

Experiment No:04

Amplitude Modulation

Laboratory Tasks

To build a simple unbalanced Amplitude Modulator.

Background

Read Chapter#03 of the text [John G. Proakis and Masoud Salehi (2014)] for theoretical background of the experiment.

Description

The circuit in Figure 4.1 is used to implement an unbalanced Amplitude Modulation. In the circuit shown, V1 and V2 are two sinusoidal sources for generating the message and carrier signals respectively. The R1-V1-V2 network adds the carrier and message signal. The diode D1 is the nonlinear device used to achieve modulation, while the network C1-L1-R4 is the band-pass (BP) filter. The inductor used for the experiments may not have the same inductance and hence the resonant frequency of the BP filter will be different. Note that the resistor R4 is not required in the actual hardware implementation. It was used in the simulation to control the resistance of the inductor. You should be able to realize that changing R4 affects the Q-factor of the band-pass filter.

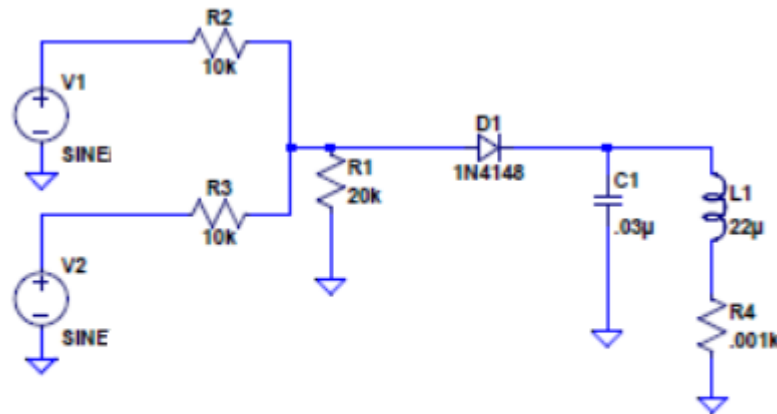


Figure 4.1: The unbalanced AM modulator.

In this lab, you will perform the following task:

1. Find the resonant frequency f_o of the BP filter by ignoring its resistance.
2. Set the frequency of one of the sinusoidal sources to f_o . Will this source be the carrier or the message signal?
3. Set the frequency of the other sinusoidal source appropriately. i.e. if it is generating a carrier signal then its frequency is to be more than 100 times greater than the message signal's frequency or vice versa.
4. Implement the circuit on breadboard and observe the output. Plot the input and output signals.
5. For task in (4), explain the output waveform, the methodology and the circuit.

Rubrics for hardware experiments evaluation are as follows:

Performance	Exceeds expectation (2)/(1)	Meets expectation (1.5)/(0.5)	Does not meet expectation (0)/(0)	Marks
R1: Realization of Experiment's Hardware on Breadboard. Marks: 0-2	The circuit is patched correctly, and safely, with neat connections on the breadboard	The circuit is patched neatly and correctly, but not in a workable form	Incapable to patch the circuit correctly and neatly on breadboard	
R2: Knowledge of theoretical aspects Marks: 0-2	Has theoretical knowledge required for the experiment	Has partial theoretical knowledge about the experiment	Has no background knowledge about the experiment	
R3: Conducting Hardware Experiment. Marks: 0-1	All the required tasks are correctly implemented	The required tasks are partially implemented	Unable to implement all the tasks even with guidance	
R4: Demonstrate proper results with justification. Marks: 0-2	Correct results are provided with required justification	Results are provided with minor errors and/or with little justification	Results are provided with major errors and/or with no justification	