

EXPERIMENT# 9

TO DESIGN BASIC BPSK MODULATION SYSTEM WITH NOISE EFFECTS

OBJECTIVE:

Binary Phase Shift Keying:

Binary PSK is a digital modulation scheme that conveys data by changing, or modulating, the phase of a reference signal (the carrier wave). Any digital modulation scheme uses a finite number of distinct signals to represent digital data. PSK uses a finite number of phases; each assigned a unique pattern of binary bits. Usually, each phase encodes an equal number of bits. Each pattern of bits forms the symbol that is represented by the particular phase. The demodulator, which is designed specifically for the symbol-set used by the modulator, determines the phase of the received signal and maps it back to the symbol it represents, thus recovering the original data. This requires the receiver to be able to compare the phase of the received signal to a reference signal — such a system is termed coherent (and referred to as CPSK). Simply, the phase is shifted for the different values of digital signals i.e., a particular phase for '1' and another phase (e.g.: A phase shift of 180°) for '0'.

- **Bits Generation**

Generate the bits for each frame for creating symbols.

- **BPSK Modulator**

Binary Phase Shift Keying modulator modulates the bits into BPSK symbols i.e. it translates 1's into positive voltage and 0's into equal negative voltage.

- **Pulse Shaping**

The square pulses are not practical to send. They are hard to create and require a lot of bandwidth. So in their lieu we send shaped pulses that convey the same information but use smaller bandwidths and have other good properties such as inter-symbol interference rejection.

Some common pulse shaping methods are

- Raised Cosine
- Half-Sinusoid
- Gaussian

- **Base-Band Transmission**

A type of digital data transmission in which each medium (wire) carries only one signal, or channel, at a time. In contrast, broadband transmission enables a single wire to carry multiple signals at the same time. Baseband transmissions typically use digital signaling over a single wire; the transmissions themselves take the form of either electrical pulses or light. The digital signal used in baseband transmission occupies the entire bandwidth of the network media to transmit a single data signal. Baseband communication is bidirectional, allowing computers to both send and receive data using a single cable. However, the sending and receiving cannot occur on the same wire at the same time.

- **Noise Generation**

Noise, the unwanted signal, is always generated at the receiver’s side with the signal. As we have seen, noise is an ever present part of all systems. Any receiver must contend with noise. In digital communication systems, noise degrades the throughput because it requires retransmission of data packets or extra coding to recover the data in the presence of errors.

- **Noise Added with the Signal**

Noise when added with signal produces transient responses of significantly high amplitudes making the behavior of the signal uncertain. The main effect of noise is that it deteriorates the signal magnitude, phase and frequency wise respectively.

Mathematically

$$\text{Received Signal (Rx)} = \text{Transmitted Signal (Tx)} + \text{Noise}$$

- **Noise Removal Using LPF**

Studying the basics of a receiver of conventional BPSK communication system, Rx signal contains noise with high frequency components with the baseband signal (message signal) lying in the low frequency range. In order to get the message signal, we truncate the high frequency components using a low pass filter making it easy for us to process on the filtered signal further.

SOFTWARE USED:

Lab Task :

Design BPSK Modulation System with Noise Effects using MATLAB, generate its pdf and attach the output.

CONCLUSION:

Post Lab Questions

a) Define the following:

1.	Low Pass Filter	
2.	Baseband Transmission	
3.	hold on	
4.	BPSK	

b) What is command 'fftshift' used for in Matlab ?
