**Digital Communication Systems Laboratory**

**Fall 2021**

**Laboratory 05: Phase Shift Keying**

**Laboratory Goals:**

* How to implement phase shift keying modulation?
* What is the most common demodulator and detector for PSK?
* What is the bandwidth of the PSK modulation?

**Description:**

In this experiment, we study the transmission and detection of signals in the passband. Most of the laboratory content can be found in the MATLAB live script. This document gives a brief description about every section, then states the laboratory tasks.

1. Parameter initialization.
2. This shows the several types of modulation.
3. The Phase Shift Keying (PSK) is discussed here.
4. The received signal is decoded then detected.
5. The correlator decoder and detector are implemented.
6. The generation of noise and its impact are implemented and discussed.

**Tasks:**

1. Use these parameters for the following tasks:
   1. Message frequency (): TUID(8) + 1 Hz
   2. Carrier frequency (): (TUID(7) + 20) \*
2. Find the appropriate thresholds for signal detection in 4-PSK.
3. Use the following constellation for 4-PSK, angles are in Degree and you may need to convert them into Radian:
4. Generate 1000 random samples for the modified 4-PSK and fill the following table

|  |  |
| --- | --- |
| 4-ASK | |
| SNR | Mean Absolute Error |
| 20 |  |
| 8 |  |
| 0 |  |
| -8 |  |
| -16 |  |
| -20 |  |
| -24 |  |

1. Design a 16-ASK system with these amplitudes and find the appropriate thresholds for signal detection in 16-PSK.

[-8, -7, -6, …, -1, 1, 2, …, 8] / 8

Then make the message to send the message that contains your TUID digits in order. Put the corresponding plots and titles in your report.

1. Generate 1000 random samples for the 16-PSK and fill the same table in Task 2.
2. Compare Tables in task 2 and 4 and describe the observed differences in mean absolute error of 4-PSK and 16-PSK.
3. Plot the power spectrum of the baseband, carrier, modulated, and received signals for SNR = 0 dB.