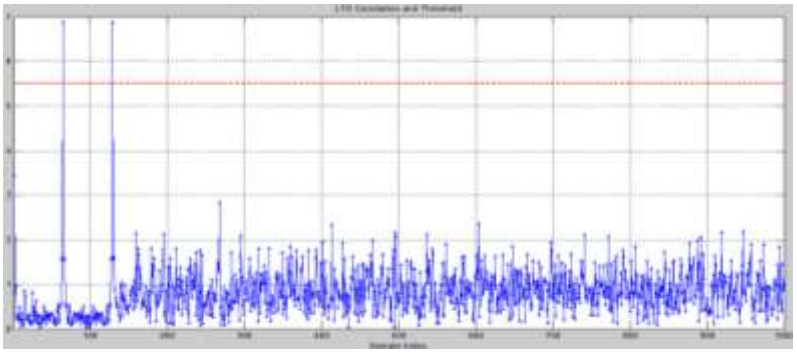


Figure 5 Actual Data

III. HARDWARE SETUP

Wireless open-access Research Platform (WARP) v3 kit was used for hardware testing and implementation of the code. It consists of 2 programmable RF interfaces each with 2.4 GHz transceiver and operates in IEEE 802.11.The 802.11design is used to work at the physical level. Signal transmission took place between the two antennas namely Transmitter (TX) and the Receiver (RX).

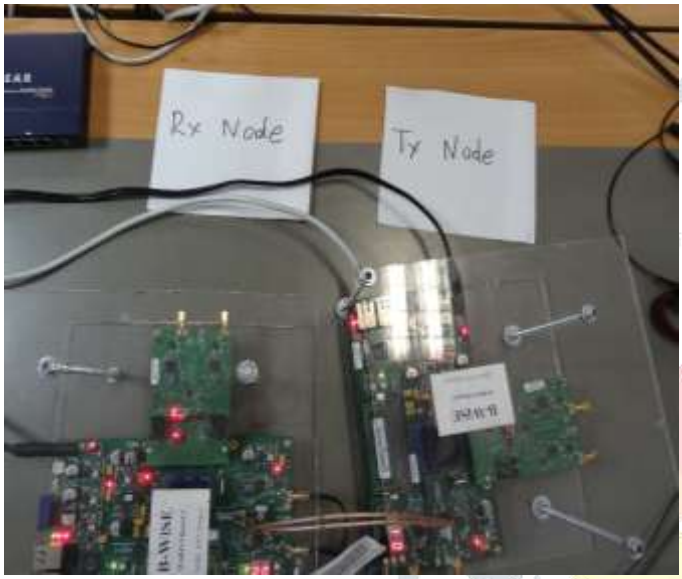


Figure 6 Hardware Used

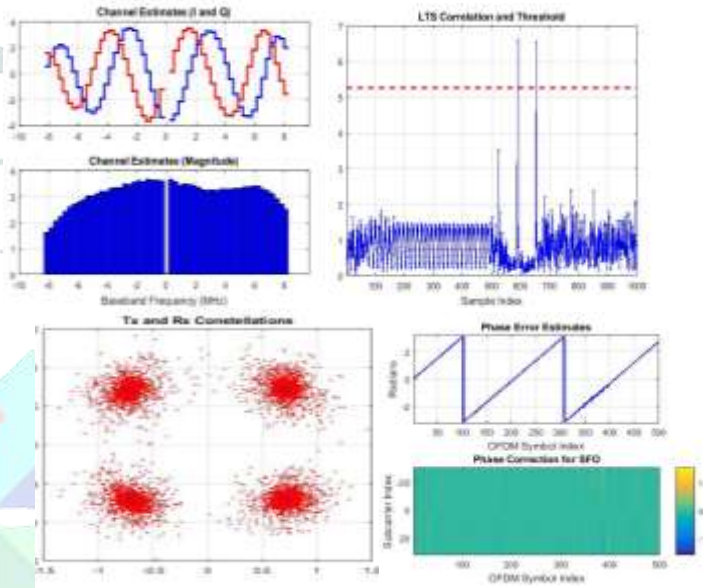
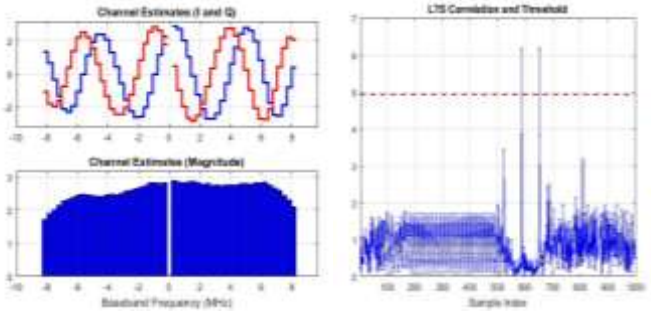


