

Design Project: Progress Report 3

Table 1: Specifications of Amplifier Design

V_T	\square	V_{CC}	A_{V1}	A_{V2}	A_{V3}	V_E	I_C	V_{BE}	$\square/(1+\square)$	$iR1$
25 mV	100	12 V	-15.6	-16.8	1	0.4 V	1 mA	0.7 V	1	10lb

Since the last report, we have completed a major part of the circuit design, which is impedance bridging. Doing this has allowed our gain to reach well upwards of 200V for our final cascaded design.

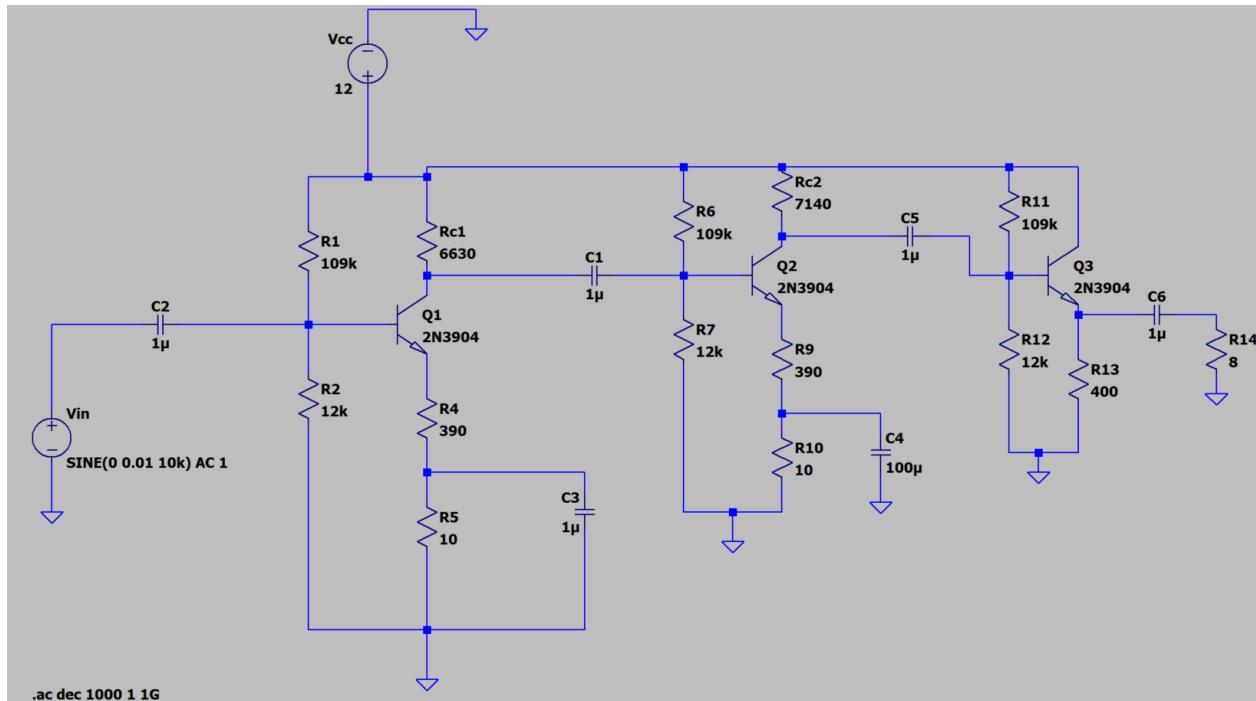


Figure 1: Fully Cascaded Amplifier (No Impedance Bridging)

