EE 316: Electrical Circuits and Electronic Design Laboratory.

Lab 08

Amplification of a Signal at Using JFETs.

Submitted by: **Dan Otieno.**

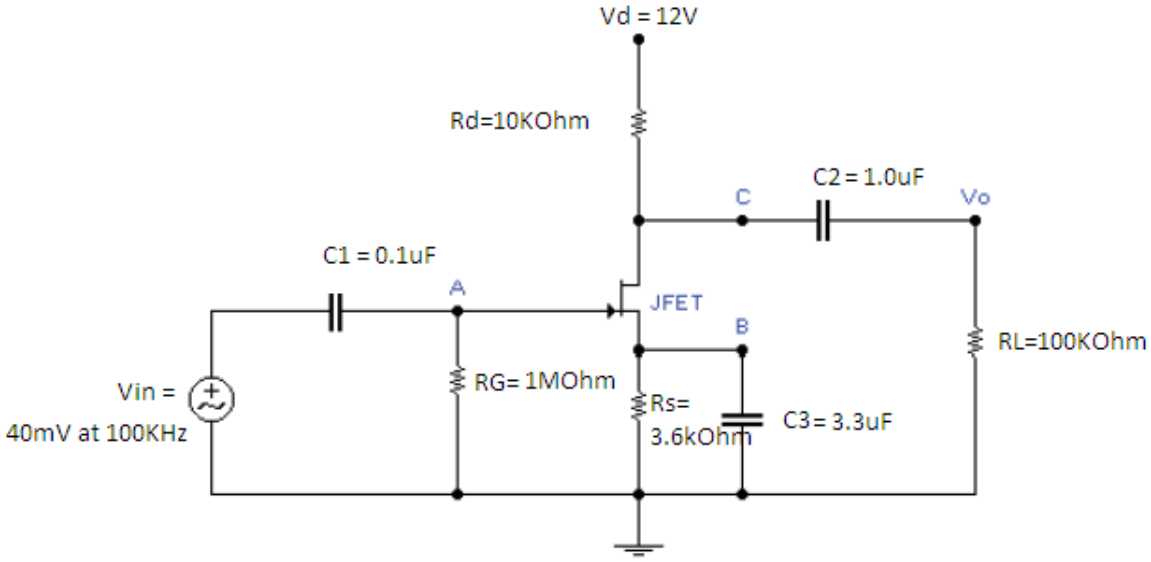
Date of Experiment: 10/17/22.

INTRODUCTION:

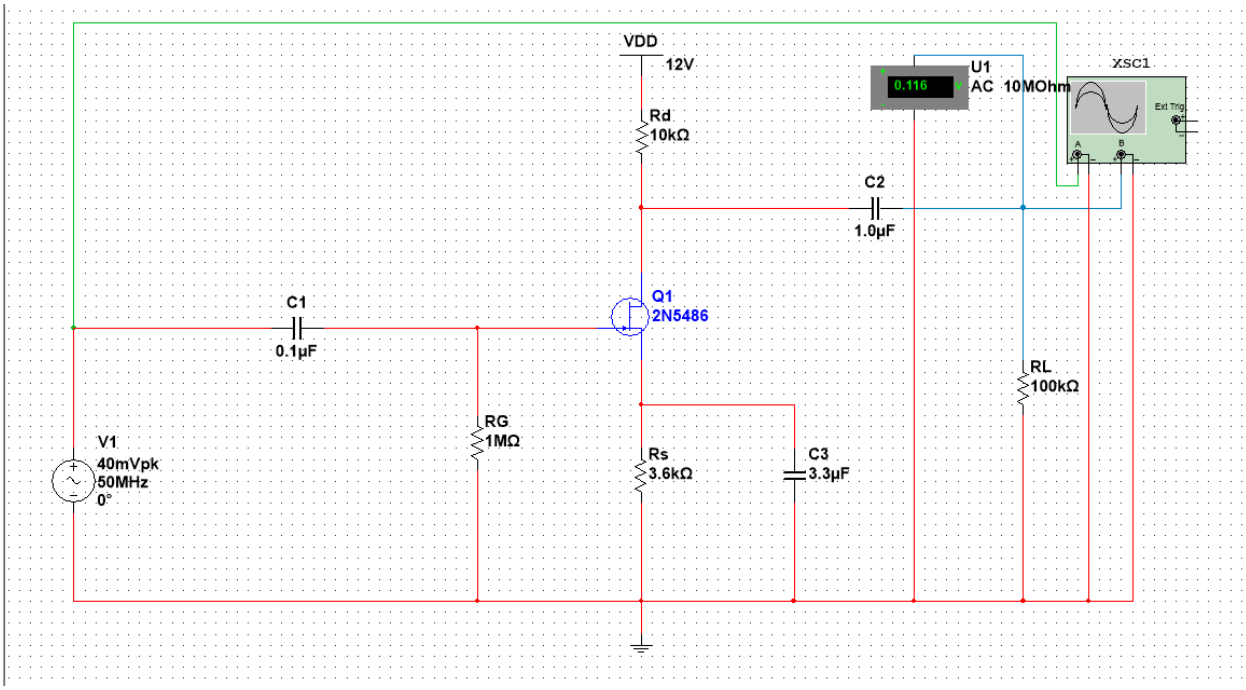
The laboratory builds up to the previous lab, simulating and experimenting with Field Effect Transistors (FETs). For this lab, we design, simulate, and analyze circuits with JFETs. **NOTE: This report only contains details from the simulation and a photo of the hardware setup in the laboratory. Unfortunately, the waves and output data were not achieved in the laboratory with hardware, despite consistently checking the circuit layout and testing different equipment.**

PART A:

The first part of the lab was to design and simulate the circuit shown below:



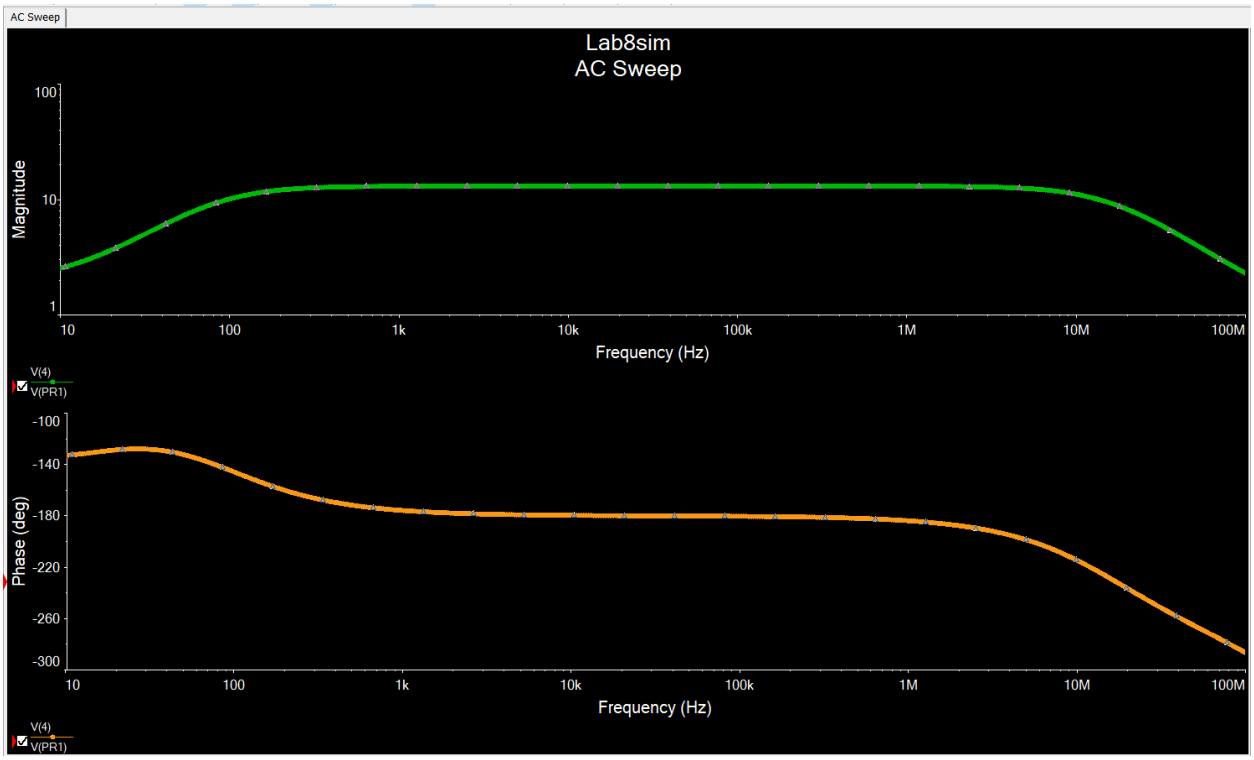
The circuit was completed in Multisim as shown:



After completing the circuit, I analyzed it through an AC Sweep and interactive simulation. The complete AC Sweep graph and simulation data is shared below:

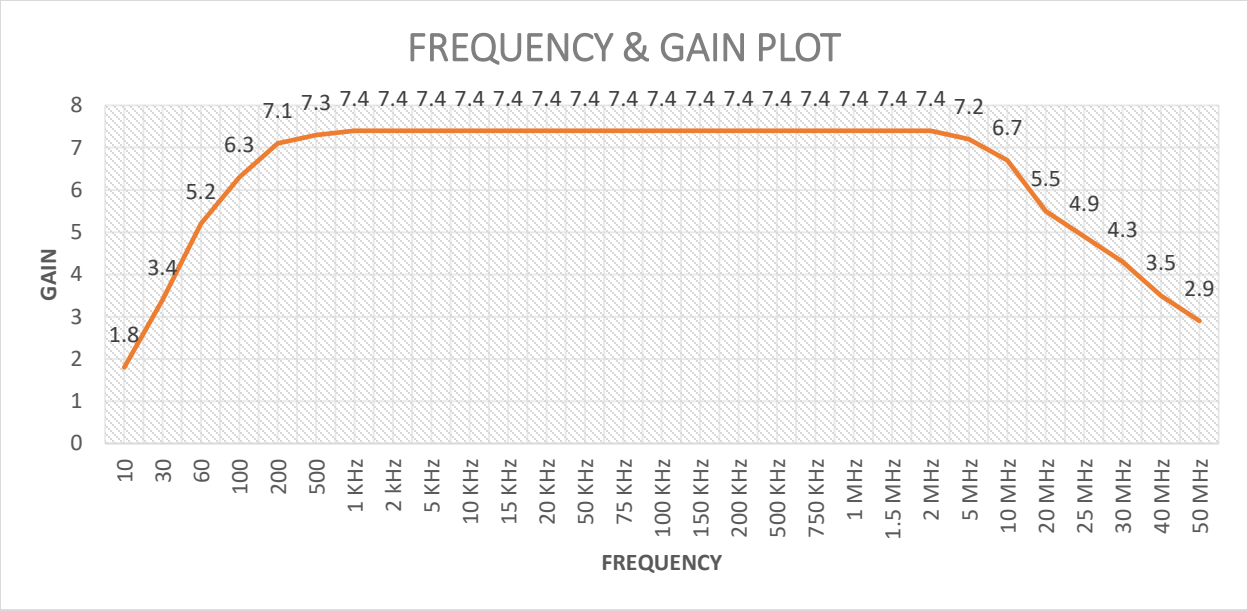
Frequency	Vout	Voltage Gain
10	0.072	1.8
30	0.136	3.4
60	0.209	5.2
100	0.253	6.3
200	0.282	7.1
500	0.292	7.3
1 KHz	0.294	7.4
2 kHz	0.294	7.4
5 KHz	0.294	7.4
10 KHz	0.294	7.4
15 KHz	0.294	7.4
20 KHz	0.294	7.4
50 KHz	0.294	7.4
75 KHz	0.294	7.4
100 KHz	0.294	7.4
150 KHz	0.294	7.4
200 KHz	0.294	7.4
500 KHz	0.294	7.4
750 KHz	0.294	7.4
1 MHz	0.294	7.4

