USING QAM-256 FOR ROBUST TRANSMISSION OF AUDIO FILES

Final Project for Digital Communications by Leonel Gomez

AGENDA

Review Objective

System Diagram

Results

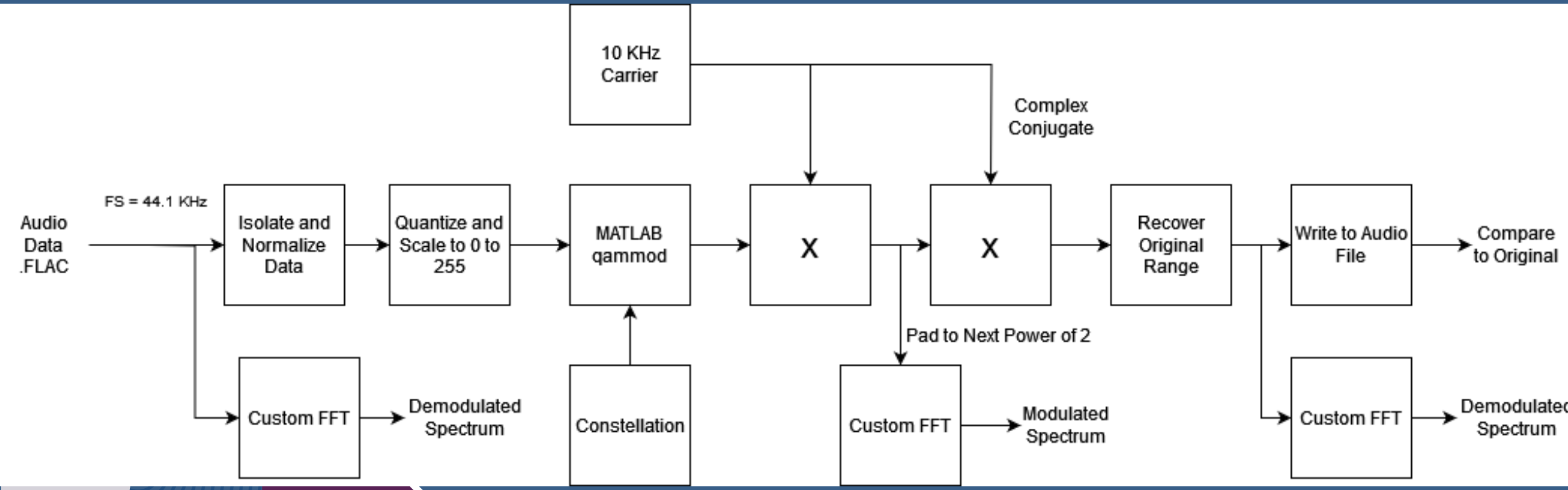
Audio Comparison

Future Work

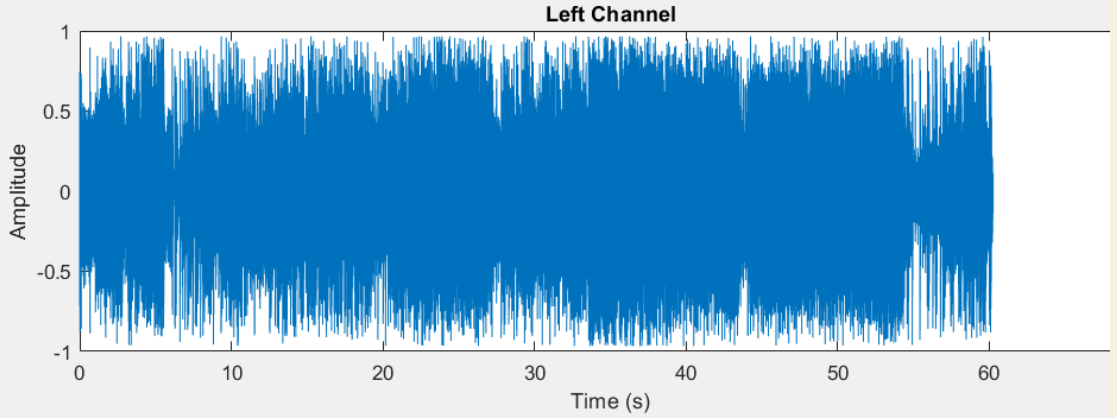
OBJECTIVE: ENCODE, MODULATE, AND DEMODULATE A .FLAC FILE USING QAM-256

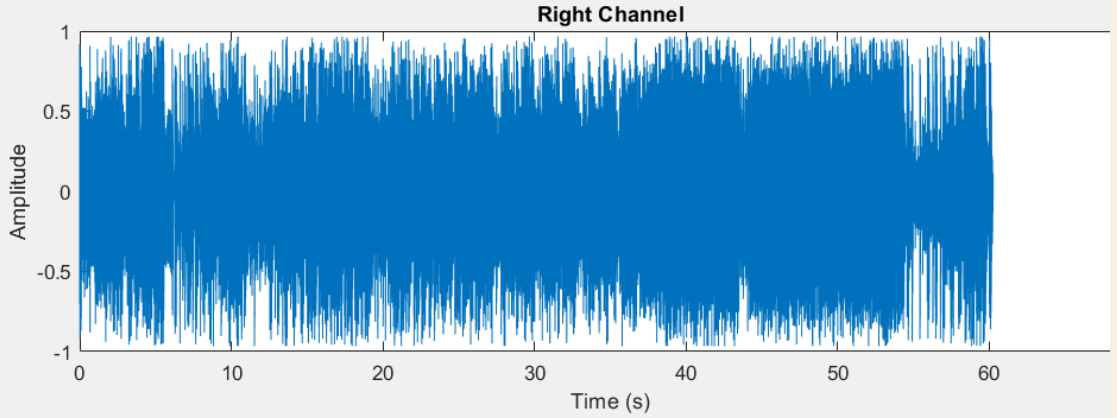
Observe differences in frequency spectrums at various points, changes in audio, and robustness of QAM-256