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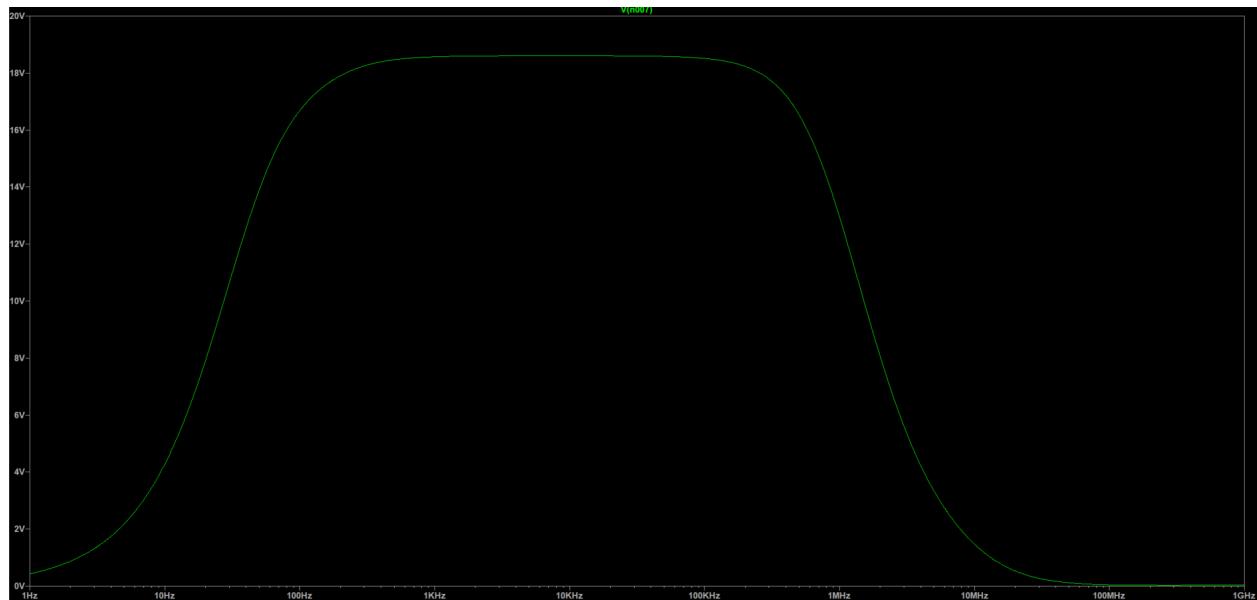


Figure 2: Bode Plot of Fully Cascaded Amplifier (no Impedance Bridging)