1.5 MHz	0.294	7.4
2 MHz	0.294	7.4
5 MHz	0.289	7.2
10 MHz	0.268	6.7
20 MHz	0.218	5.5
25 MHz	0.194	4.9
30 MHz	0.173	4.3
40 MHz	0.14	3.5
50 MHz	0.116	2.9



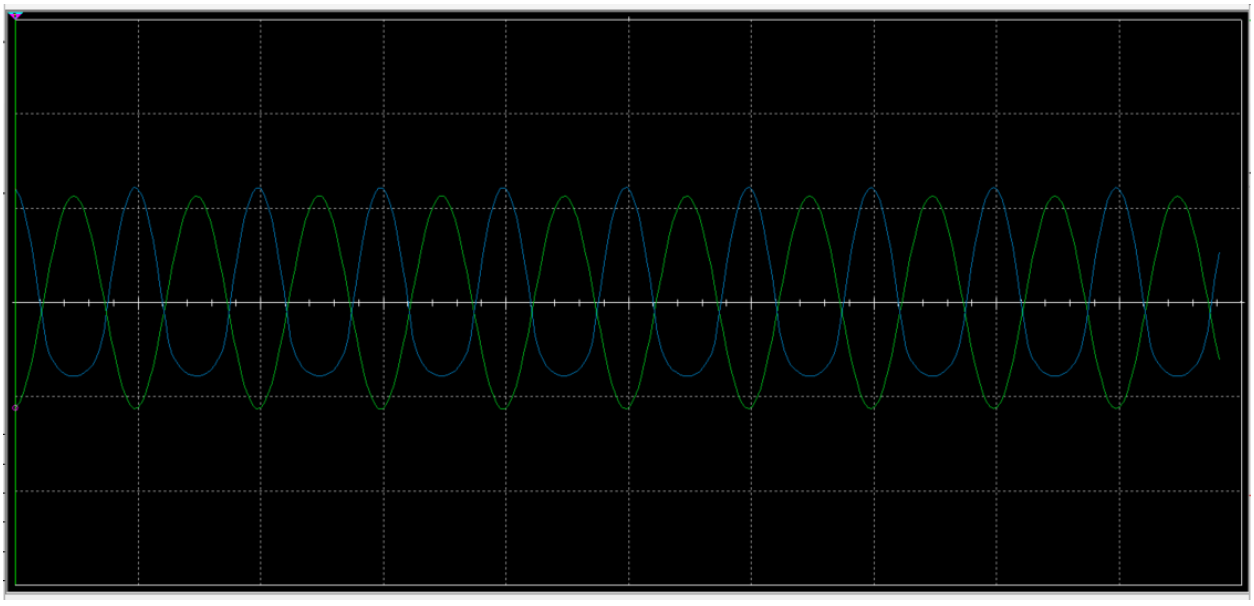
Gain is calculated from the table using the formula Vout / Vin, where Vin is just constant 40mV.

