

Title of the Experiment:

Frequency Modulation – Modulation using eSim

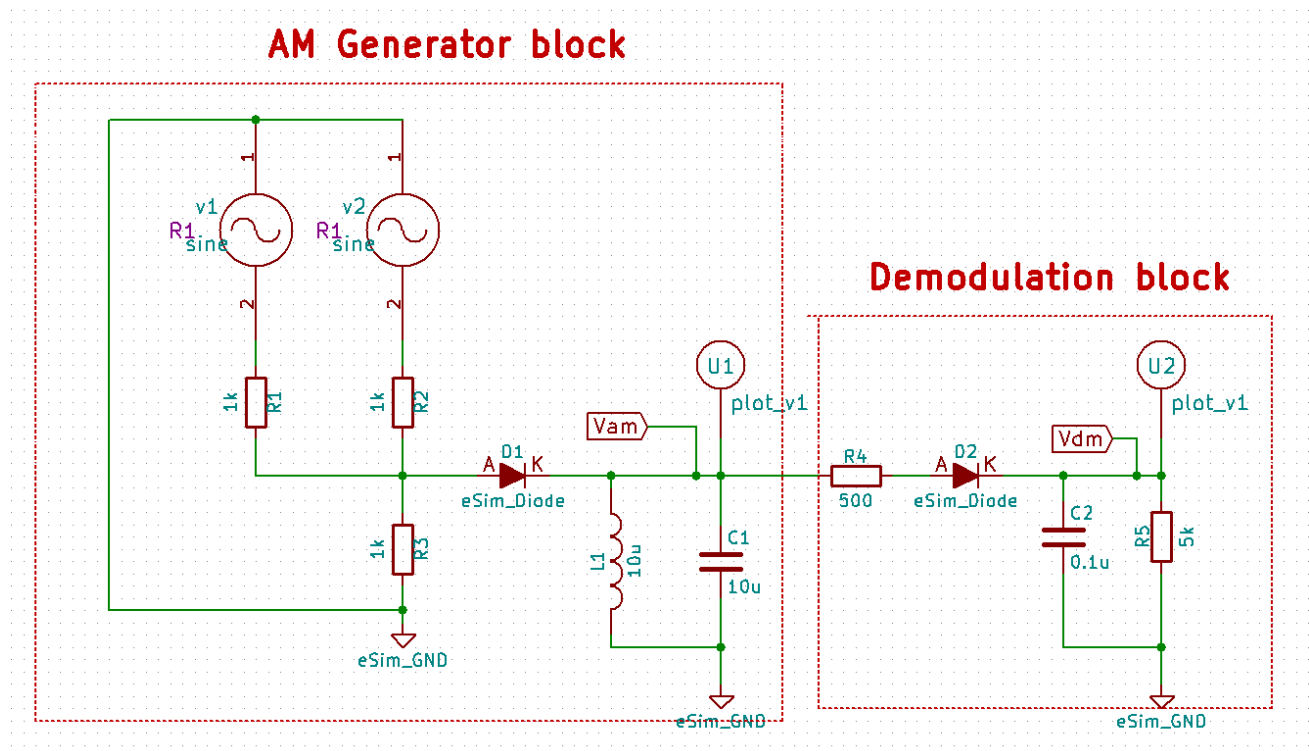
Theory:

Amplitude Modulation is a modulation technique used for convenient transmission of message signals by varying the amplitude of the carrier signal. This method is most commonly used for transmitting audio signals or short-wave radio signals over high frequency waves. AM signals are also referred to as Double Side Band-Full Carrier (DSB-FC) signals as AM signals have two sideband components attached to the main carrier wave. Some techniques of AM generation include Analog Modulation like Square Law Modulator, Digital Modulation, Pulse Code Modulation etc.

To extract the message signal back from the AM signal, we require Demodulation. The most commonly used Amplitude Demodulation method is the 'Envelope Detector' circuit. It is highly preferable since the hardware overhead is minimal yet results are accurate.

Schematic Diagram:

Below is the schematic for Amplitude Modulation-Demodulation circuit.



Simulation Results:

1. NgSpice Plots:

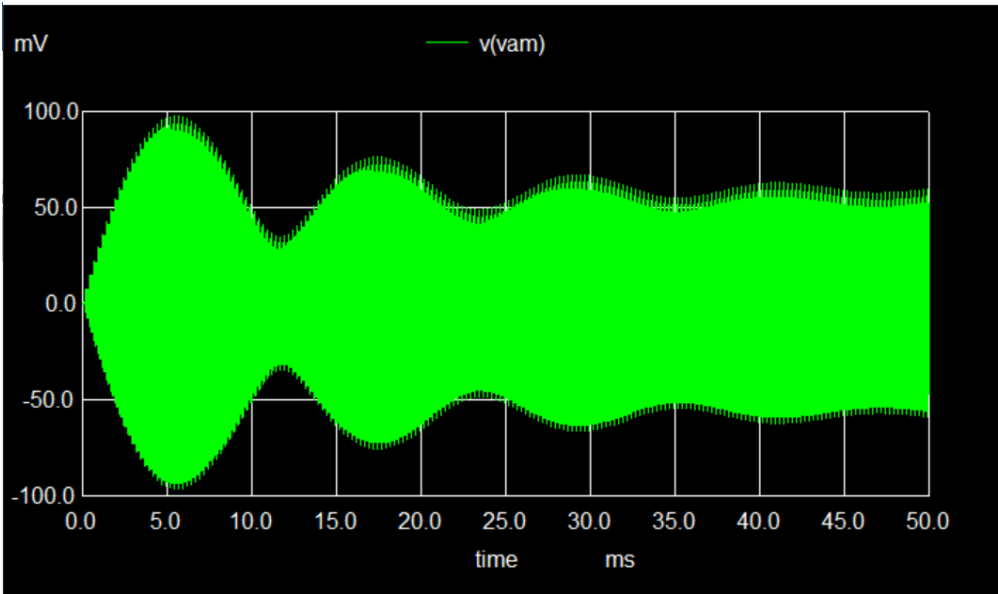


Figure 1: Ngspice AM signal output

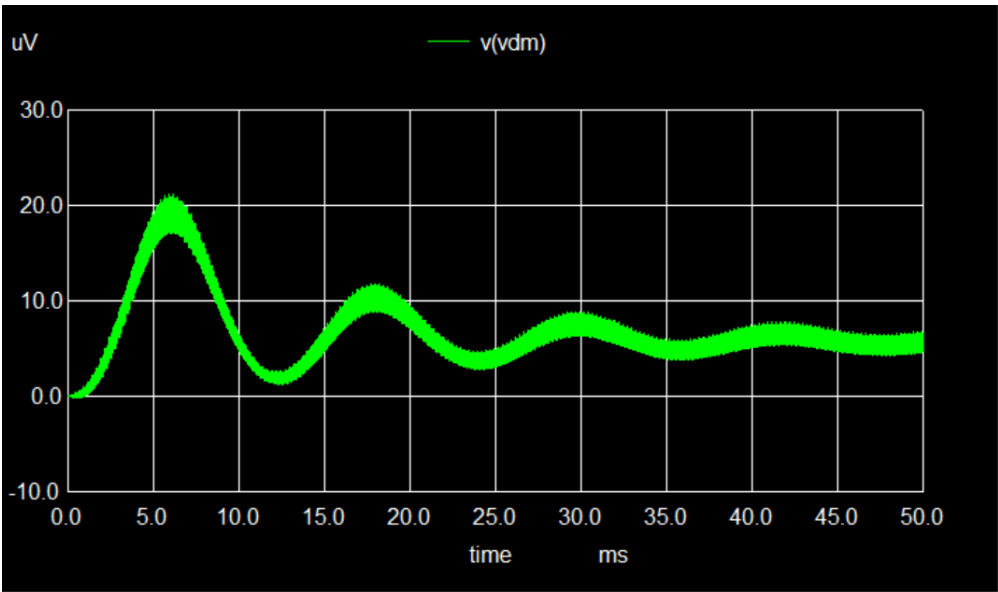


Figure 2: Ngspice Demodulated signal output

2. Python Plots:

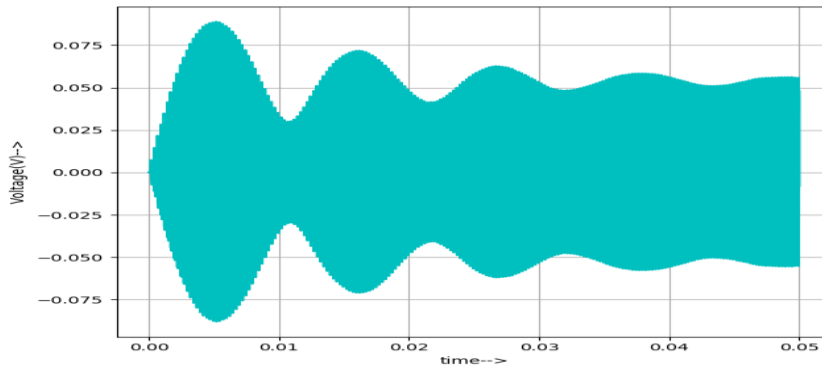


Fig 3: Python Amplitude Modulated Signal plot

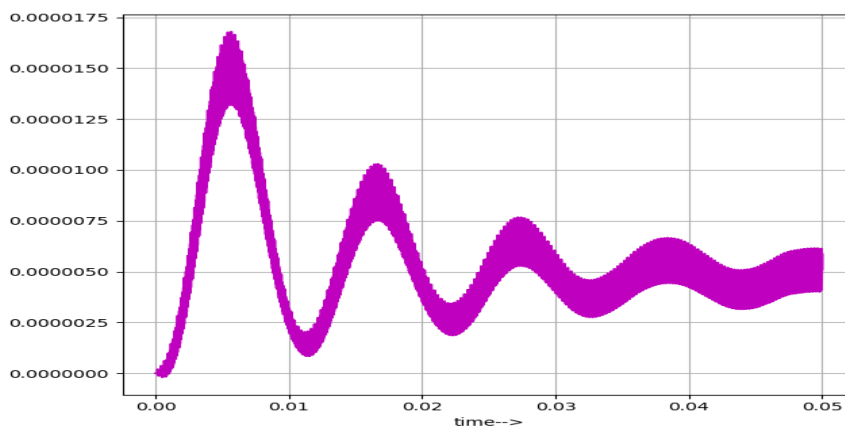


Fig 4: Python Amplitude Demodulated Signal plot

Conclusion:

From the above simulations, we have thus understood the generation of an Amplitude Modulated (AM) Signal by using a low frequency message signal riding over a high frequency carrier signal and successful demodulation of the AM using an Envelope Detector circuit.

References:

1. https://www.tutorialspoint.com/analog_communication/analog_communication_amplitude_modulation.htm
2. https://en.wikipedia.org/wiki/Amplitude_modulation