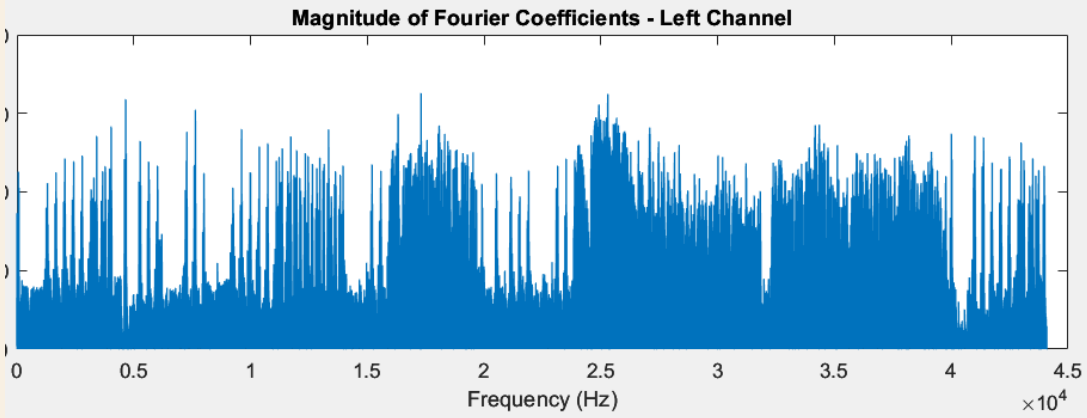
SYSTEM DIAGRAM

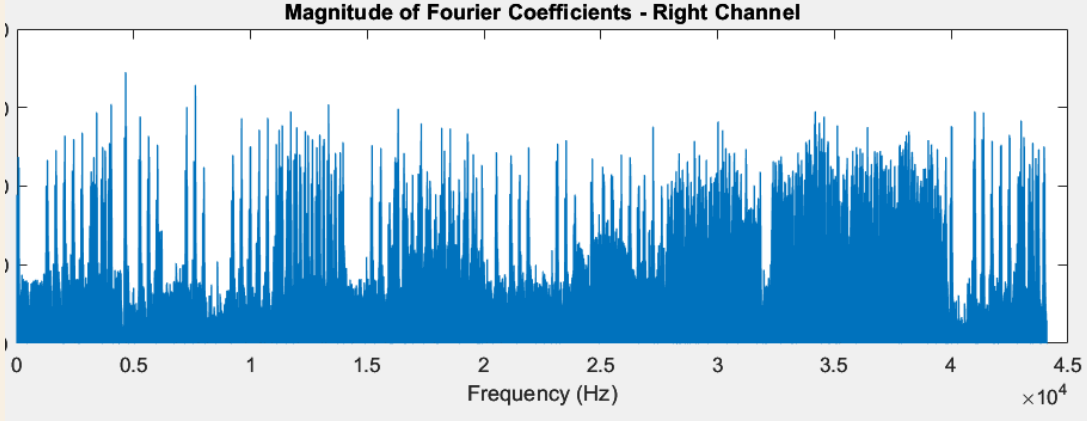


INITIAL TIME DOMAIN SIGNAL AND FREQUENCY SPECTRUM

