AMERICAN INTERNATIONAL UNIVERSITY BANGLADESH
Faculty of Engineering

Laboratory Report Cover Sheet
Students must complete all details except the faculty use part.

Please submit all reports to your subject supervisor or the office of the concerned faculty.

Lab Title: Study of Analog to Analog Conversion (QAM) using MATLAB Simulink

Experiment Number: **10** Due Date: **03 /05/2024** Semester: **Spring 2023-2024**

Subject Code: **COE3103** Subject Name: **DATA COMMUNICATION** Section: **E**

Course Instructor: **NOWSHIN ALAM** Degree Program: **B.Sc. CSE**

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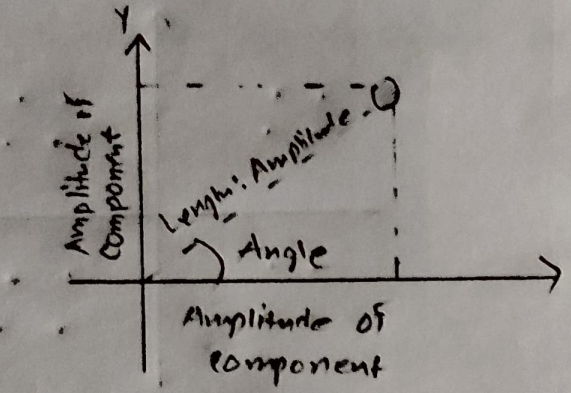
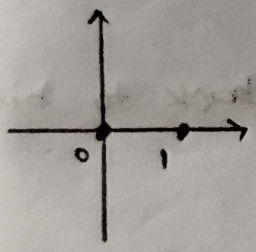
Faculty comments_____

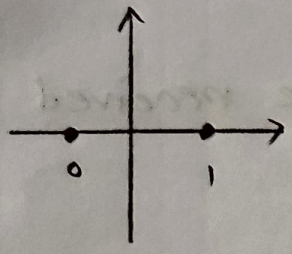
Introduction:

psk is limited by the ability of the equipment to distinguish small differences in phase. This factor limits its potential bit rate. The idea of using two carriers, one in-phase another the other quadrature, with different amplitude levels for each carrier is the concept behind quadrature amplitude modulation (QAM)

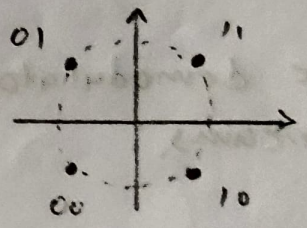




(a) BASK (OOK)



