Cairo University
Faculty of Engineering

Digital Communications

Project

Due on 9 December 2023

Project Details

The purpose of the project is to introduce the students to the simulation of the single carrier communication systems. The requirements of the project are described in the following sections.

1. Single Carrier System

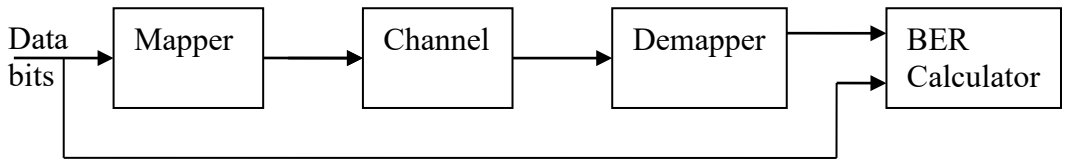


Figure 1 Single carrier communication system.

1.1 The Mapper

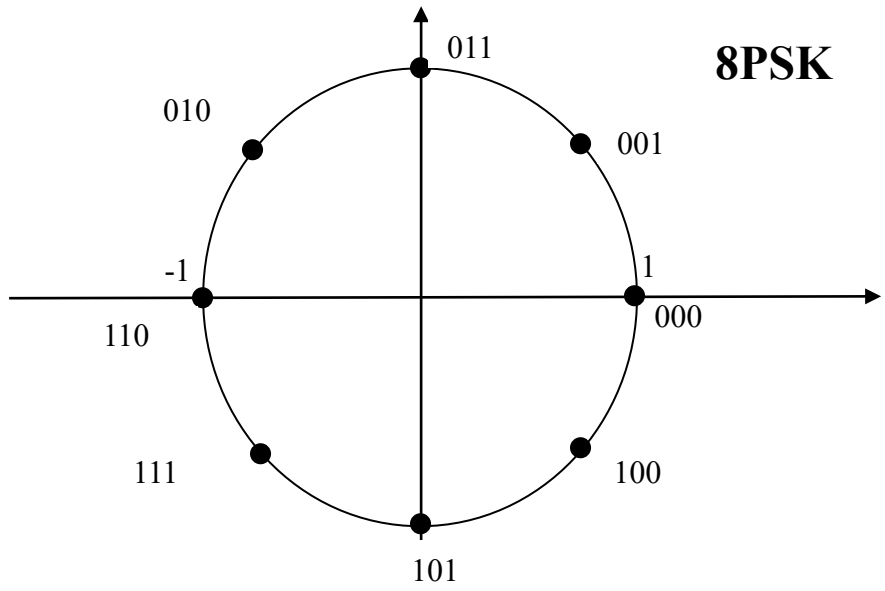
The first block in the communication system under consideration is the mapper. The mapper takes the I/P data bits and produces the symbols to be transmitted on the channel. The modulation schemes under consideration are the BPSK, QPSK, 8PSK, and 16QAM systems. Figure 2 shows the constellations.

1.2 The channel

The channel is an AWGN channel. In this model, the channel just adds noise to the transmitted signal. In MATLAB, the command "randn" should be used to generate the AWGN.

1.3 The Demapper

The simple demapper in the model under consideration will take the output of the channel and decide on the symbol transmitted. The output bit stream of the receiver is compared to the input bit stream and the BER is calculated.



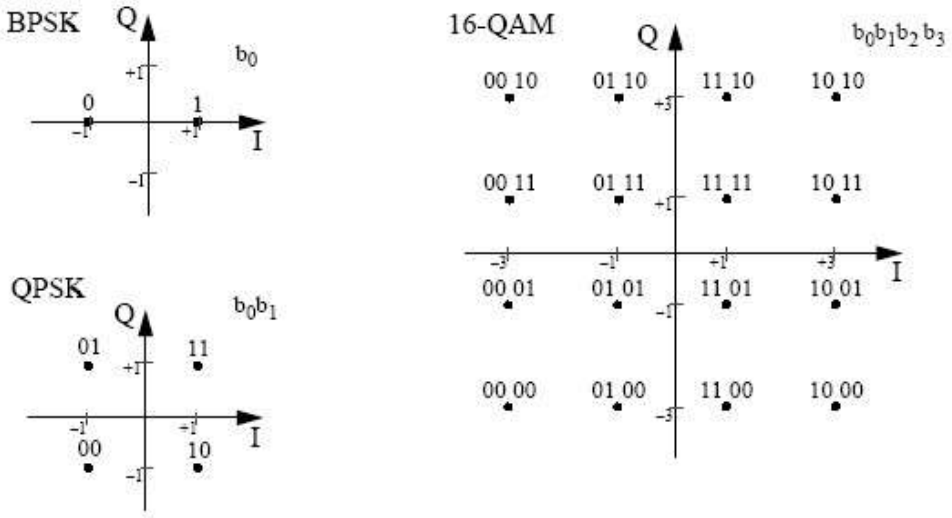


Figure 2 8PSK, BPSK, QPSK, and 16-QAM constellations

1.4 Tasks

- All simulations are done on the baseband equivalent system, with no carriers.
- It is required to plot curves for the BER Vs Eb/No for the four modulation schemes. On the same graph, the theoretical BER or a tight upper bound should be drawn for each one of the 4 modulation schemes (you can generate 48000 bits as the input to the system and the sweep range of SNR is from 1 : 10 dB).

Project Submission

- **The project can be done by group of 2 students (or less).**
- **Prepare a report with the codes you use, screenshots of results and your comments on them. Submit the report as a pdf file.**
- **Submit your report using Google Classroom. The due date is December 9,2023.**