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Lab Assesment – 6

Quadrature Phase Shift Keying

Aim

Digital communication is widely used in all fields of communication. Different digital modulation schemes based on keying techniques are used for implementing digital communication systems. There are different types of keying like amplitude shift keying, frequency shift keying, phase shift keying etc. QPSK can encode two bits per phase. Here we have used LABVIEW (Laboratory Virtual Instrumentation Engineering Workbench) as the simulation platform. This programming environment being graphical, gives good visualization of the results.

Abstract

Keying is a family of modulation forms used to transmit digital signals over an analog channel. Modulation is the technique of shaping a signal to convey information.

For representing digital signals into analog waveform the techniques keying can be used. The modulating signals will always have only limited number of states to represent the corresponding digital states in keying. Quadrature phase shift keying (QPSK) is a widely used digital modulation technique in wireless communication because of its ability to transmit twice the data rate for a given bandwidth.

For the efficient data transmission the wireless communication systems require high data rate. The purpose of the modulation techniques is to increase the data transmitting efficiency. QPSK is one

of the forms of Phase Shift Keying modulation scheme. This technique is widely preferred because of its advantages increased data rate and ease of implementation.

For a given binary data rate the transmission bandwidth is reduce by a factor of 2. The term quadrature means the signal shifts between the phases which are 90^0 apart. Here QPSK communication system is being implemented using the software LabVIEW.

AWGN noise is added to the QPSK output and the input signal is retrieved at the output after removing the noise.

Examples of digital modulation include:

ASK (Amplitude Shift Keying)

FSK (Frequency Shift Keying)

PSK (Phase Shift Keying)

The combination of ASK and PSK also used to form new techniques such as Quadrature Amplitude Modulation (QAM).

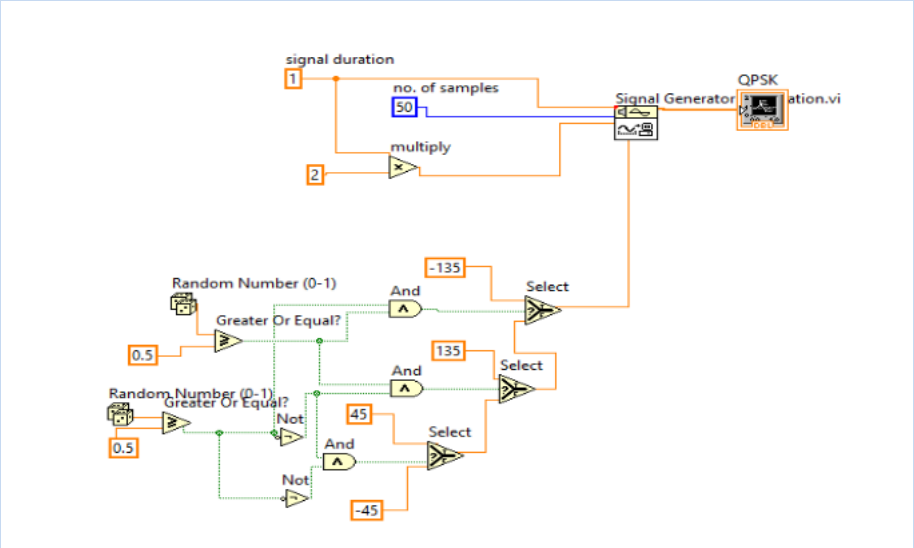
Mathematical Formula

The basic mathematical expression of QPSK is given by eqn.1 [5].