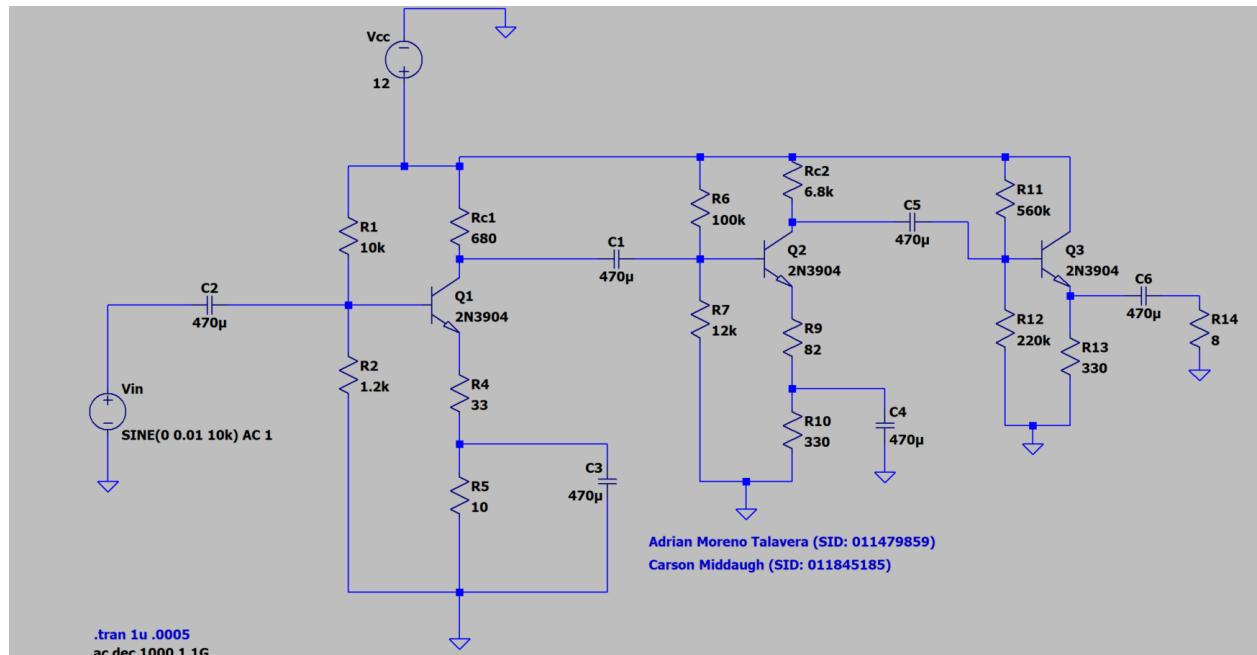


Figure 3: Fully Cascaded Amplifier (with Impedance Bridging)

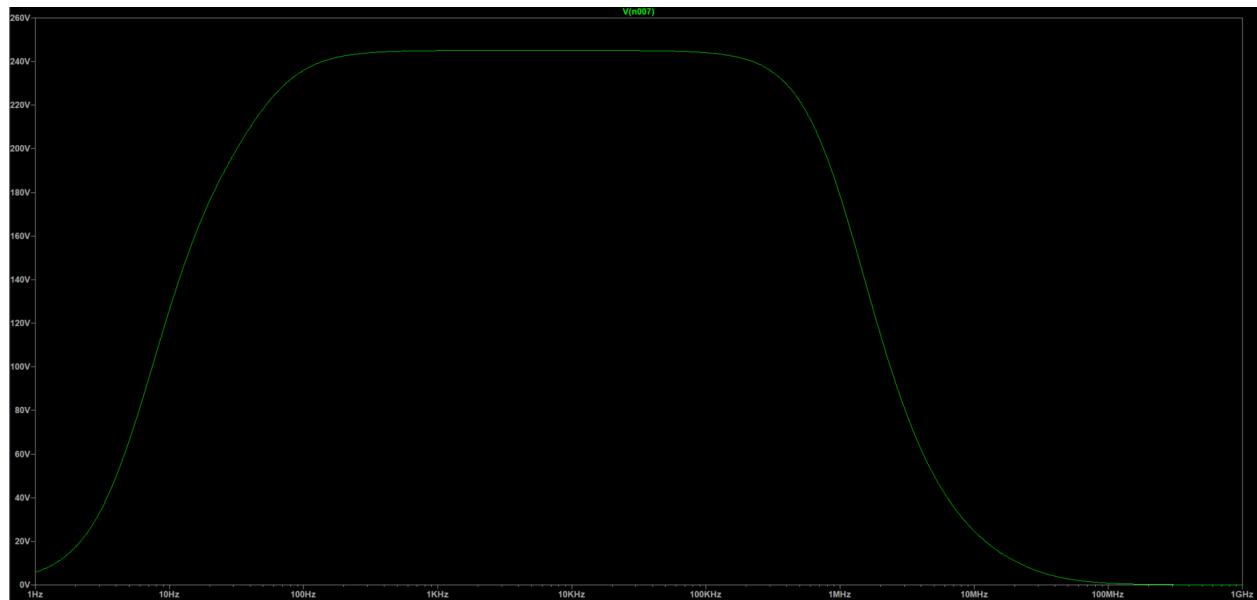


Figure 4: Bode Plot of Fully Cascaded Amplifier (with Impedance Bridging)

When comparing the Bode plots of the two fully cascaded amplifiers, we can see that the gain went from about 18 volts, which was very low and nowhere near our goal of 262.8 volts, to 245 volts. This was made possible by the process of impedance bridging, although there were some drawbacks to this process. Although our cascaded amplifier works as intended with an ideal gain, the individual stages, when decoupled, do not accurately give the gain needed. This can be changed quickly by adjusting some resistor values, but we have not found a solution to accommodate both situations, cascaded and decoupled.