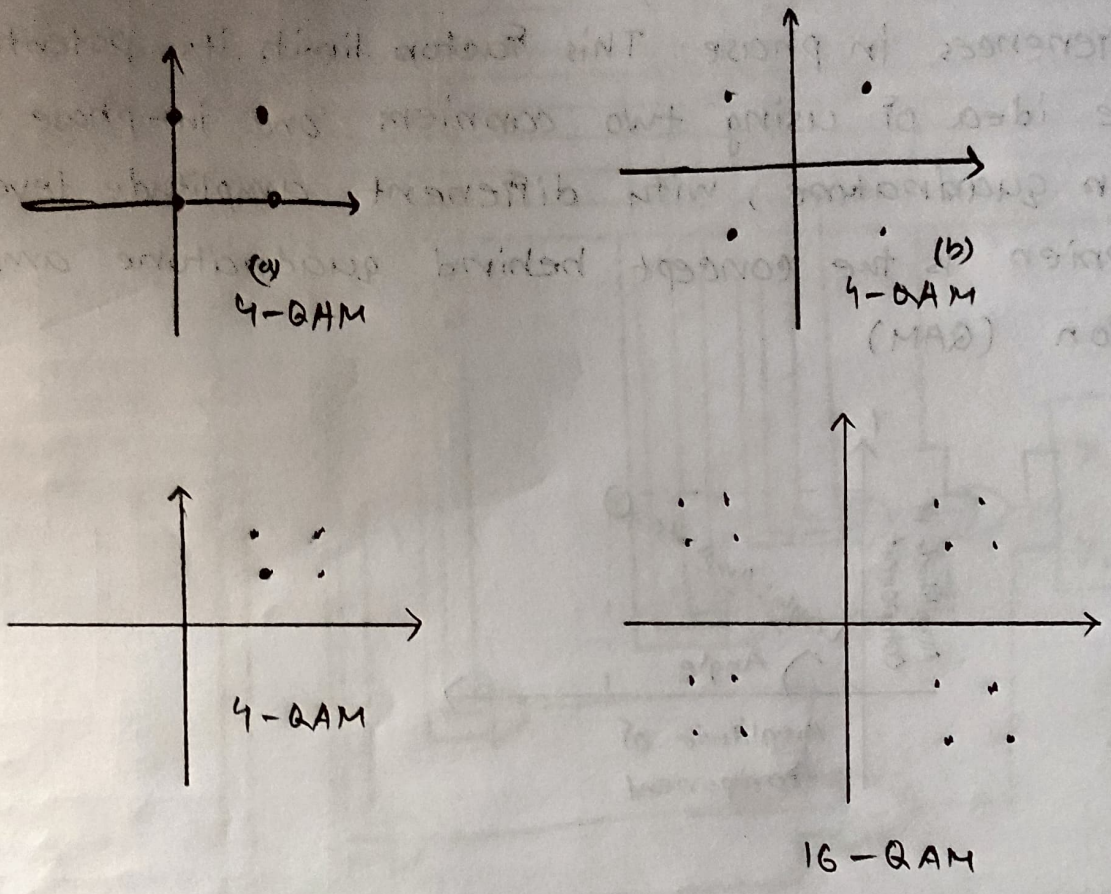
(b) BPSK



(c) QPSK

The possible variations of QAM are numerous. Figure (a) shows the simplest 4-QAM scheme using a unipolar NRZ signal to modulate each carrier. Part b shows another 4QAM using polar NRZ. Part c shows another QAM-4 in which a signal is used with two positive levels to modulate each of the two carriers. Figure (d) shows 16-QAM constellation of a

signal with 8 levels four positive and four negative.



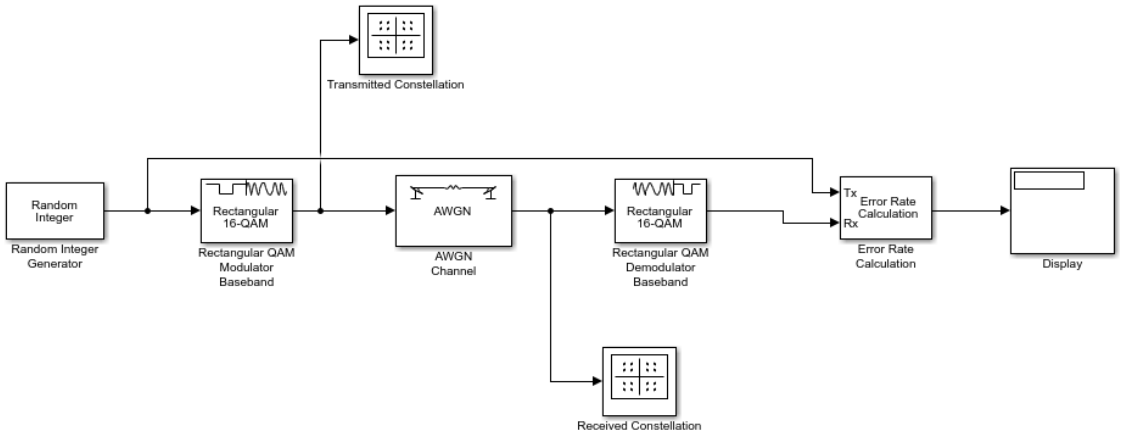
The demodulator maps the received signal back to bit streams.

