# Round 1

# Experiment Design for Communication Systems Laboratory

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**Department**: ECE

**Discipline**: ECE

**Name of the Lab**: Communication Systems Laboratory (C.S.L)

**Name of experiment**: Quadrature Phase Shift Keying (QPSK)

**Focus Area**: Experimental Analysis Method

**About the experiment:**

Quadrature Phase Shift Keying (QPSK) is a form of Phase Shift Keying in which two bits aremodulated at once, selecting one of four possible carrier phase shifts (0, 90, 180, or 270 degrees). QPSK allows the signal to carry twice as much information as ordinary PSK using the same bandwidth.The Quadrature Phase Shift Keying QPSK is a variation of BPSK, and it is also a Double Side Band Suppressed Carrier DSBSC modulation scheme, which sends two bits of digital information at a time, called as bigits.

Instead of the conversion of digital bits into a series of digital stream, it converts them into bit pairs. This decreases the data bit rate to half, which allows space for the other users.

**Learning Objectives and Cognitive Level:**

|  |  |  |  |
| --- | --- | --- | --- |
| **S.No.** | **Learning Objectives** | **Cognitive level** | **Action Verb** |
| 1 | *Students will be able* to define Quadrature phase shift keying and its typical modulator & demodulator circuits. | Remember | Define |
| 2 | *Students will be able* to define modulation and demodulation techniques of QPSK. | Remember | Define |
| 3 | *Students will be able* to analyse the characteristics of QPSK signals, modulators and demodulators. | Analyse | Analyse |
| 4 | *Students will be able* to evaluate the QPSK signal upon the computation of BER. | Evaluate | Evaluate |

2. **Instructional Strategy**:

**2. 1 Instructional Strategy**: Expository

**2.2 Assessment Method**: Formative Assessment

**2.3 Description of section:**

* + - * Detailed theory is provided by considering all the aspects which develops intuition and deeper understanding of concepts, also reference will be provided for further information.
      * In order to understand the process followed in simulation a complete set of procedure will be provided which helps the students to perform simulation.
      * Step by step procedure which is carried out in lab manually is being simulated which gives exposure to real laboratory apparatus, empowering independent learning.
      * Pre-quiz and post-quiz will be provided to test the understanding of the students before and after performing the experiments.
      * Assignment questions will be provided to the students to make them explore more on the experiments.
      * Once the students go through the virtual lab experiments, they can perform those experiments in real lab effectively.

3. **Task & Assessment Questions**

| **No** | **Instructions given by the Teacher** | **Tasks to be done by the students** | **Assessment questions aligned to the task** |
| --- | --- | --- | --- |
| 1) | Read the theory and procedure for performing the Quadrature Phase Shift Keying simulations with ease. | Click on the theory and procedure icons to view the theory and step by step procedure to guide the student to perform the simulation of Quadrature Phase Shift Keying modulation and demodulation. | **Q4** |
| 2) | Generate Pseudo Random binary sequence. | Click on the Pseudo random Binary sequence (PRBS) generator block to generate random binary digital input signal | **Q2** |
| 3) | Choose the required blocks and construct the Quadrature Phase shift keying modulator and demodulator circuit as per the procedure and execute the simulator. | The user can vary the input and run it to see both the modulated and demodulated outputs simultaneously. | **Q1** |
| 4) | Calculate the average probability of symbol error for coherent quadrature phase shift keying with the simulated results. | The students should evaluate the values of amplitude, frequency, transmitted signal energy per bit and noise spectral density to carry out BER calculations. | **Q3** |

**Additional Assessment Questions:**

1. The function of carrier recovery in QPSK receiver is

1. to produce a non-synchronous signal
2. to produce low frequency signal
3. **to produce original, transmit carrier oscillator signal**
4. to produce high frequency out of phase signal
5. to separate message and carrier

2. The purpose of bit splitter in QPSK transmitter is

1. multiplexer
2. de multiplexer
3. **serial to parallel converter**
4. parallel to serial converter
5. encoder

3. How many possible outputs are obtained across Q-channel in 8-PSK transmitter?

1. 2
2. 8
3. **4**
4. 3
5. 6

4. How many dots will be there in the constellation diagram of QPSK modulation?

1. **4**
2. 8
3. 16
4. 10
5. 2

4. **Simulator Interactions:**

|  |  |  |  |
| --- | --- | --- | --- |
| **S. No** | **What students will do?** | **What Simulator will do?** | **Purpose of the task** |
| 1 | Click on the theory and procedure given in the home page to carry out the QPSK modulation and demodulation experiment. | Show the theory and procedure to be followed to simulate the experiment. | Identify the functionality and objectives of the experiment. |
| 2 | Understand the blocks and perform the calculations such as BER | Display the block diagram along with its connections. | To realize the theoretical concepts in the simulation environment. |
| 3. | Open the workspace and enter the binary data sequence . | Display the complete illustration of QPSK modulation in the workspace. | To enter the binary data sequence to get the desired output . |
| 4. | Amplitude and frequency sliders are varied . | Display the output signal of the binary data sequence. | To observe the QPSK waveforms for different binary data sequences. |