Experiments:

Provide a description of the manner in which you performed the experiments necessary to verify your design, placing all of your data in easy to read table(s) such that hand calculations can be compared to both simulated and measured results.

We performed experiments on our design by building the physical implementation of our schematic. Although it is an imperfectly built circuit, as it was before impedance bridging was completed.

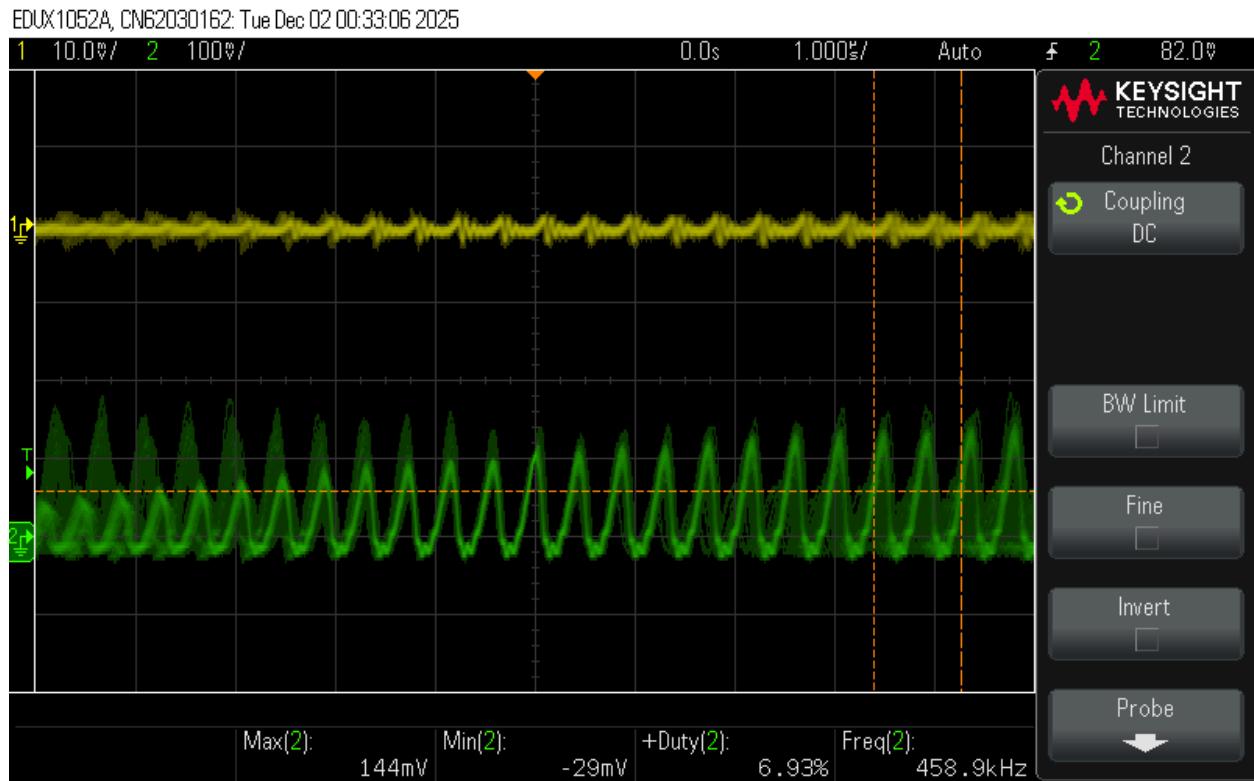


Figure 5: Gain of Non-Impedance Bridging Full Amplifier

In this version of our circuit, there was no impedance bridging present, and there was plenty of noise. Although given that information, we can see that the input signal was still amplified in the end without impedance bridging, even if not by much.