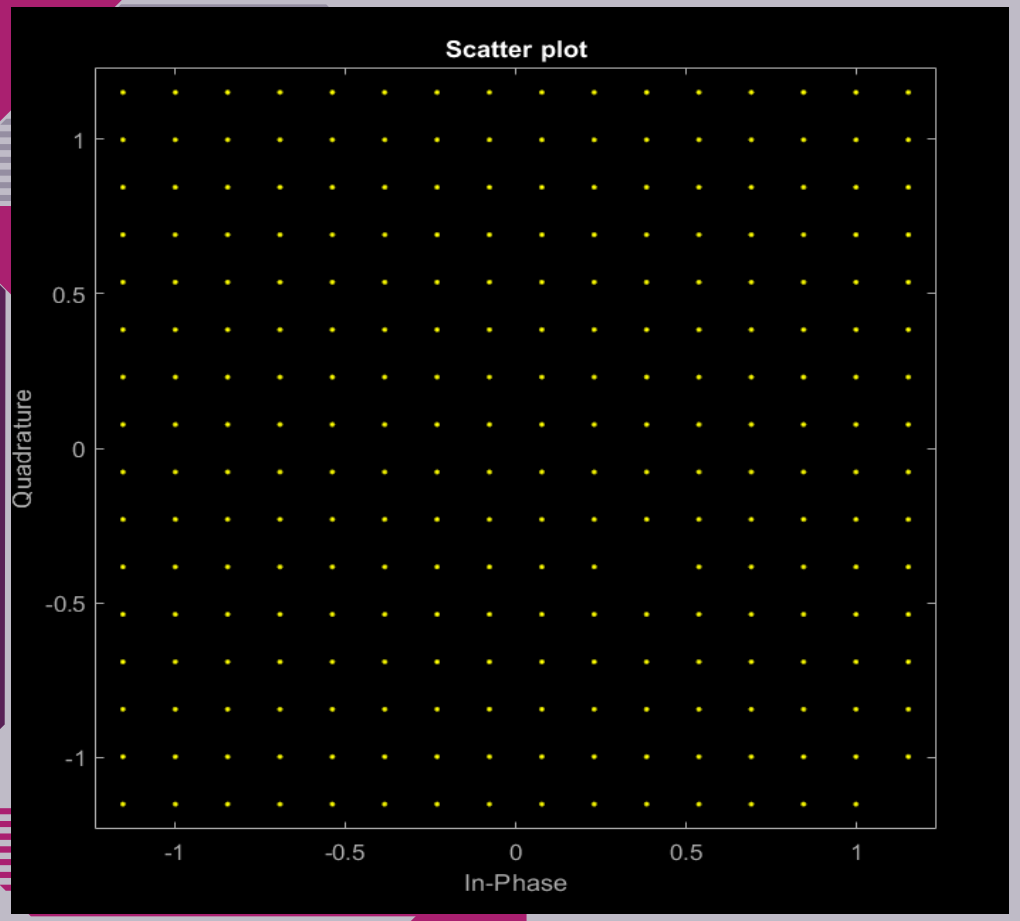


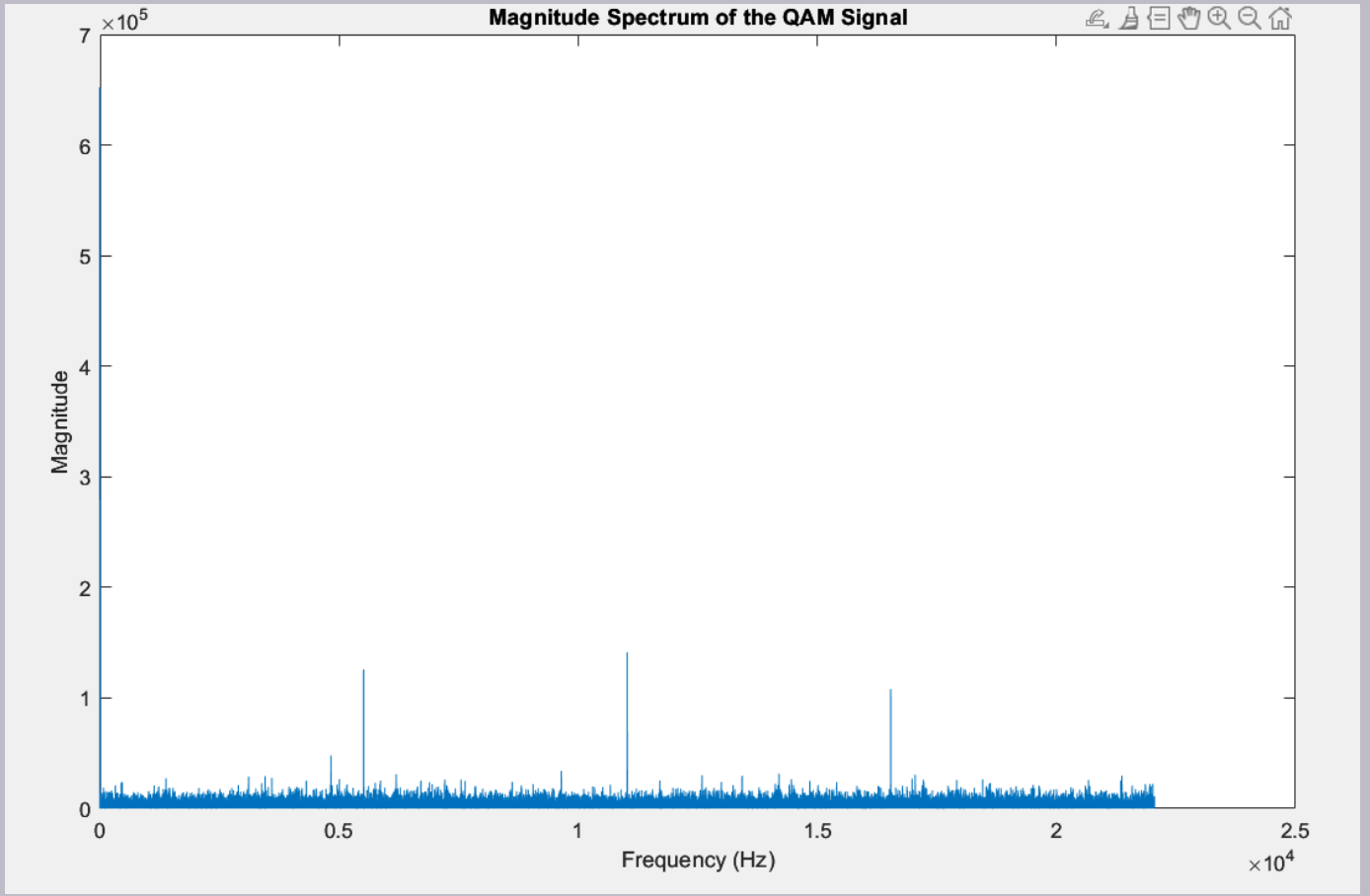




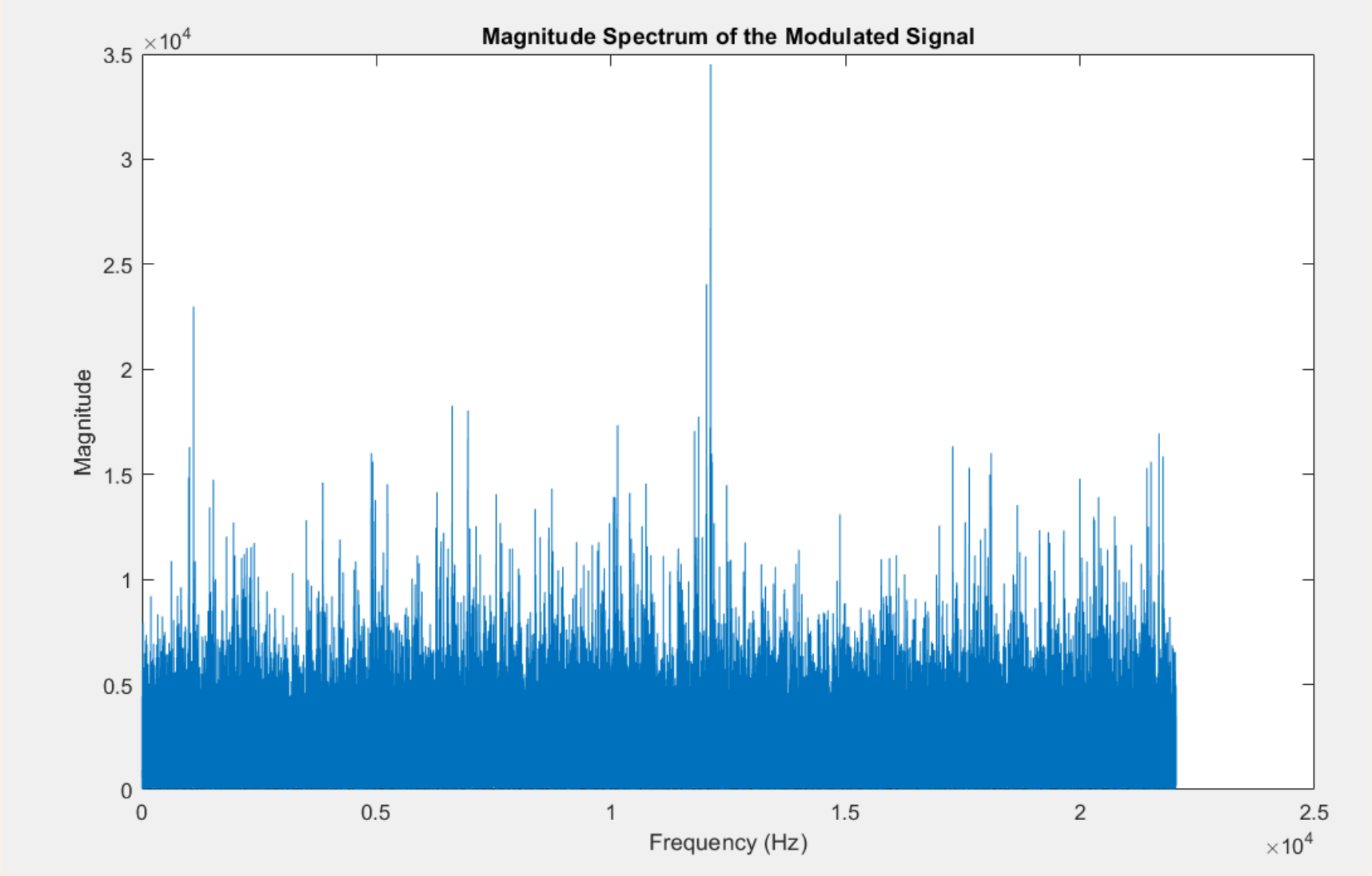


QAM SPECTRUM AND CONSTELLATION

