



Department of Electrical & Computer Engineering
ENEE4113 - Communications Laboratory

Experiment #11

Frequency Shift Keying (FSK) and Phase Shift Keying (PSK)

Prepared by:

Mohammad Abu-Shelbaia 1200198

Instructor: Dr. Ibrahim Nemer

Assistant: Eng. Mohammad Al-Battat

Section: 4

Date: August 27, 2023

Contents

1	Simulation and Data Analysis	1
1.1	Frequency Shift Keying (FSK)	1
1.1.1	Input Signals	1
1.1.2	Modulation and Demodulation	2
1.2	Phase Shift Keying (PSK)	6

List of Figures

1	Modulation/Demodulation Simulink Block Diagram	1
2	Message Signal	1
3	Carrier1 Signal	2
4	Carrier2 Signal	2
5	Modulated Singal	2
6	Demodulaed Singal	3
7	Modulated Singal (2V)	3
8	Demodulated Singal (2V)	4
9	Modulated Singal (500Hz)	4
10	Demodulated Singal (500Hz)	4
11	Modulated Singal (10% Duty Cycle)	5
12	Demodulated Singal (10% Duty Cycle)	5
13	Modulation/Demodulation Simulink Block Diagram	6

1 Simulation and Data Analysis

1.1 Frequency Shift Keying (FSK)

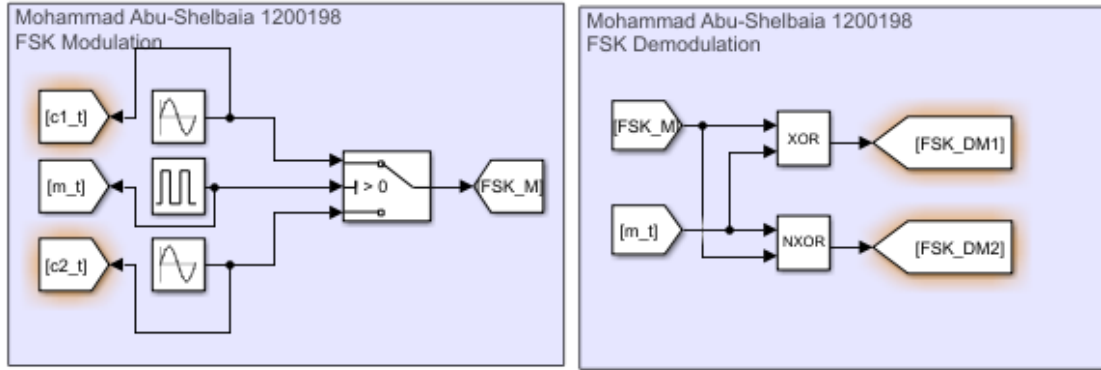


Figure 1: Modulation/Demodulation Simulink Block Diagram

The above system is simulated using MATLAB Simulink for different messages modulated over two carrier signal:

$$c(t) = \cos(2\pi(15k)t) \quad (1)$$

$$c(t) = \cos(2\pi(25k)t) \quad (2)$$

1.1.1 Input Signals

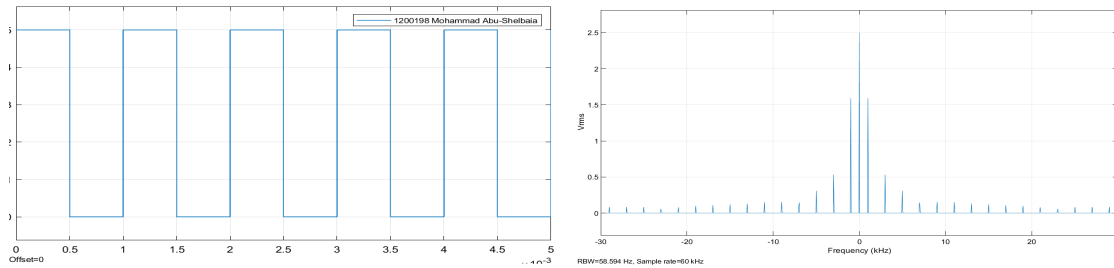


Figure 2: Message Signal

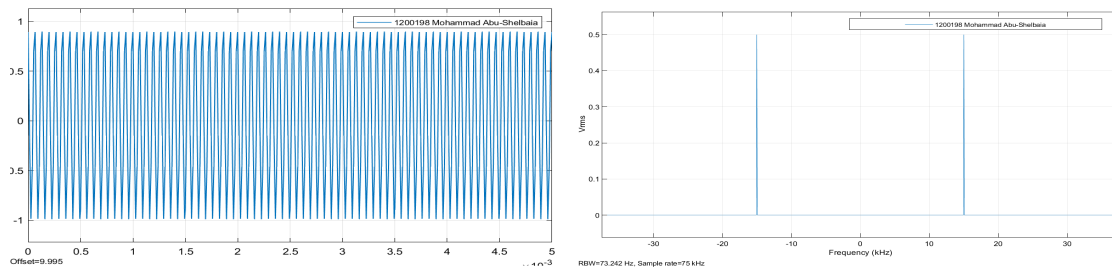


Figure 3: Carrier1 Signal

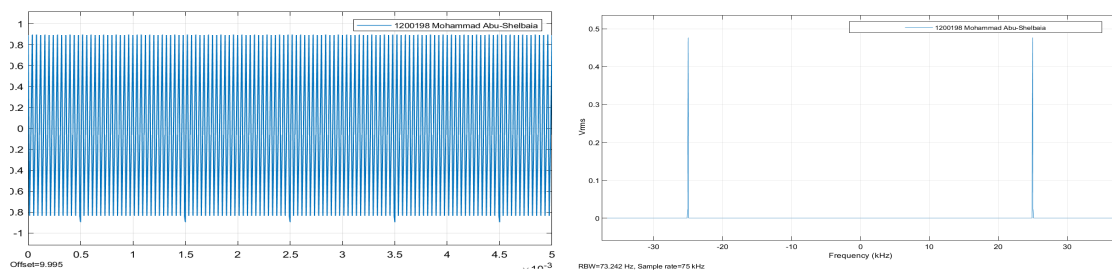


Figure 4: Carrier2 Signal

1.1.2 Modulation and Demodulation

Refrence Modulating Signal This is our refrence modulating signal, which is a pulse-train with a frequency of 1KHz, duty cycle of 50%, and an amplitude of 5V.

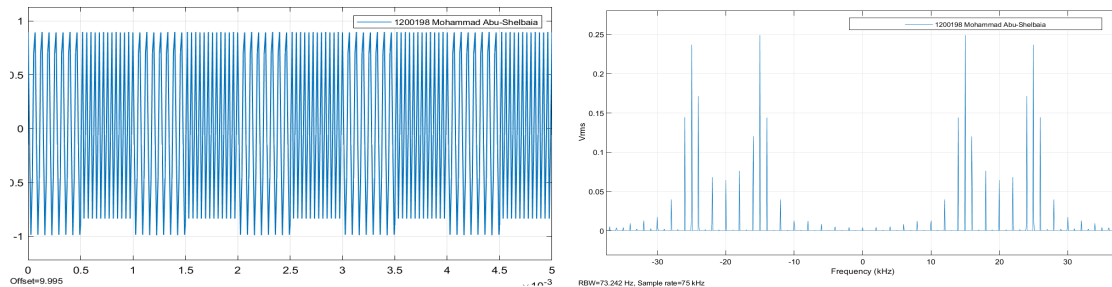


Figure 5: Modulated Singal

We can see that the modulated signal is a cosine wave with two different frequencies,

15KHz and 25KHz, each frequency is used to represent a bit, 0 or 1, the high frequency is used to represent 0, and the low frequency is used to represent 1.

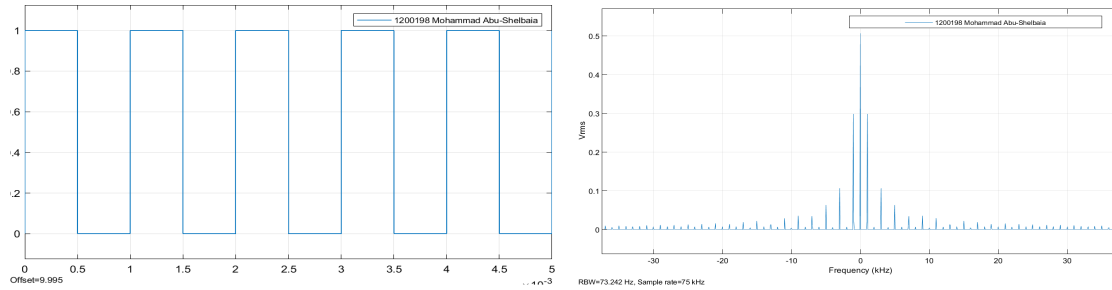


Figure 6: Demodulaed Singal

We can see that we have successfully demodulated the signal using both methods, the high portion of the message singal is recovered as 1, and the low portion is recovered as 0.