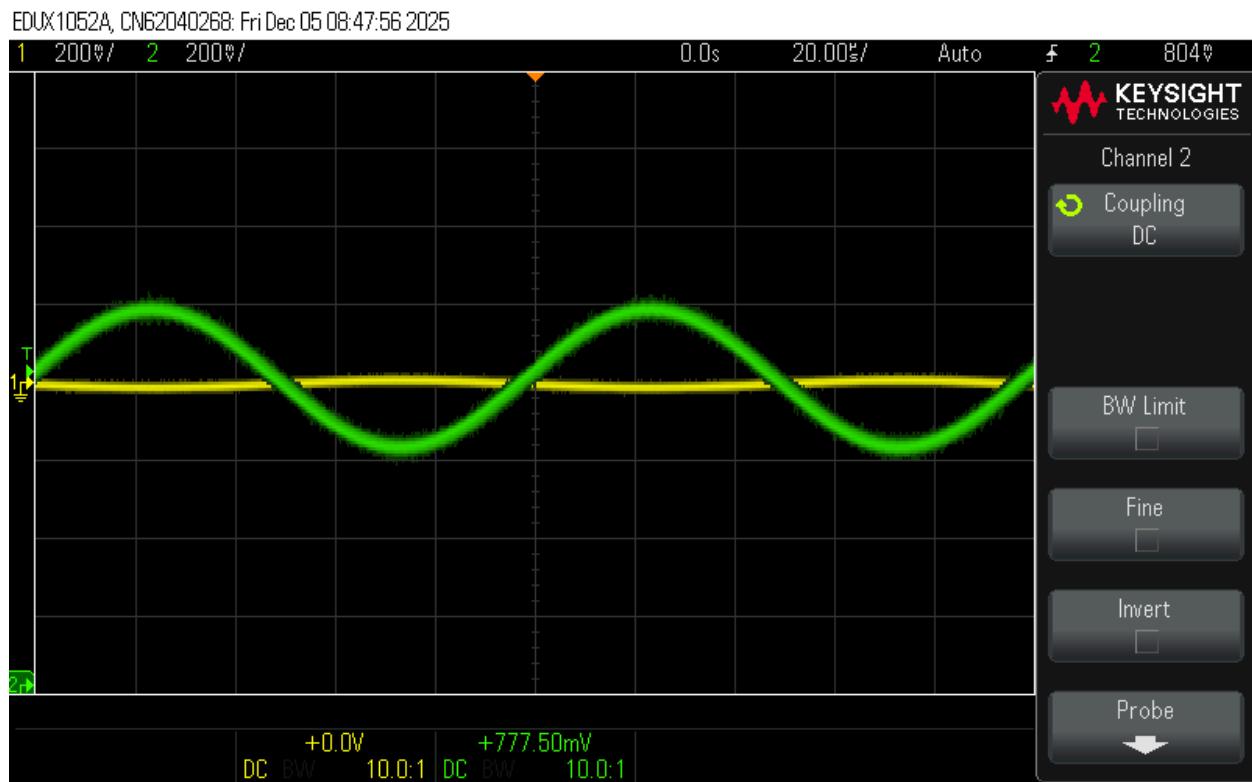


Figure 6: Stage 1 Amplifier Traces

As we can see, the output of the stage 1 amplifier is very clear and visibly amplifies the input signal.