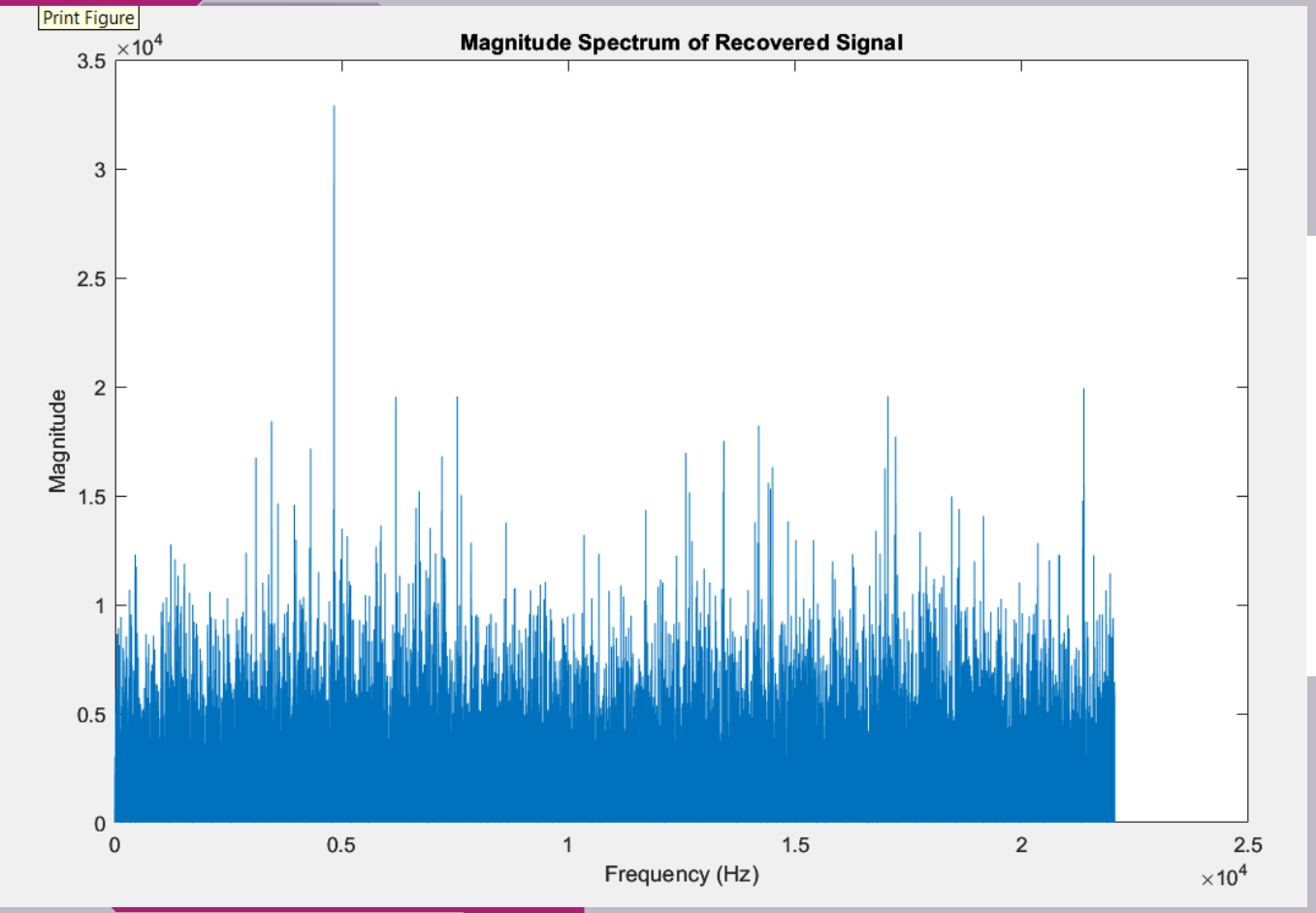




CARRIER MODULATION SPECTRUM



DEMODULATION AND RECOVERY




```
% Recover the original signal range
minValue = min(leftChannel); % Minimum value of the original signal
maxValue = max(leftChannel); % Maximum value of the original signal
recoveredSignal = normalizedSignalRecovered * (maxValue - minValue) + minValue;
```

AUDIO COMPARISON

Original Audio

Modulated Audio

Recovered Audio

Bonus Audio!

