Signals and Systems Lab

Laboratory report submitted for the partial fulfillment
of the requirements for the degree of

Bachelor of Technology
in
Computer and Communication Engineering

by

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Chapter *1*

Experiment - 8

1.1 Aim:

Using MATLAB Simulink:

1) To generate frequency modulated signal (using varactor diodes in the oscillator circuit) and Demodulated Signal.
2) To study the characteristics of Phase Locked Loop, identify Lock and Capture range.

1.2 Software Used

MATLAB

1.3 Theory

1.3.1 FM Modulation

Frequency Modulation is the process of varying the frequency of the carrier signal linearly with the message signal. Consider a message signal defined by s(t) = Am cos 2fmt. The instantaneous frequency of the FM signal is expressed as

f(t) =fc + kf Am cos 2fmt =fc + f cos 2fmt (2 where f = kfAm is the maximum frequency deviation that occurs in the carrier frequency. Modulation index is

Beta =f/fm =kfAm/fm

The quantity beta is a dimensionless quantity since kf has the units of volt1 second1. The FM signal is given by

sFM(t) = Ac cos[2fct + (beta)sin 2fmt]

1.3.2 FM Demodulation

A coherent detector has two inputs - one for a reference signal, such as the synchronized oscillator signal, and one for the modulated signal that is to be demodulated.

A non-coherent detector has only one input, namely, the modulated signal port.