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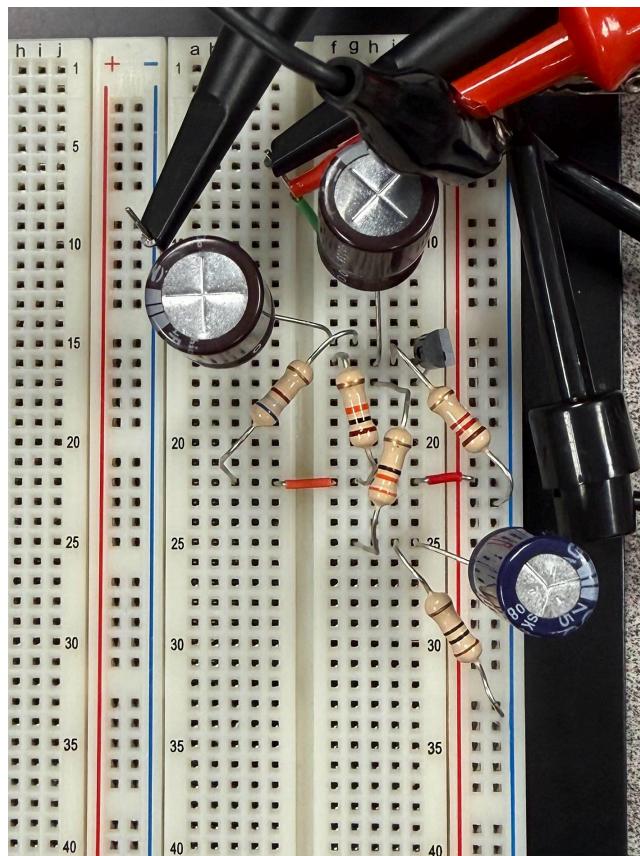


Figure 7: Stage 1 Amplifier Built Circuit

After our impedance bridging was completed, we got to building the circuit with its final resistance values.

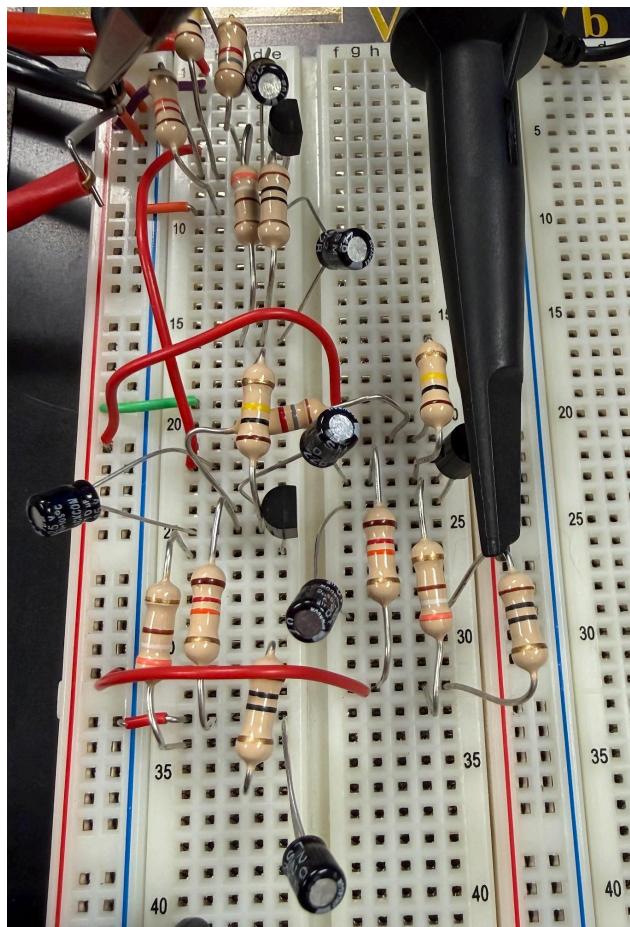


Figure 8: Fully Cascaded Amplifier (No Impedance Bridging)

Once the circuit with impedance bridging values is built, it will give us a gain that we are looking for.

Group member contributions (Roughly):

Adrian: Setting up input voltages and reading measurements on oscilloscope, trying to source high Farad capacitors ($470\mu F$) for bypass and coupling capacitors calculated for maximum potential gain

Carson: Finalizing impedance bridging on LTspice, building the physical circuit (before impedance bridging)