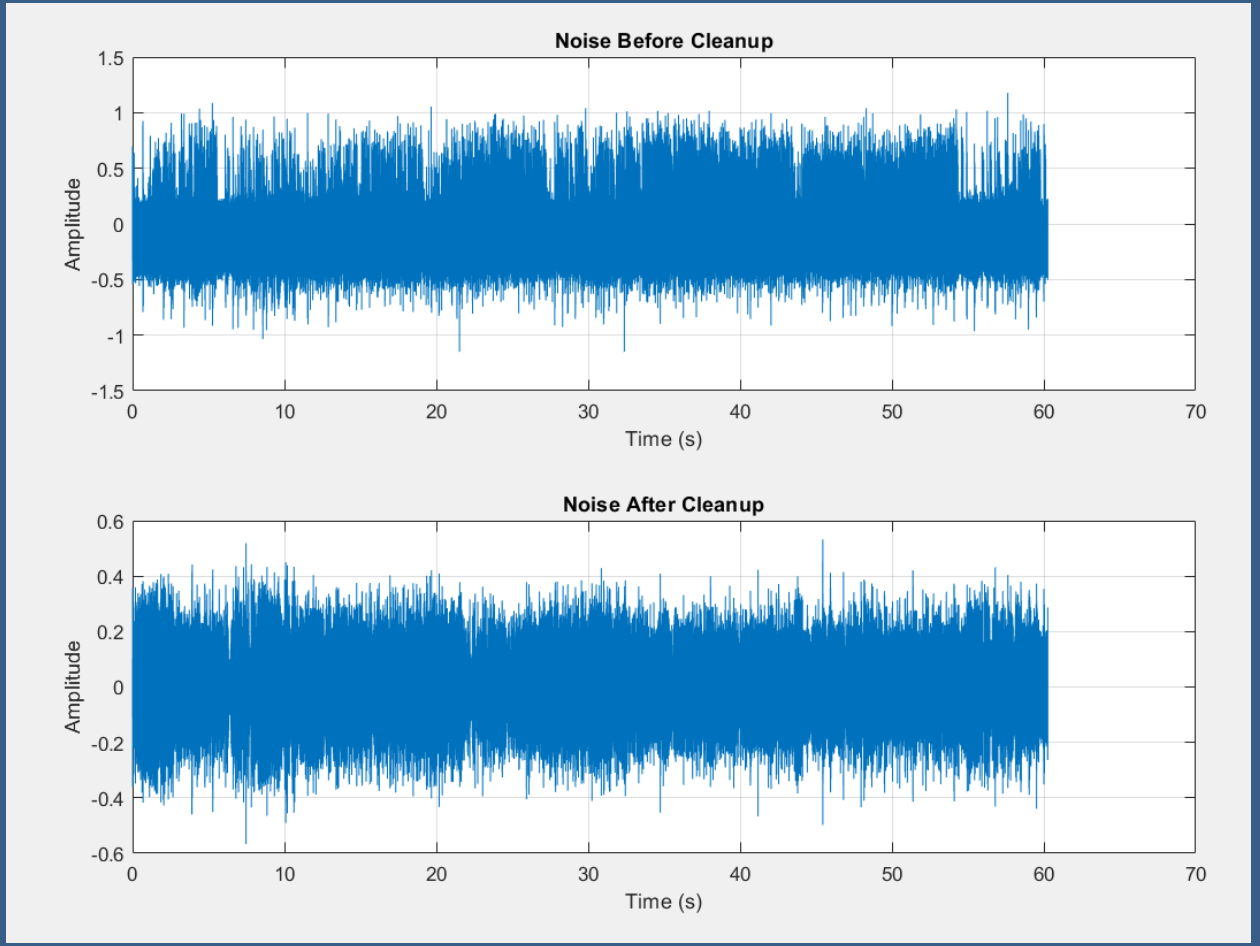
FUTURE WORK

Impacting the recovered signal via noise, was difficult. There was very little effect.

1. Build stand-alone QAM

1. Investigate and implement stronger methods of noise injection

2. Consider Jamming Techniques



FIN!