Phase-Locked Loop (PLL) Detector

• Coherent demodulator • Superior performance; complex and expensive

1.4 Simulink ScreenShots

1.4.1 Simulink Block Diagram

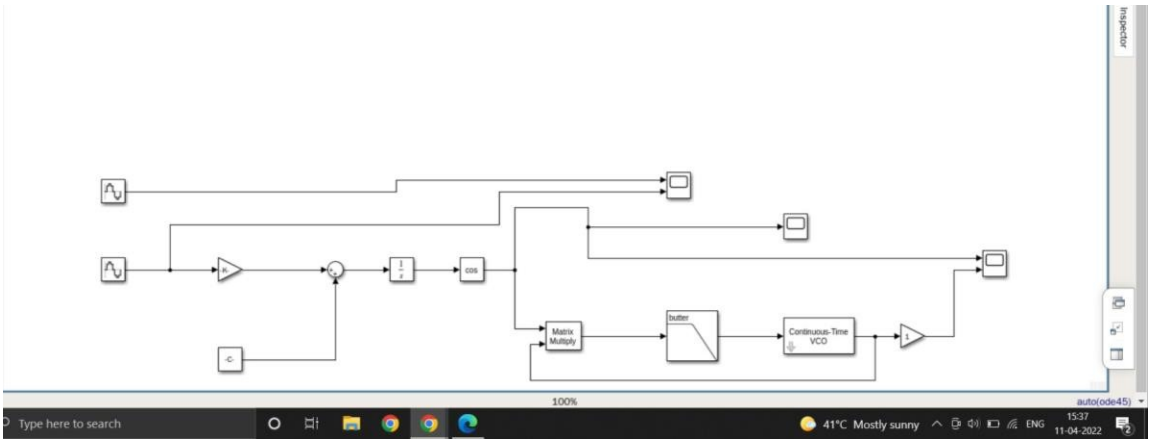

Figure 1.1 Block Diagram

1.4.2 Carrier, Message and Modulated Signal

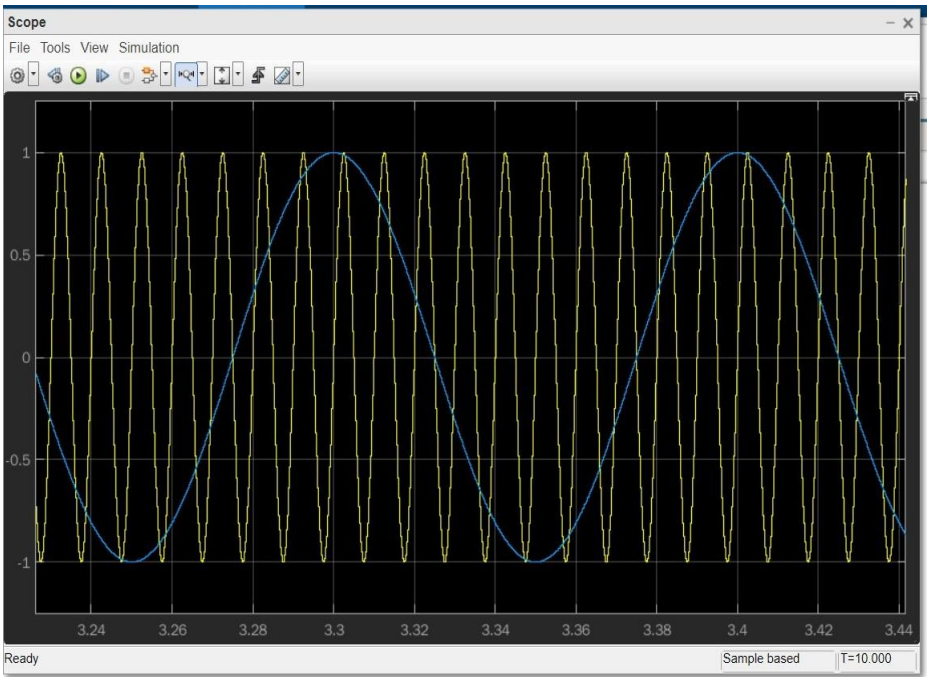

Figure 1.2 Yello is carrier and blue is message

1.4.3 Demodulated Signal

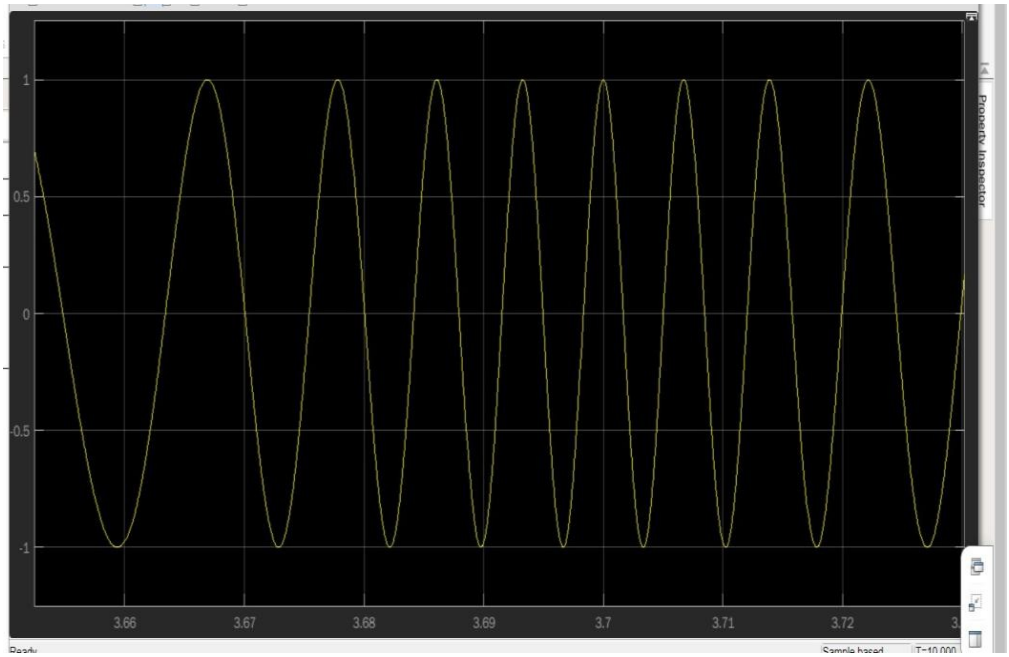

Figure 1.3 The FM signal

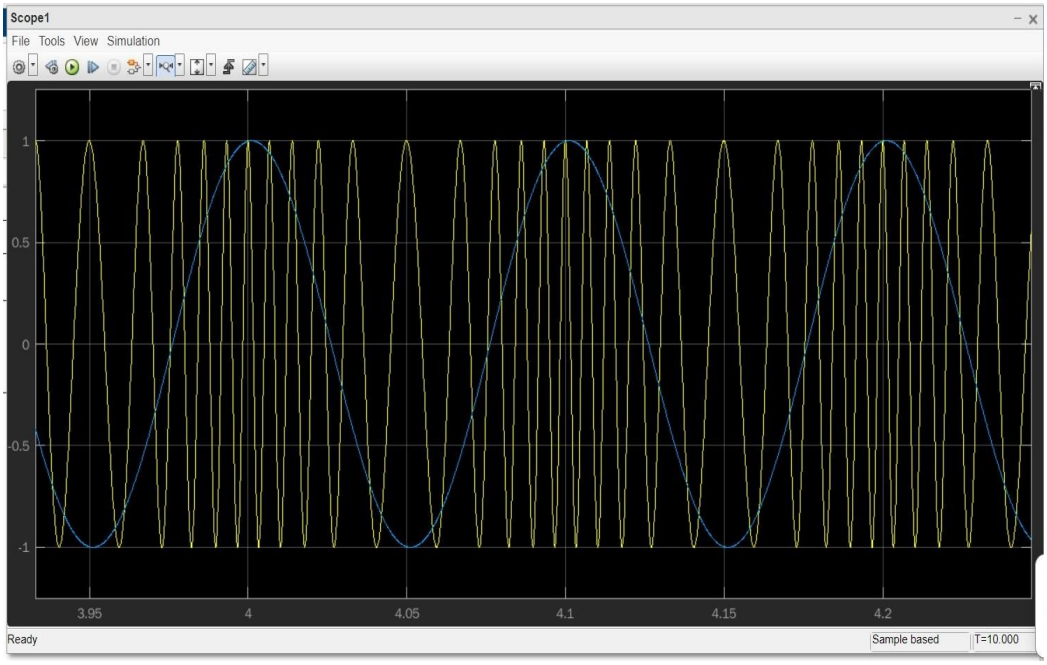

Figure 1.4 Yellow is modulated signal and blue is demodulated signal

1.5 Conclusion and Analysis of Results

In this experiment we learnt about how to create FM signal and how to demodulate it. In frequency modulation, the instantaneous frequency keeps on changing unlike AM where the amplitude is the quantity that changes. The demodulation is done by using a PLL. In the graph that we obtain, we can see that the the high frequency regions of the FM correspond to the high amplitude region of our message wave and vice versa.