2V Modulating Signal

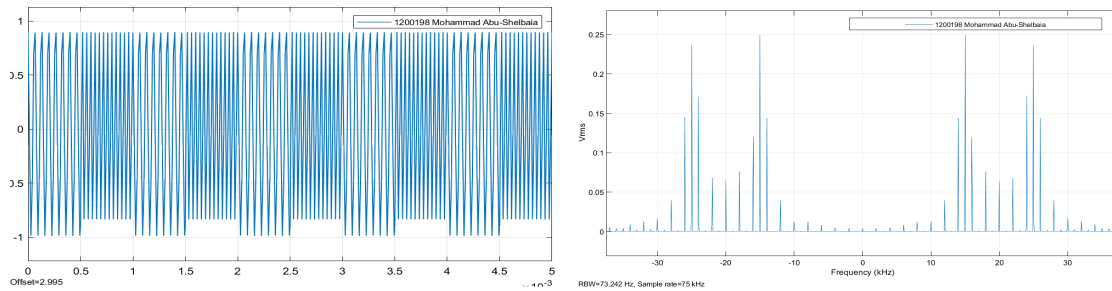


Figure 7: Modulated Singal (2V)

We can see that the amplitude of the modulating signal does not affect the modulated signal.

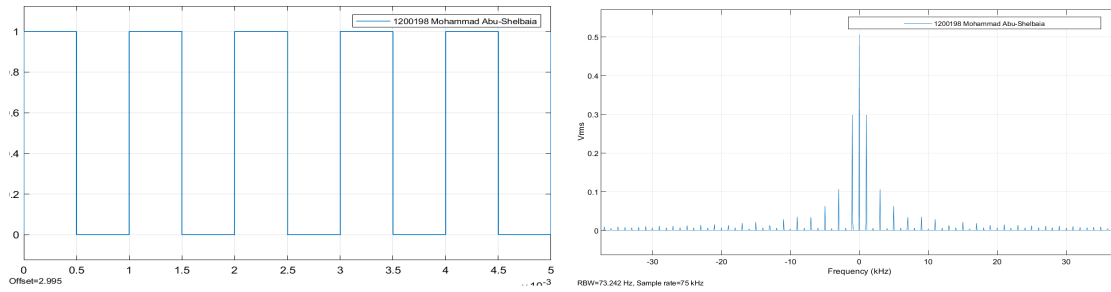


Figure 8: Demodulated Singal (2V)

We can see the same results as before, and we conclude that the amplitude of the modulating signal does not affect the demodulation process.

500Hz Modulating Signal

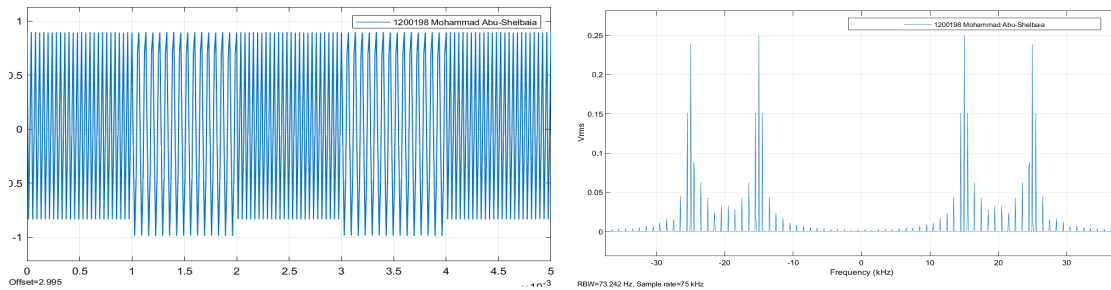


Figure 9: Modulated Singal (500Hz)

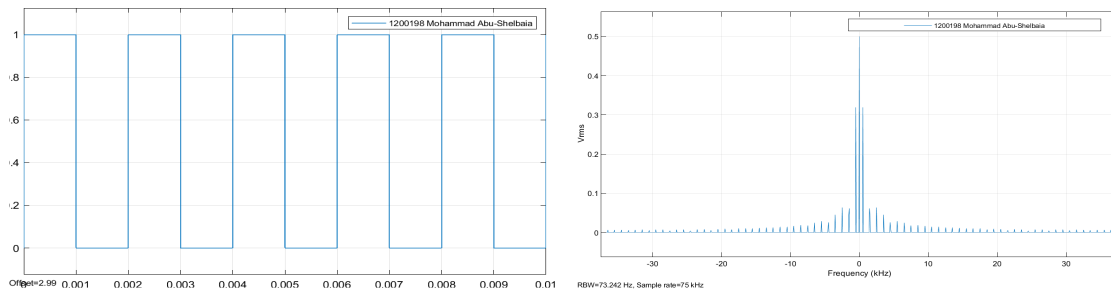


Figure 10: Demodulated Singal (500Hz)

Here the frequecy deviation (The space between pulses) is lower which saves band-width.

