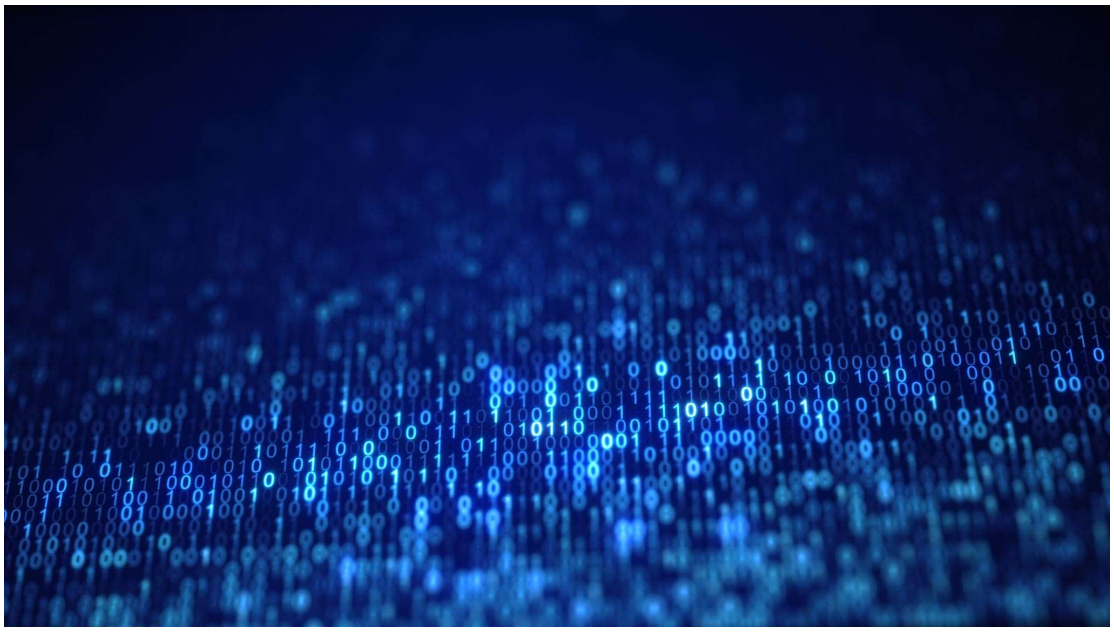
LBYEC4A – EK2

Signals, Spectra and Signal Processing Laboratory



Final Project Proposal

Implementation of 32-QAM Tx-Rx System using MATLAB

Francis Xavier L. Guimalan
Raphael Dominic H. Pozas
Cleajane Y. Sabino

PROJECT DESCRIPTION

For this project, an audio file would be transmitted through a QAM scheme, and the receiver would receive the signal and demodulate it. White/Gaussian Noise would also be added to make the TX-RX system closer to real-life systems. The receiver would recover the audio file input with plausible data. The proposed QAM system would contain the following features: Generates a modulated signal using QAM Generates a carrier signal of a particular frequency Generates a test signal of known frequency, amplitude, and phase Displays the transmitted and received signals on display Presents the Bit Error Rate for Accuracy Uses Different Signal Noise Ratios (SNR) to test the Tx-Rx Model.

QAM

QAM stands for Quadrature Amplitude Modulation, which is defined as a method that combines two AM signals into a single channel to be able to double the effective bandwidth of the signal. Application of QAM is usually found in the realm of wireless communications such as Wi-Fi and mobile data. [1]

Filter

Audio filters are electronic components designed to filter out the noise of an input signal. There are several different types of audio filters, namely low-pass filters, high-pass filters, bandpass filters, shelf filters, and notch filters. Each type of filter is designed to remove specific frequencies from an audio signal based on its design. [2]

Signal-to-Noise Ratio

Signal-to-Noise Ratio (SNR) describes the total noise present in the output signal compared to the amount of noise present in the original input signal. This measure the quality of signal compared to the background noise present. A high SNR indicates a strong signal relative to the noise, meanwhile a low SNR shows a weak signal that is overwhelmed by the noise.[3]

