



Designing Of Zigbee Transceiver Using MATLAB/SIMULINK

Pradeep Kumar¹, Shelly Garg², Lovely Chawla³

¹ Student of M.Tech in Deptt. of Electronics & Communication Engineering,
INDUS, Jind (Haryana), India Email: pradeepchahal17@yahoo.com

² HOD in Deptt. of Electronics & Communication Engineering,
Indus Institute of Engineering & Technology, Jind (Haryana),

³ Assistant Professor in Deptt. of Electronics & Communication Engineering,
Indus Institute of Engineering & Technology, Jind (Haryana),

Abstract: In this paper, OQPSK modulation technique is used for designing of Zigbee Transceiver because it provides good battery life, better range and various other advantageous for which Zigbee technology is known.

Keywords: OQPSK, SNR, NOISE CHANNEL, ZIGBEE

I. INTRODUCTION

ZigBee is a low-cost, low-power, wireless mesh networking standard. First, the low cost allows the technology to be widely deployed in wireless control and monitoring applications. Second, the low power-usage allows longer life with smaller batteries. Third, the mesh networking provides high reliability and more extensive range. ZigBee is a standard that defines a set of communication protocols for low data rate short range wireless networking. ZigBee based wireless devices operate in 868MHz, 915MHz and 2.4GHz frequency bands. The main focus of the work is to design a ZigBee Transceiver using Matlab/Simulink that uses OQPSK modulation. This work will be helpful for designing a ZigBee chip.

II. MODULATION TECHNIQUE USED (OQPSK):

This is a variant of Quadrature Phase Shift keying method and can be implemented by shifting the Quadrature bit stream by a half bit period. The following constellation plot describes the need for doing so.