Figure 7 QPSK at 50 inches



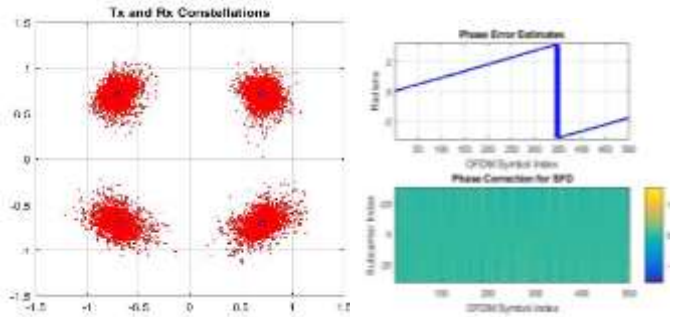
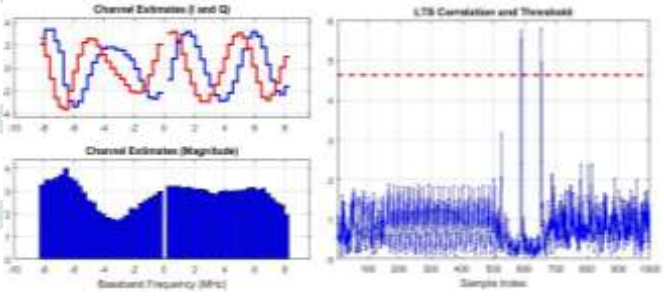


Figure 8 QPSK at 30 inches



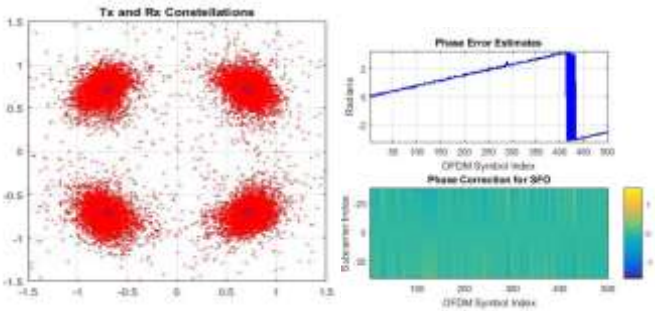


Figure 9 QPSK at 100 inches

IV. RESULT & ANALYSIS

The whole code was tested at various noise levels. The transmitter (TX) and the receiver (RX) nodes were kept at certain distances for the results.

Fig.7, Fig.8 and Fig.9 shows the magnitude of channel estimation and the constellation diagrams for QPSK observed at 30 inches, 50 inches and 100 inches of distance between the two nodes.

In the channel estimation diagrams, the center frequency does not transmit any information. Both ends of the spectrum are empty because of guard bands. The sub-carrier basis is used for channel estimation. There is Different magnitude for each sub-carrier.

It is evident from the constellation diagrams that at 30 inches, the noise level was low and it increased as the distance was increased to 50 and 100 inches gradually.

V. CONCLUSION

In this paper, simulations results were observed in MATLAB. Magnitude for channel estimation has been realized using OFDM. The hardware testing is done using WARP v3 kit with MATLAB. The constellation diagrams, noise levels and data levels were observed by varying distance between the two ends for QPSK.

VI. ACKNOWLEDGMENT

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