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ECEN 325 Section 510

Lab date: 4 April 2024

Due date: 8 April 2024

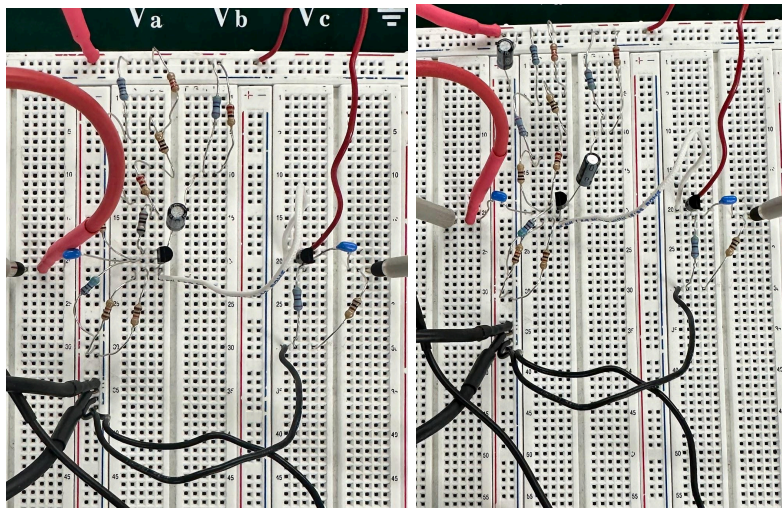
Lab 8: BJT Amplifier Design

Procedure:

For the lab procedure, I started by building the two-stage BJT amplifier circuit from the lab manual with my calculated component values, and measured the DC values stated in the manual. I then connected it to the oscilloscope to measure the gain and input resistances. Next I applied a 5 kHz, 50 mV sine wave signal as my input voltage and obtained a time domain waveform showing the input and output voltages. Next, I measured the THD of the output waveform using the oscilloscope.

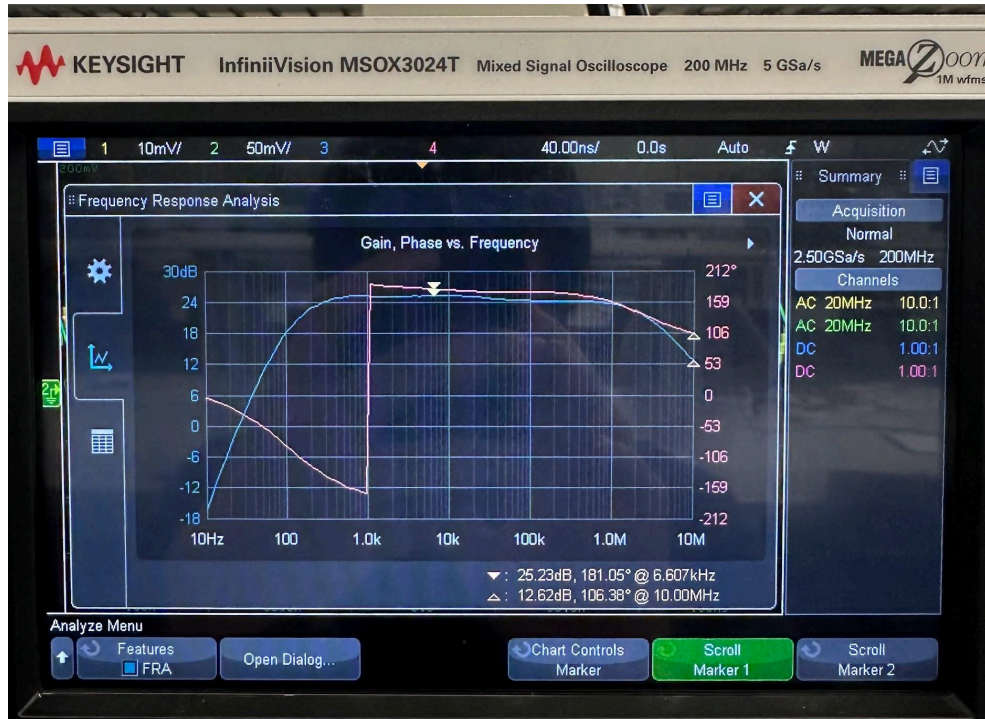
Two-stage BJT amplifier circuit:

Breadboard

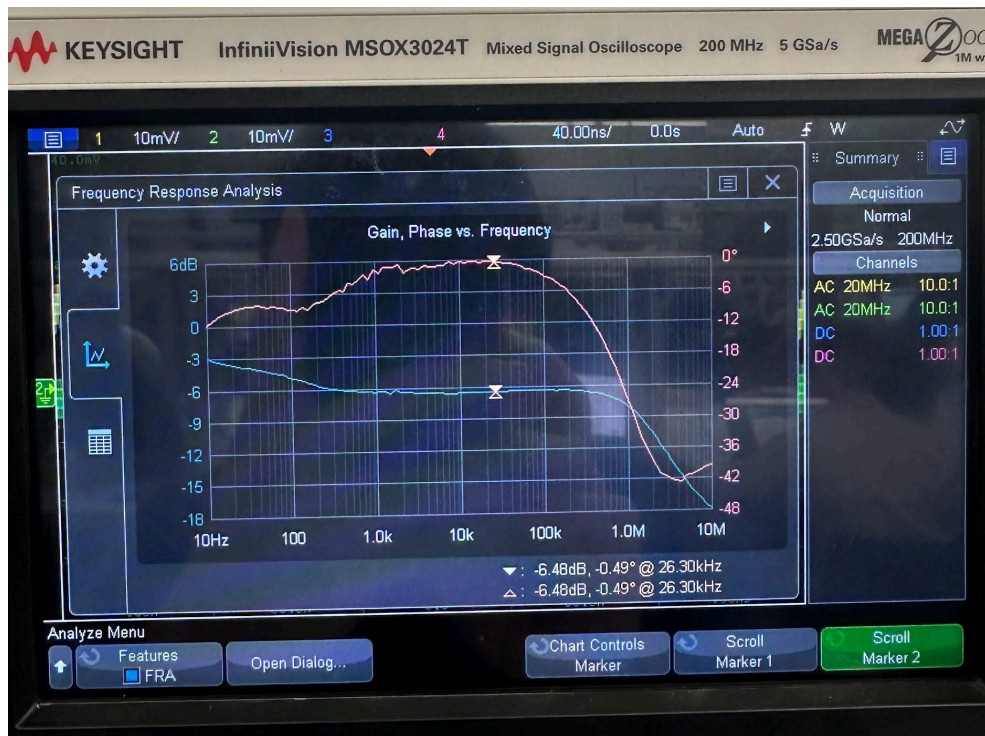


Here are the two circuits I used for the measurements. The circuit on the left was used to measure the DC operating point and the circuit on the right was used to obtain the rest of the measurements. The only difference between the two is that there is an extra 100 uF capacitor connected from V_{CC} to ground for the circuit on the right, since the circuit was producing a highly distorted output signal.

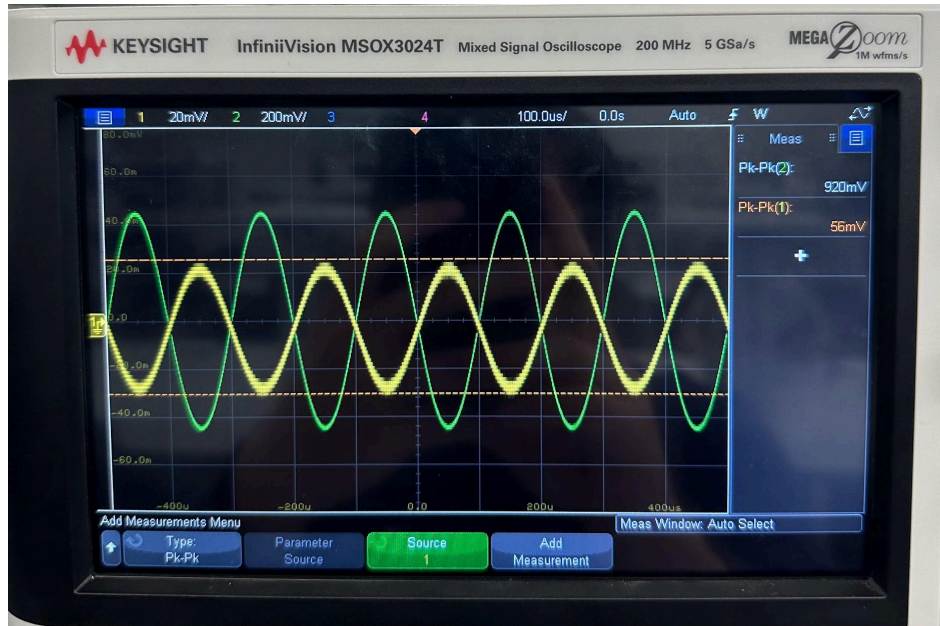
Gain Bode Plot:



R_i Bode Plot:



Time-domain waveform:



THD waveforms:



Data Tables and Results:

Table 1:

Below is a table for the NPN common emitter circuit comparing the calculated and simulated DC operating results with the measured values in the lab

	V_{RB2} (V)	V_{RE} (V)	V_{RC} (V)	V_{RH} (V)	I_{C1} (mA)	I_{C2} (mA)	A_v (V)	R_i (k Ω)	V_{out} (V)	THD (%)
Calculated	2.8	1.5	2.2	1.5	4.4	30	20	1	1	5
Simulated	2.71	1.55	2.16	1.4	4.43	29.46	20.2 5	1.45	1.05	4.41
Measured	2.79	1.64	2.23	1.49	4.51	31.21	18.2 6	1.35	0.92	1.22

Here we can see that all of the calculated, simulated, and measured values are all consistent with each other and satisfy the given parameters, with the biggest difference being the simulated and measured THD values. Some of the differences in the measured values could be due to the extra capacitor used in the lab measurements, as well as extra noise in the breadboard and oscilloscope.