METHODOLOGY

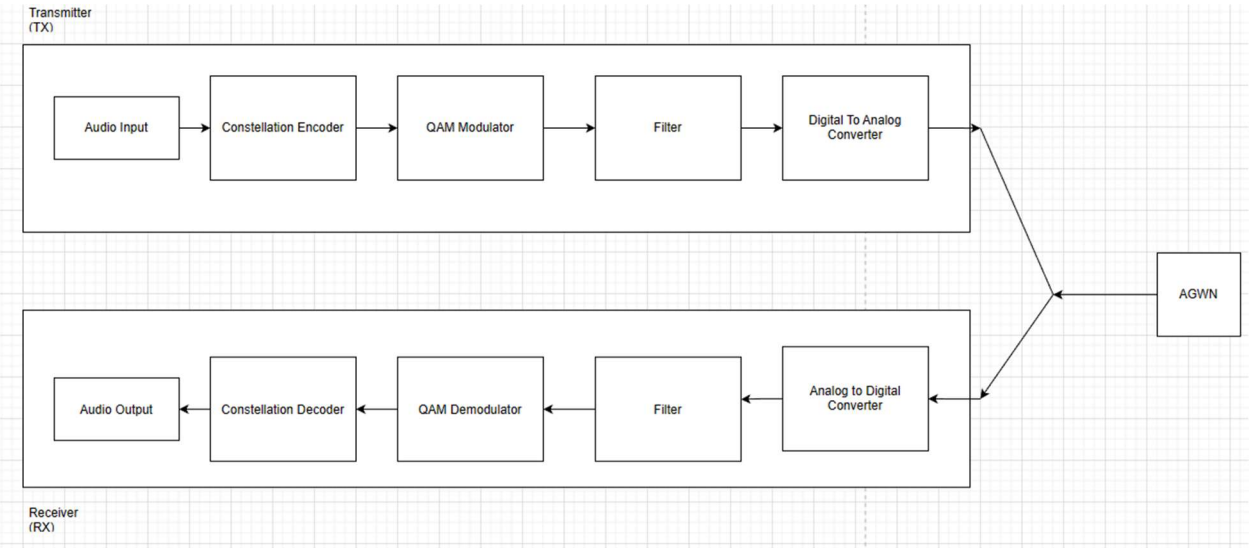


Figure 3.1 Flowchart for the Tx - Rx System

Figure 3.1 shows the overall flow of the QAM system. The audio input would be read and converted in the Frequency domain and would be represented in bits by Constellation Encoder. The signal would be modulated using QAM and filtered before being transmitted. Additive Gaussian White Noise (AWGN) would be added to the signal during the transmission.

The Receiver system starts with an Analog to Digital Converter to quantize the analog signal before being filtered. The filter would be important in removing some of the AGWN. It is expected that the system will not be able to remove all the AGWN because of its properties as White noise. The resulting digital signal would be demodulated by a QAM demodulator before being decoded into the signal by the Constellation Decoder. The output signal would be the input signal with minimized noise.

SCHEDULE OF ACTIVITIES

QAM Transmission and Receiver System

GUIMALAN, POZAS, SABINO
Team MARTIAN

Project Start: Mon, 2/27/2023
Display Week: 1

TASK	PROGRESS	START	END	DAYS
Phase 2 Final Project Proposal				
Research for Concepts of the Project.	100%	2/28/23	3/14/23	
Create an IPO (Input-Process-Output) Model.	100%	2/28/23	3/14/23	
Update the Files in the Repository Link.	100%	2/28/23	3/14/23	
Update the Trello Board.	100%	2/28/23	3/14/23	

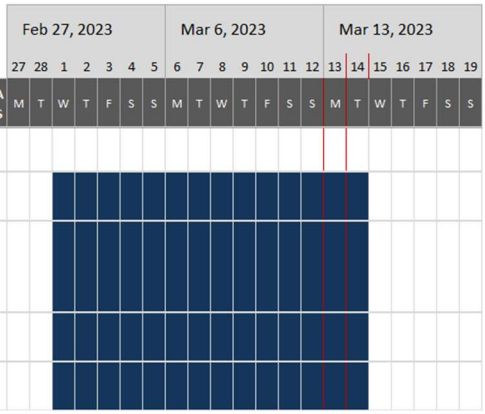


Figure 4.1. Phase 2 Gantt Chart

QAM Transmission and Receiver System

GUIMALAN, POZAS, SABINO
Team MARTIAN

Project Start: Mon, 2/27/2023
Display Week: 1

TASK	PROGRESS	START	END	DAYS
Phase 3 Review				
Initial Code for the Project.	20%	3/14/23	3/18/23	
Meeting with the Team for Alignment.		3/19/23	3/19/23	
Revision of Codes.		3/20/23	3/24/23	
Finalization of Codes.		3/25/23	3/26/23	
Reviewing Files and Documents in the Repository.		3/27/23	3/28/23	