Next, I plotted the voltage gain as a function of Frequency in Excel, that chart is as shown below:



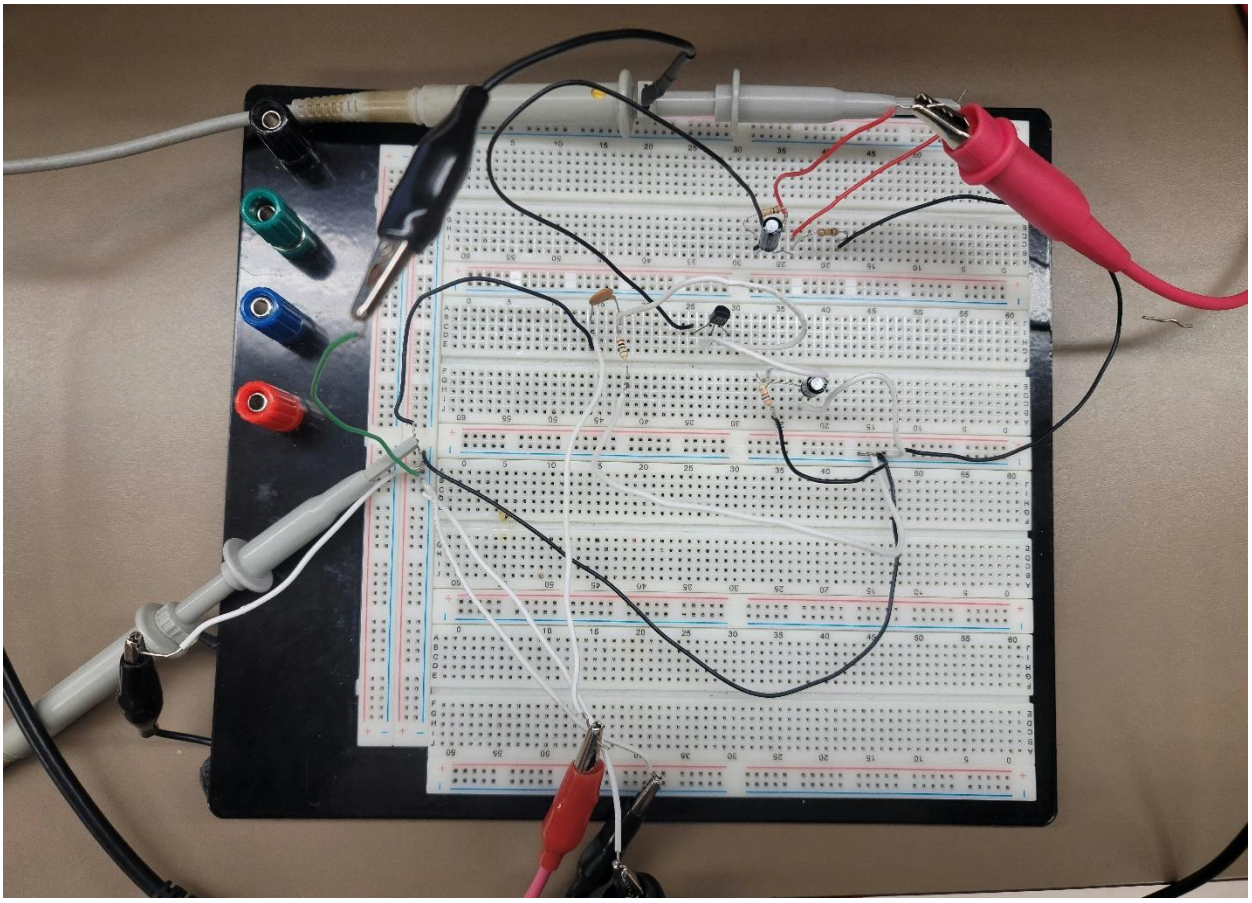
We can see that the chart above just about matches the magnitude/frequency plot on the AC Sweep graph.

The waveform achieved in the simulation is below:



PART B:

For the hardware portion of the experiment, the setup is in the photo below:



As already mentioned, I was unable to complete the experiment within the lab period, because of unexplainable issues that we could not determine with the instructor's assistance. This may be included in a separate report as allowed.

CONCLUSION:

The conclusion I was able to draw from the simulation, is the signal starts at a steady upward trajectory as frequency increases, almost a linear trend, and then flattens at roughly 200Hz, which I would suggest is the F_{low} value, and then starts to drop at 2MHz, which I would suggest is the F_{High} value.