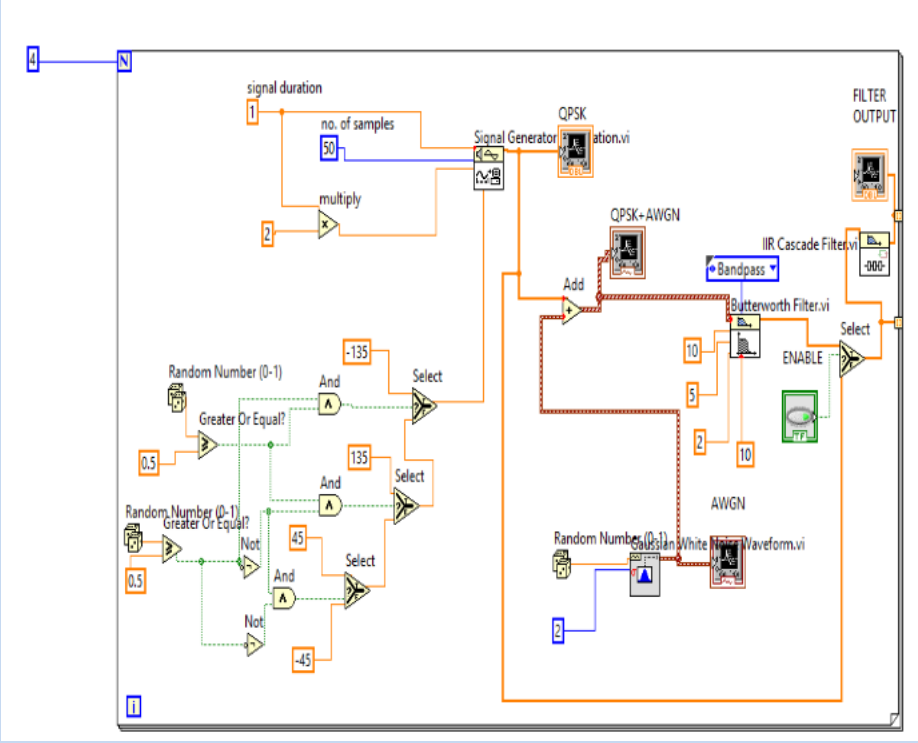
$$S_{qpsk}(t) = \sqrt{\frac{2E_s}{T_s}} \cos\left(2\pi f_c t + (2n-1)\frac{\pi}{4}\right)$$

Where n=0, 1, 2, 3.

