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Lab 5 ECED 3202

Design of Multistage Amplifier

Problem Statement:

You are part of a startup company developing a wireless video projector. You oversee the team designing the amplifier for the audio subsystem and are asked to design a small power amplifier to drive an $8\ \Omega$ speaker located in the bottom of the device with at least 10mW of power with $<5\%$ THD and a minimum gain of $15\times$.

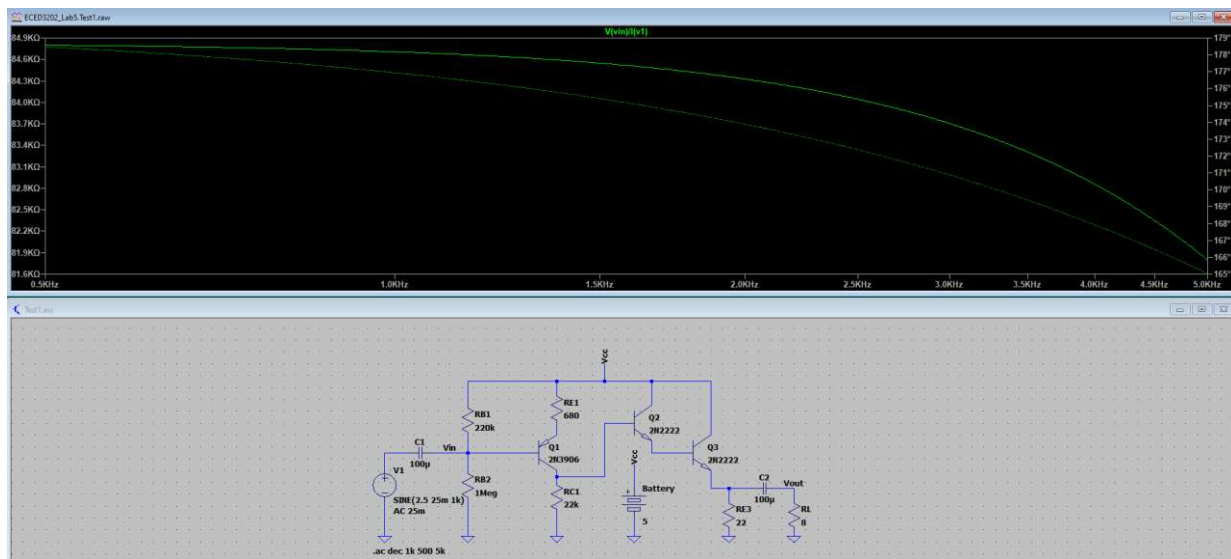
R5-01:

The circuit is powered by a 5 V power supply

R5-02:

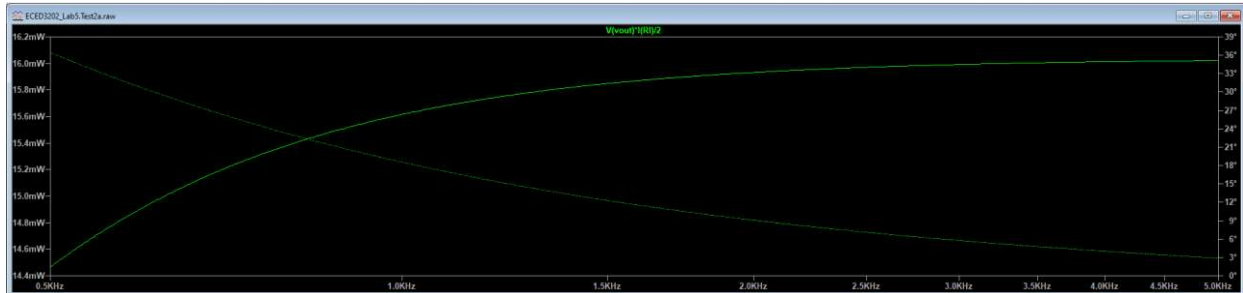
The load is a $8\ \Omega$ Resistor put after a $100\mu\text{F}$ capacitor

R5-03:

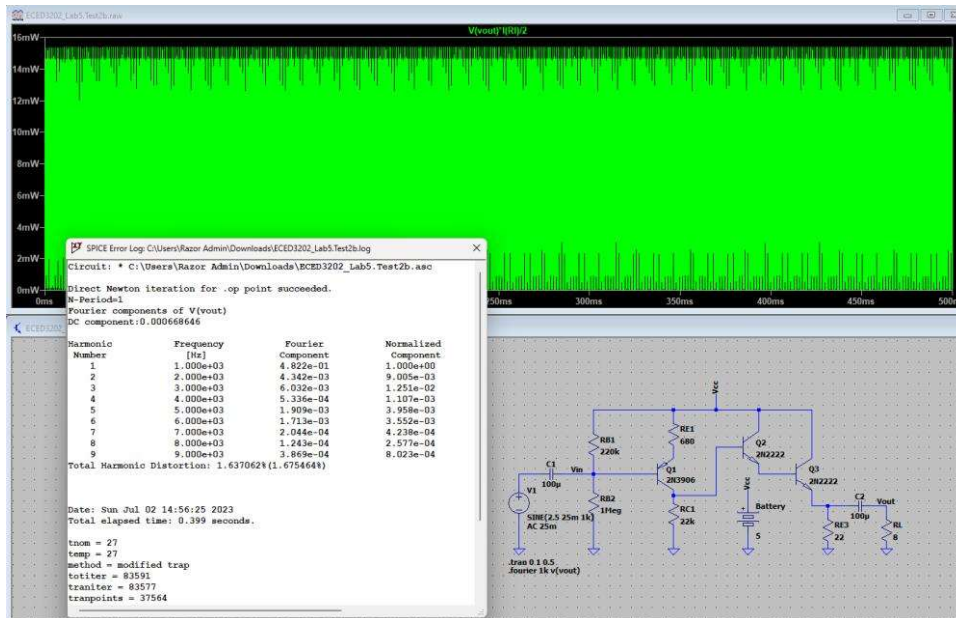


To find the range of input impedance for the circuit, it is determined by V_{out}/V_{in} . Within the range of 500Hz to 5kHz it ranges from $85\text{k}\Omega$ to $81.8\text{k}\Omega$ respectively. This passes the test with the input impedance consistently over $80\text{k}\Omega$.