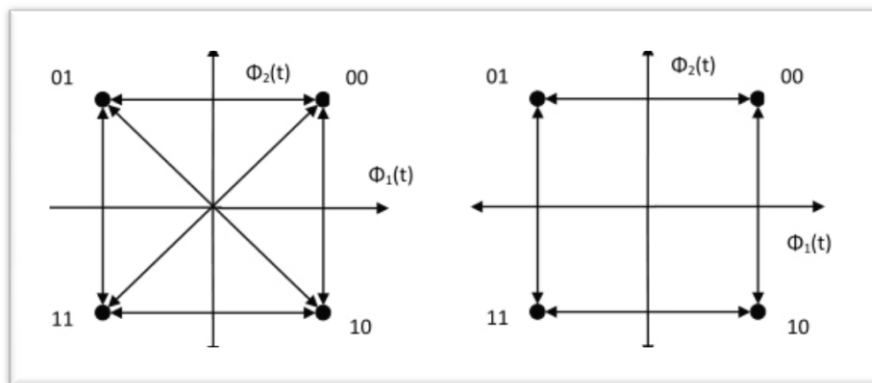


Figure: Phase transitions between QPSK and OQPSK

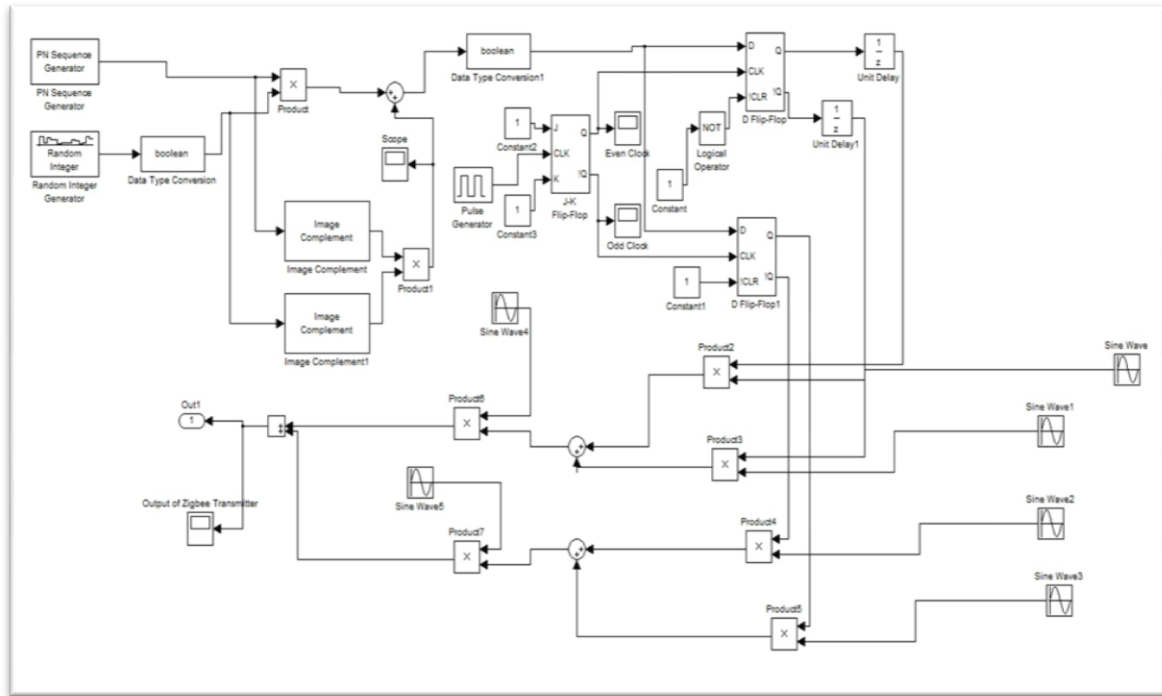
The constellation plot shown in Figure above includes all possible phase transitions that can arise in the generation of a QPSK signal. From the QPSK waveform, we observe the following:

1. The carrier phase changes by $\pm 180^\circ$ whenever both the in phase and Quadrature components of QPSK signal change the sign. This situation occurs when the input binary sequence switches from digit 01 to digit 10.
2. The carrier phase changes by $\pm 90^\circ$ whenever the in phase or Quadrature component changes sign. This situation occurs when the input bit sequence switches from digit 10 to digit 00, during which the in phase component changes sign, whereas the Quadrature component is unchanged.
3. The carrier phase is unchanged when neither the in phase component nor the Quadrature component changes sign. This situation occurs when digit 10 is transmitted in two successive symbol intervals.

Situation 1 and, to a much lesser extent, situation 2 can be of a particular concern when the QPSK signal is filtered during the course of transmission, prior to detection. Specifically, the 180° and 90° phase shifts in the carrier phase can result in changes in the carrier amplitude (i.e., envelope of the QPSK signal), thereby causing additional symbol errors on detection. The extent of amplitude fluctuations exhibited by QPSK signals may be reduced by using offset QPSK.

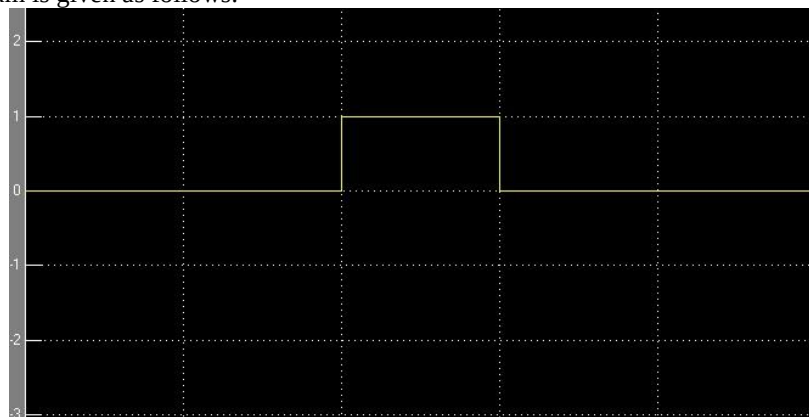
III. SIMULINK MODEL AND RESULT ANALYSIS:

Here the Zigbee Transmitter and receiver are designed using MATLAB. For the designing, OQPSK modulation technique is used for providing better result. The SIMULINK model for Zigbee transmitter and the output result are given as:



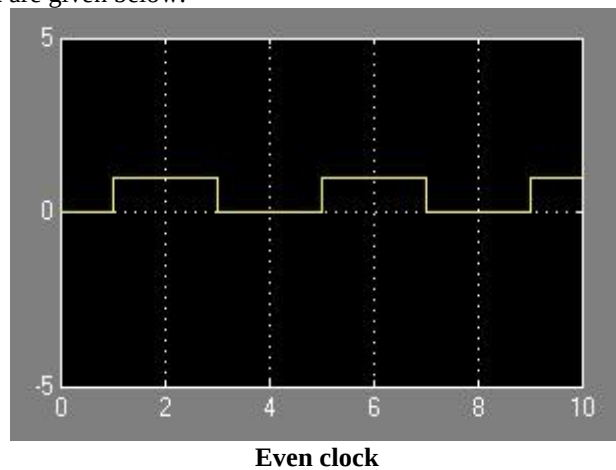
Zigbee transmitter

The input bit stream is given as follows:



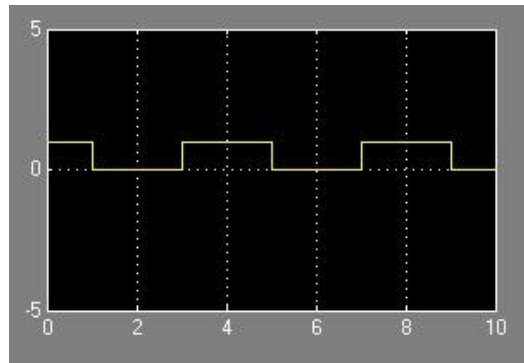
Input bit stream

The result from even clock are given below:



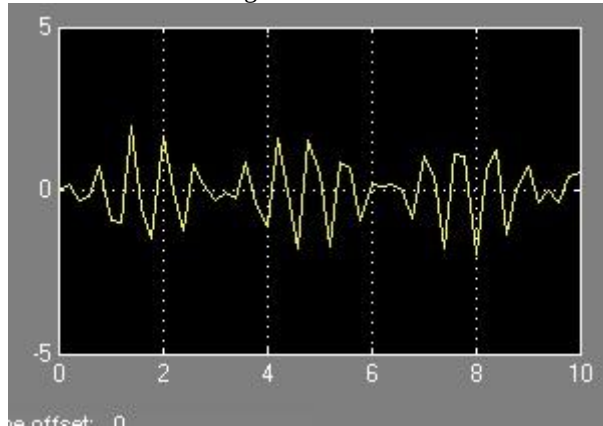
Even clock

The result from odd clock are given below:



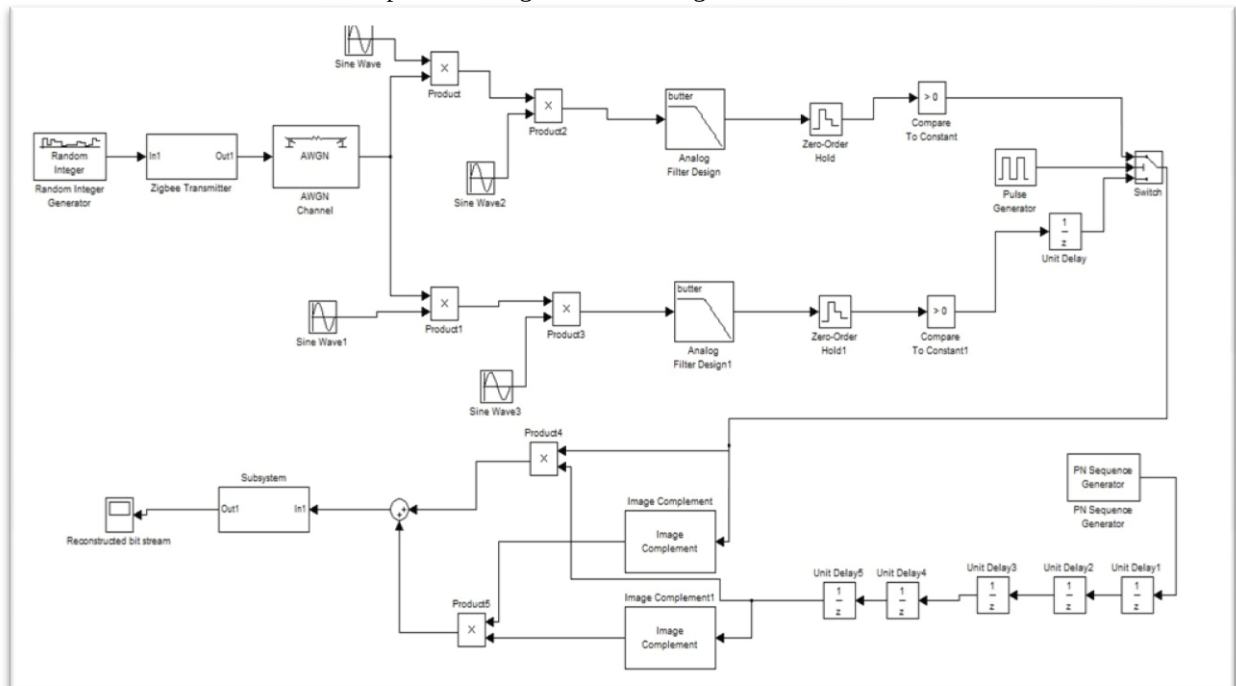
Odd clock

The Zigbee transmitter produces the transmitted signal which is shown below:



Transmitted Signal

Now, the SIMULINK model and output of the Zigbee receiver is given as follows:



Zigbee receiver

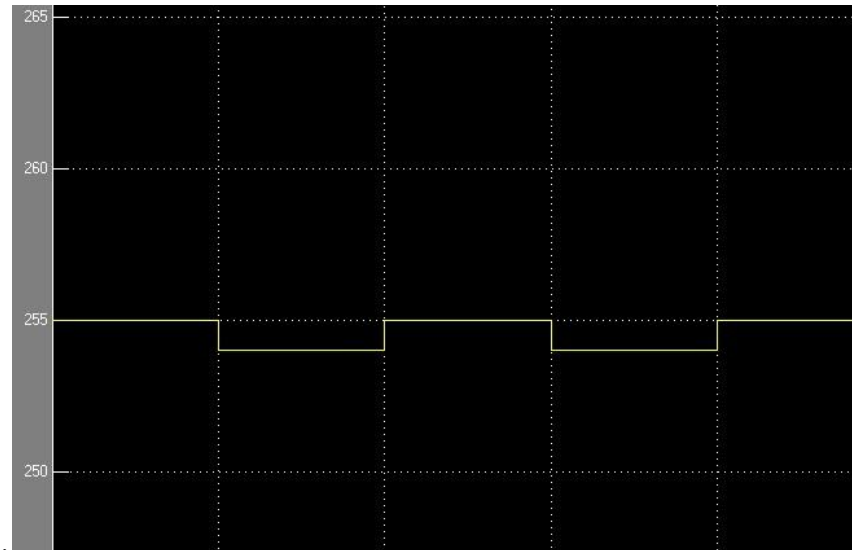
Zigbee receiver receive the signal which is transmitted through the AWGN channel by the Zigbee Transmitter. And produces the output which gives idea about the information collected.

The signal produced by the transmitter is transmitted through the channel and in the channelsome noise is combined with the transmitted due to which thereceived signal is different from the transmitted signal. In case

of OQPSK modulation technique the inter symbol interference is avoided. Due to which there is less variations in amplitude or envelope.

Receiver Output

The result for the receiver output is shown below which gives idea about the information collected by the transmitter



IV. CONCLUSION:

It is concluded here that the OQPSK modulation technique with pulse shaping avoid the phase transition and inter symbol interference (ISI) in the channel. This reduces the power required in the amplifier, which is one of the major consideration in Zigbee. Here it is also concluded that by using the OQPSK modulation technique the amplitude (envelope) variation can be reduced.

REFERENCES:

- [1]. Gronemeyer S and McBride A, "Offset QPSK modulation," IEEE transactions on communications, vol. 24, no. 8, pp. 809-820, August 1976.
- [2]. www.authorstream.com
- [3]. Ravikanth Kanna, Sarat Kumar Patra, Kiran Kumar Gurralla, Badugu Suresh, V V Satyanarayana, "Design of ZigBee transmitter using MATLAB/Simulink", International journal of systems simulation, pp.23-28, March 2011.