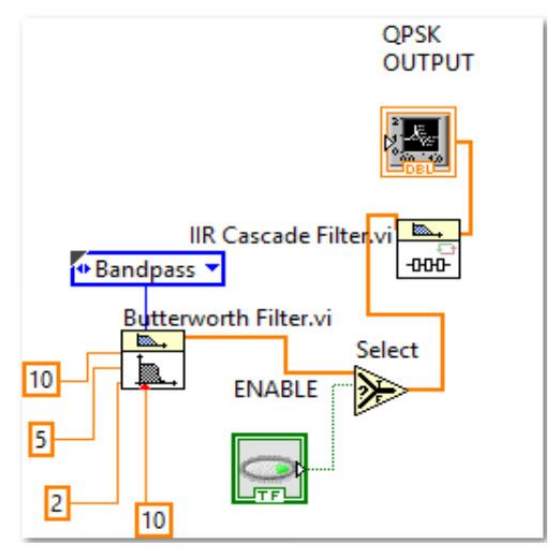
Circuit Diagram



QPSK Modulator

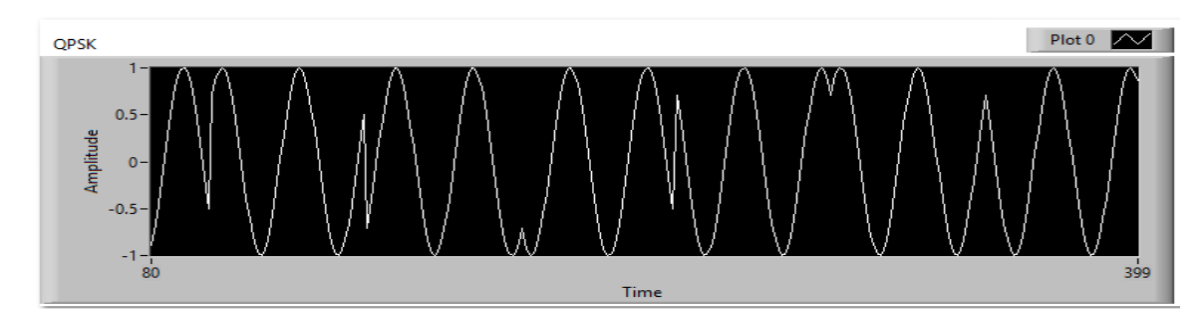


With AWGN noise VI

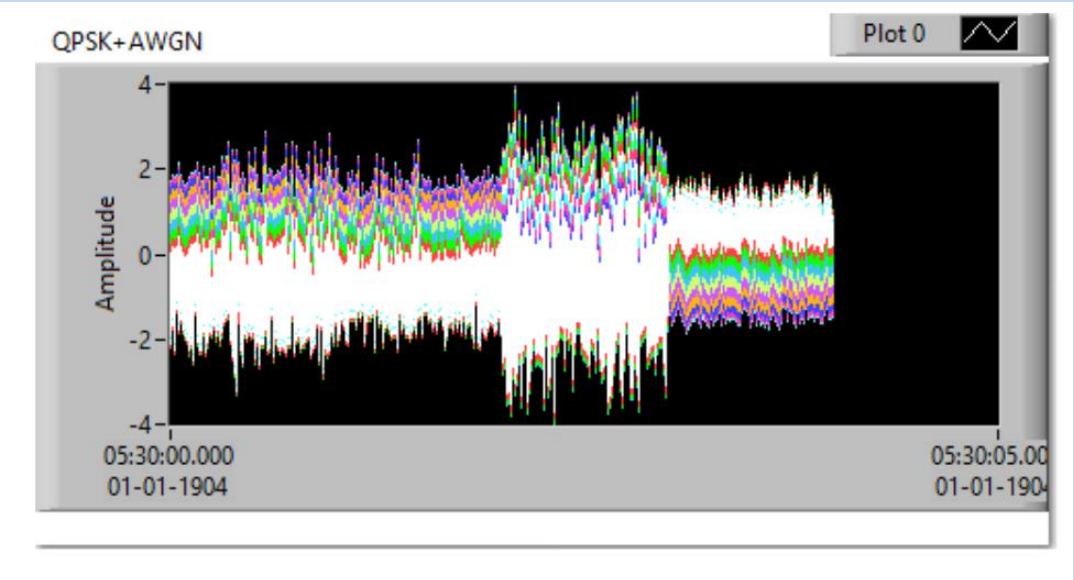


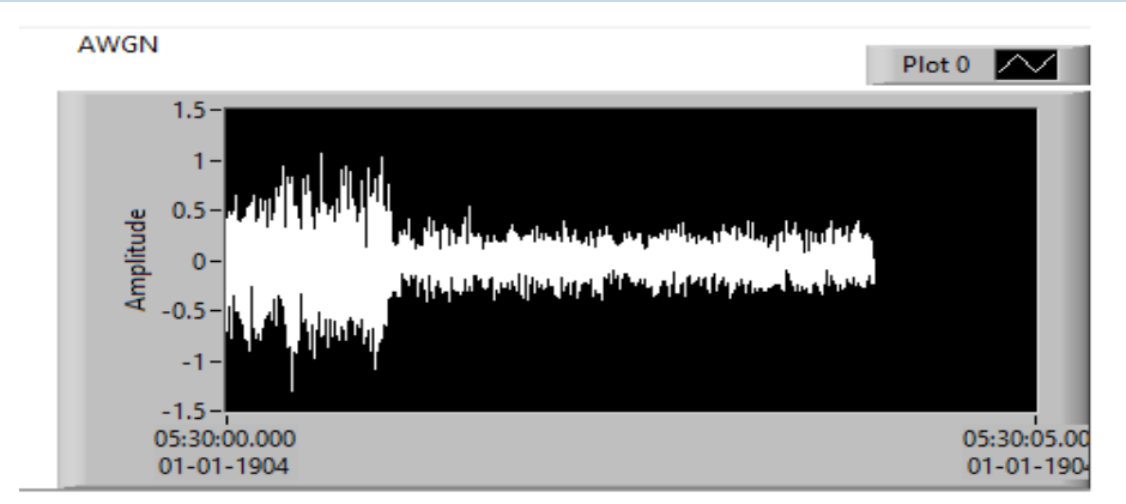
QPSK Retrieval BlockDiagram VI

Board Diagram



QPSK Modulated output





With AWGN Noise

Result

Here QPSK is implemented using LabVIEW. Through some experimental results we have demonstrated the ability of LabVIEW programming language. This graphical environment is easy to learn and simple to transform a concept to a working program. Moreover it is possible to continuously vary the input parameters and observe the corresponding results. All the concepts being implemented are simulated using basic blocks like signal generator, multiplier, adder, select switch, for loop etc. This makes the system more user friendly