Theory:

A constellation diagram is helpful for defining the amplitude and phase of a signal element, particularly when two carriers are used (one inphase another Quadrature). In a constellation diagram, a signal element type is represented as a dot. The diagram has two axes. The

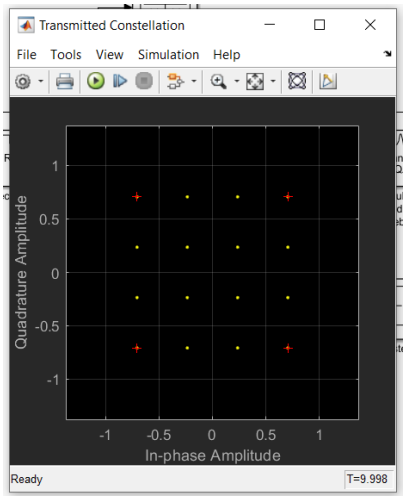
horizontal x axis is related to the inphase carrier and vertical y axis is related to the quadrature carrier. For each point on the diagram, four peices of information can be deduced. The projection of the point on the x axis defines the peak amplitude of the inphase component in the same way y axis defines peak amplitude of the quadrature component. The length of the line vector that connects the point to the origin is the peak amplitude of the signal element.

Simulink Model:

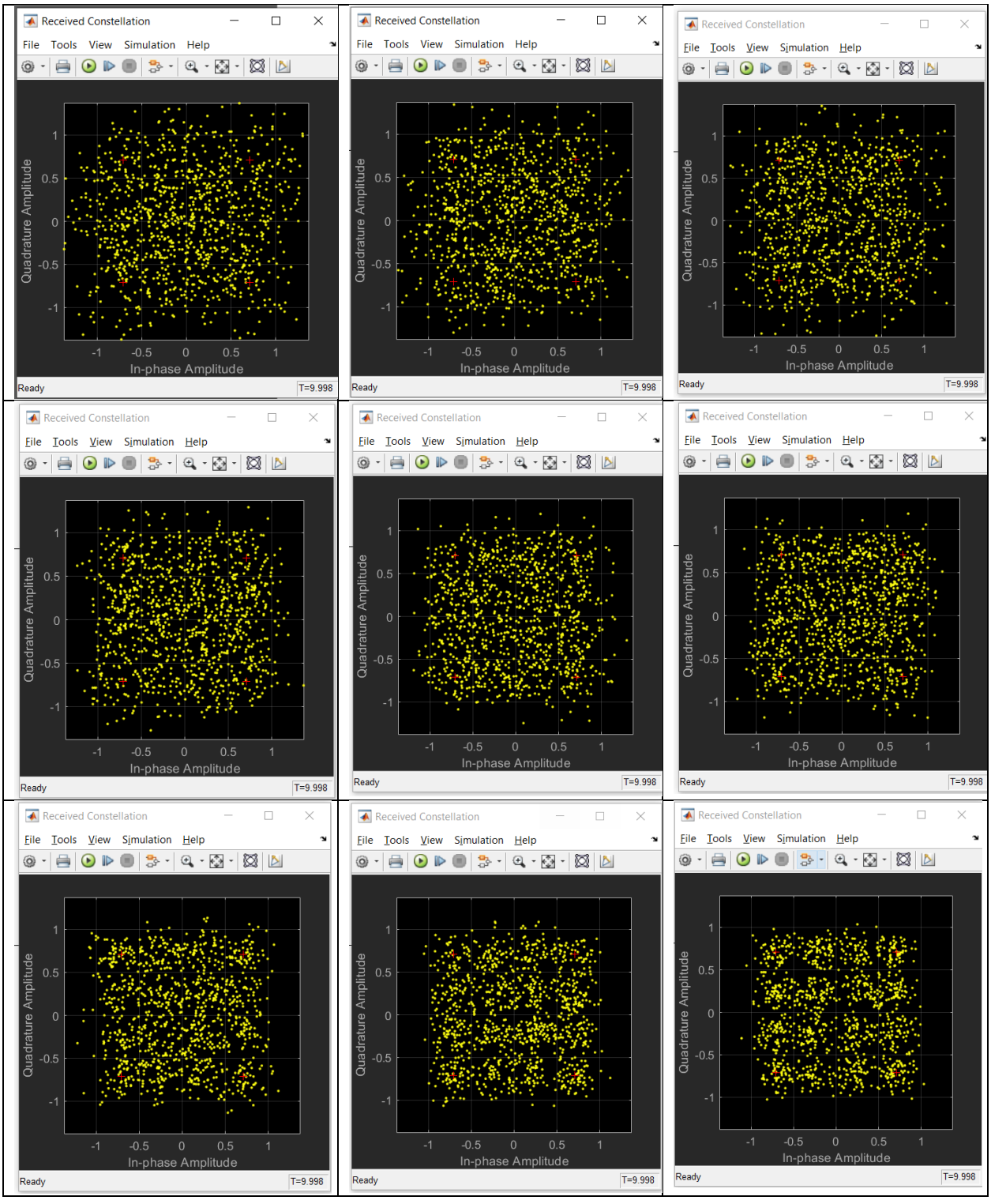


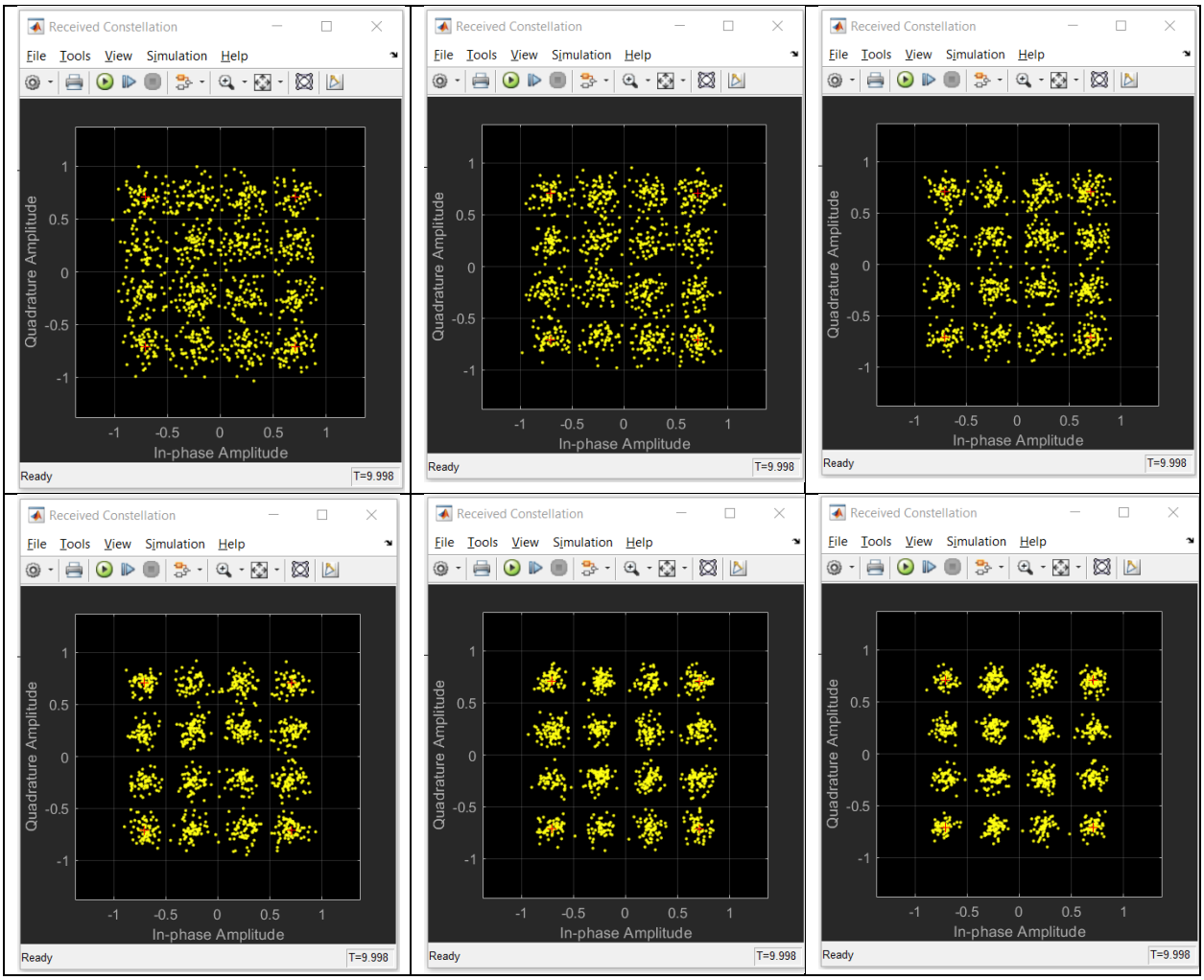
Results and Simulation:

Transmitted Constellation



For different Eb/No values: 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15

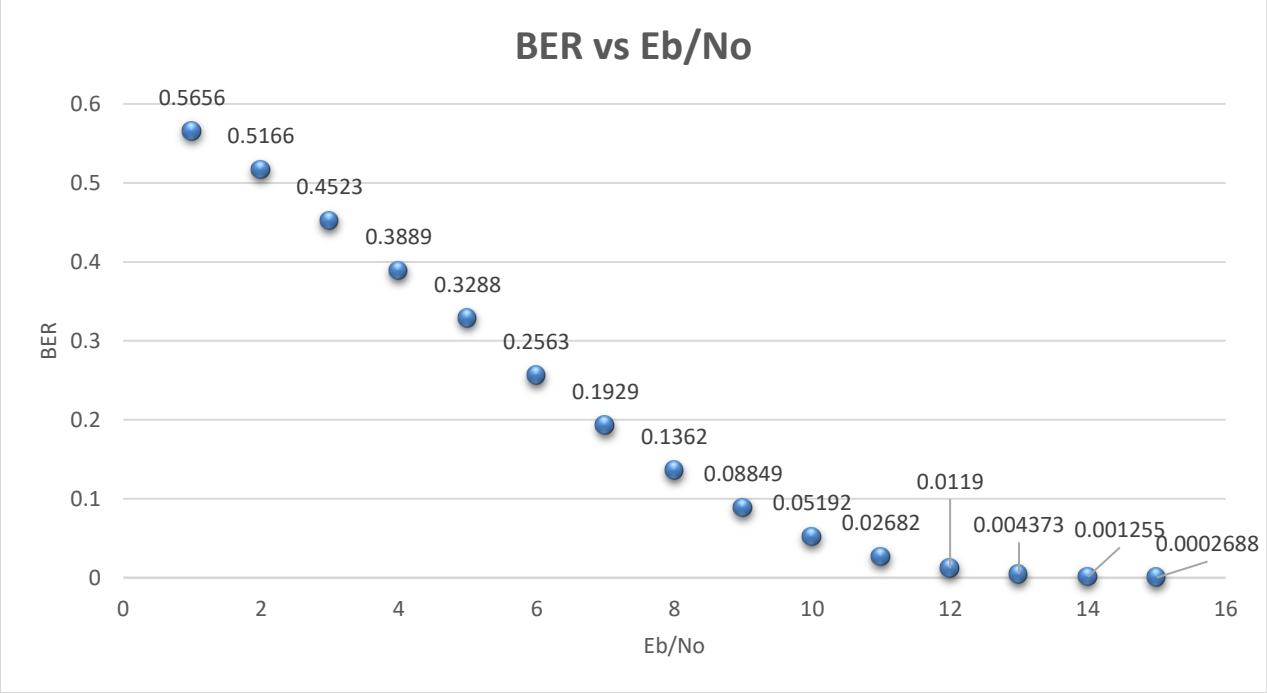

Received Constellation
File Tools View Simulation Help
Quadrature Amplitude
In-phase Amplitude
Ready
T=9.998



Dataset For Different Eb/No values and BER value:

Eb/No	BER Value
1	0.5656
2	0.5166
3	0.4523
4	0.3889
5	0.3288
6	0.2563
7	0.1929
8	0.1362
9	0.08849
10	0.05192
11	0.02682
12	0.0119
13	0.004373
14	0.001255
15	0.0002688

BER vs Eb/No Plot:



Conclusion:

The experiment was done sucessfully. Throughout this experiment the BER value for each Eb/No was determined, as well as the number of incorrect bits and the total number of bits received. It was proven that the higher the value of Eb/No the less error was occured. Overall, this report highlights MATLAB's versitality to simulate QAM.