R5-04:

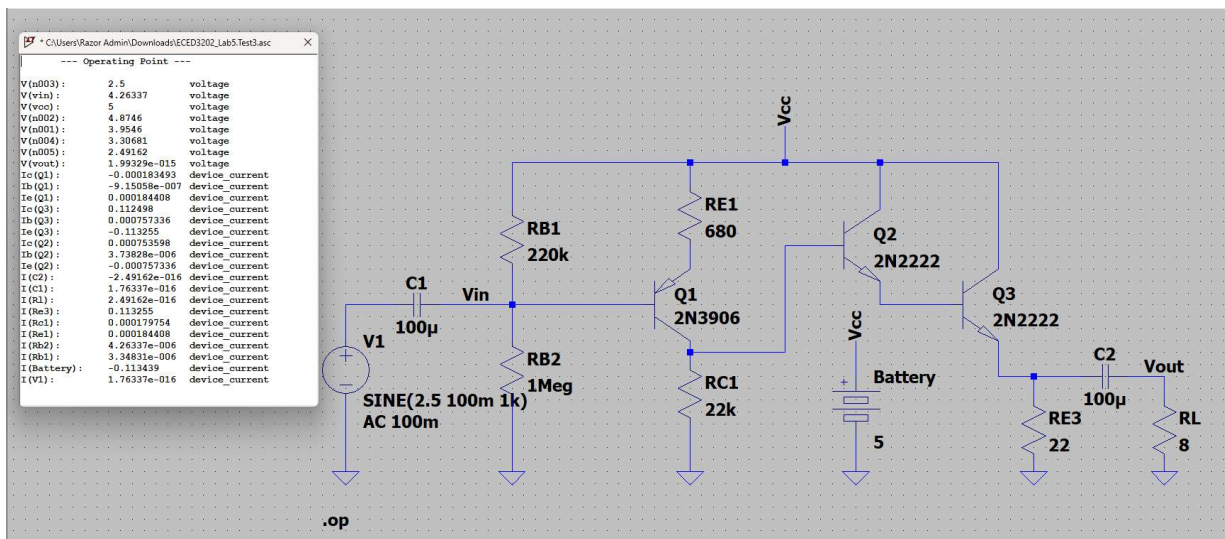


The output power of the circuit is consistently above 10mW, for the range of 500Hz to 5kHz.



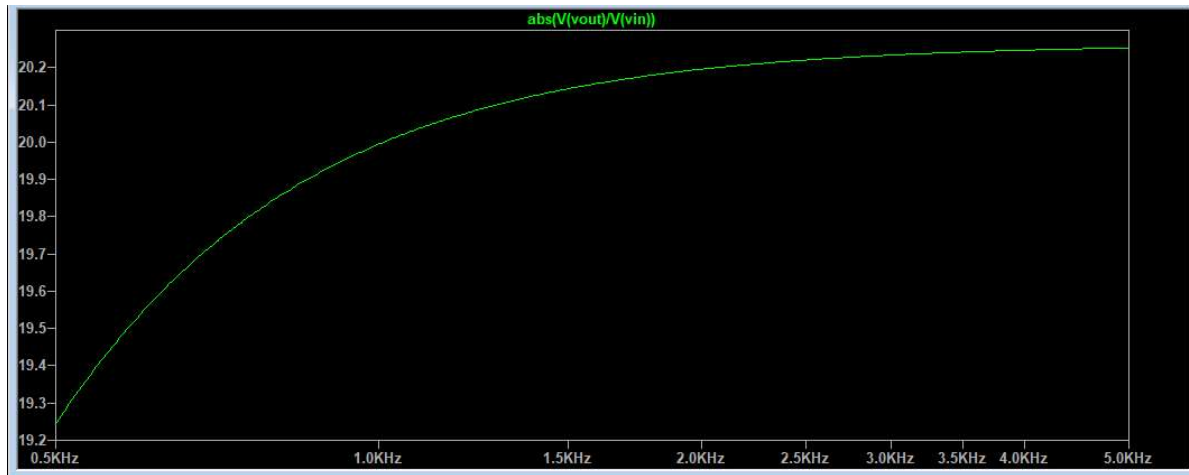
The resulting Total Harmonic Distortion for this signal is 1.67%, which is much less than the targeted max THD of 5%. This passes the criteria for test 4.

R5-05:



As you can see from the operating points chart, the I_c values are less than 800mA, at values of 0.112mA and 753uA which are both less than 800mA. This means that this criterion is validated.

R5-06:



The gain of this amplifier circuit over the range of 500Hz to 5kHz the gain is 19.25 to 20.25 respectively which exceeds the goal of a 15x gain and passes the test.

Conclusion:

The amplification circuit built on paper does not represent the same outcomes as is modeled due to some inaccuracies and assumptions. The numbers used in this circuit meet the criterion for the lab.