0.10 Duty-Cycle Modulating Signal

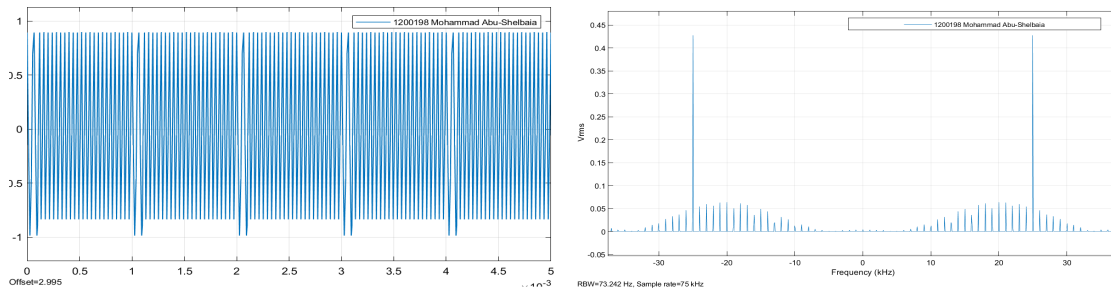


Figure 11: Modulated Singal (10% Duty Cycle)

We notice that the duty cycle of the modulating signal does not affect the modulated signal in simulation but it might affect it in real life since it looks like a noise to the modulated signal.

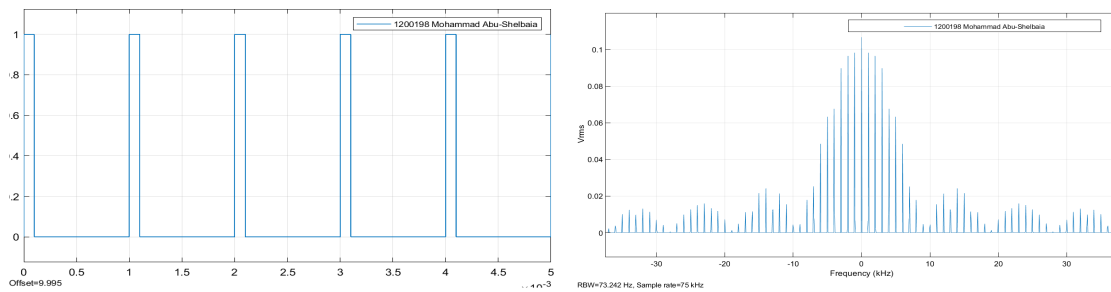


Figure 12: Demodulated Singal (10% Duty Cycle)

We can see as all the previous parts we were able to recover the message correctly, the high portion of the message signal is recovered as one, and the low portion is recovered as zero.

1.2 Phase Shift Keying (PSK)

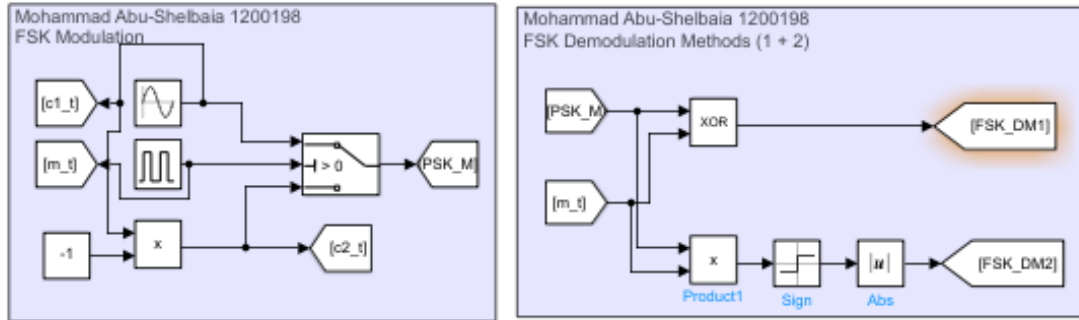


Figure 13: Modulation/Demodulation Simulink Block Diagram

The above system is simulated using MATLAB Simulink for different messages modulated over one carrier signal with a phase shift of 180 degrees:

$$c(t) = \cos(2\pi(15k)t) \quad (3)$$