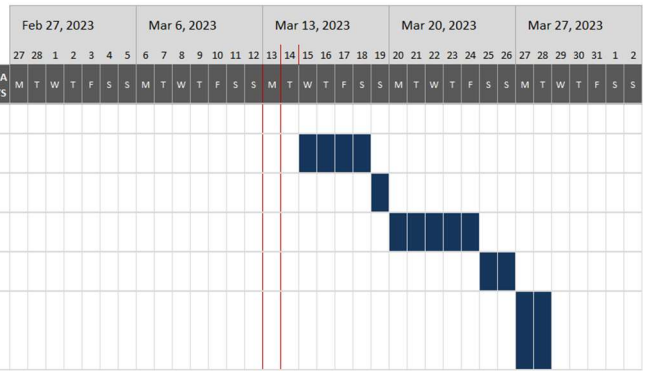


Figure 4.2. Phase 3 Gantt Chart

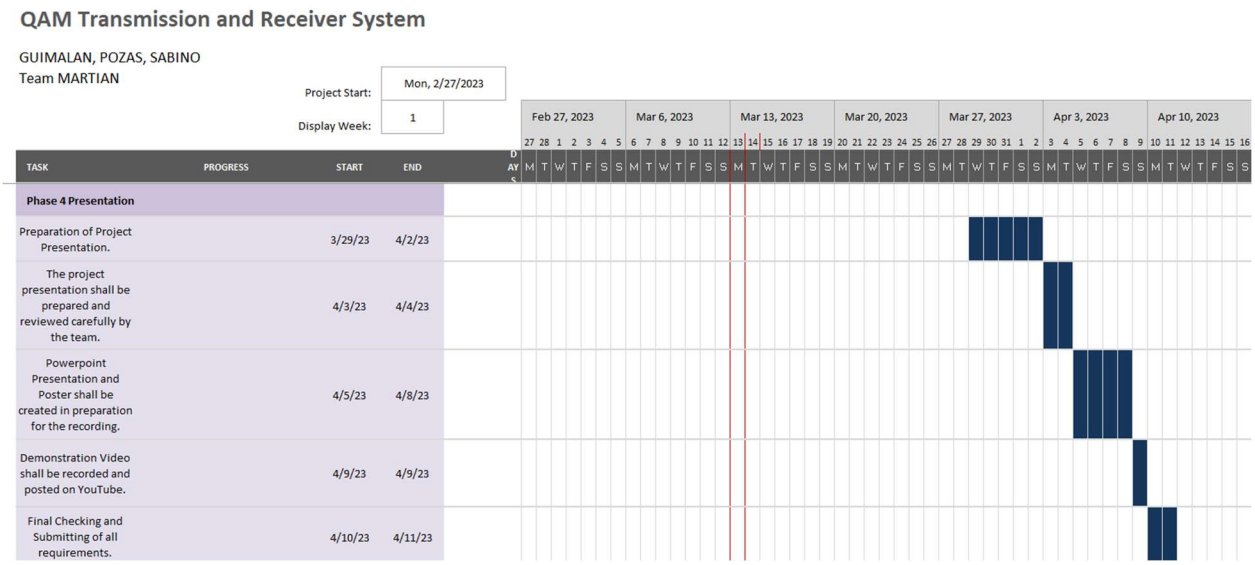


Figure 4.3. Phase 4 Gantt Chart

The figures show the schedule of the project during the term. This is referenced as instructed by the professor and the course syllabus.

REFERENCES

[1] Zola. (2023). "Quadrature Amplitude Modulation (QAM)." [Online]. Available: https://www.techtarget.com/searchnetworking/definition/QAM. [Accessed: March 21, 2023].

[2] Haven. (2022.). "Audio Filters: The Complete Guide for Producers." [Online]. Available: https://www.edmprod.com/audio-filters/. Accessed: March 21, 2023].

[3] ScienceDirect. (n.d.). "Signal-to-Noise Ratio - an overview." [Online]. Available: https://www.sciencedirect.com/topics/engineering/signal-to-noise-ratio. [Accessed: March 21, 2023].