EE/CprE/SE 491 WEEKLY REPORT 9

14/11/24 - 21/11/24

sdmay25-16

Project title: Multi-Channel High-Gain Low Noise Amplifier for High-Frequency Ultrasound Signal Acquisition

Client &/Advisor: Manojit Pramanik

Team Members/Role:
Jon Wetenkamp, Yash Gaonkar, Ethan Hulinksy, Ryan Ellerbach

- o **<u>Weekly Summary:</u>** This week we received the components we ordered from digikey and started implementing them on the prototype. Initially the prototype had two MAR6SM plus amplifiers connected to each other via a coupling capacitor but that caused clipping on the output. The new amplifier MAR3 we ordered of digikey though solves that problem when it replaces one of the amplifiers. This is because the MAR3 has a higher biasing voltage. We also used 106-ohm resistors and 360-ohm resistors to see if they would give us the feedback we wanted. Unfortunately, this did not happen, instead we got a varying gain and a narrow bandgap, something we don't want. Also, two weeks ago we drew an amplifier circuit from an amplifier in the lab to see how it worked. In that circuit there was a section we did not know entirely how it worked. The team did not know wheatear it amplified current, acted as a circuit or was a biasing circuit. After some consideration we figured out that the section acted like a high pass filter and helped with impedance matching.
- o **<u>Past week accomplishments</u>** Member 1: Worked on… ⬜ Team Member 2:
  - Yash Gaonkar: Worked on the RC component of the amplifier circuit to figure out what it did.
  - Ethan Hulinsky: Worked on the prototype and solder on the components ordered from digikey.
  - Ryan Ellerbach: Worked on the RC component of the amplifier circuit to figure out what it did.
  - Jon Wetenkamp: Worked on the prototype and solder on the components ordered from digikey.

  <u>Pending issues</u>

  As mentioned above we are not getting the desired frequency response. Instead, we are getting a very narrow bandgap and varying gain. The team thinks that the reason for this

is the inductor not being of the right value or the MAR3 might be messing with the bandgap.

Past week accomplishments
- Individual contributions

NAME	Individual Contributions (Quick list of contributions. This should be short.)	Hours this week	HOURS cumulative
Jonathan Wetenkamp	Worked on the prototype and solder on the components ordered from digikey.	3	30.5
Yash Gaonkar	Worked on the RC component of the amplifier circuit to figure out what it did.	3	28.5
Ryan Ellerbach	Worked on the RC component of the amplifier circuit to figure out what it did.	3	34.5
Ethan Hulinsky	Worked on the prototype and solder on the components ordered from digikey.	3	38

- **Plans for the upcoming week**

  In the upcoming week we will try to use different inductors of different values and try to test the MAR3 as a single stage instead of with the MAR6SMplus.
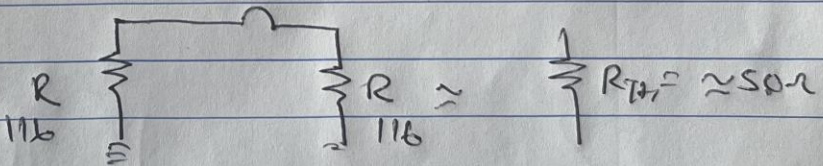
- **Graphs and some of the Notes**

Frequency Response

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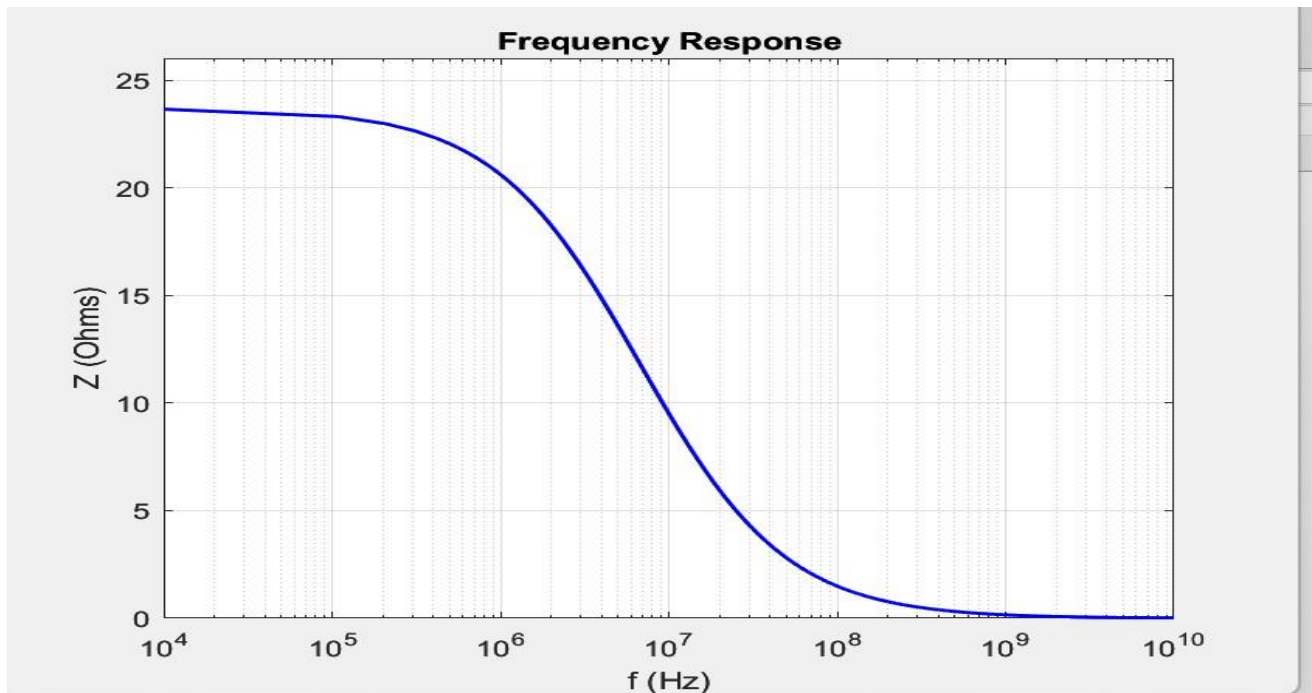
$$\frac{\cancel{1+6}\ 23.7}{1+6.28\times10^{-9}\times10^{6}\times\cancel{1+6}\ 23.7} = 67.11 = R_T$$

$$\frac{23.7}{1+6.28\times10^{-3}\times23.7} = \frac{23.7}{1+0.148836} = \boxed{20.63}$$

$$\frac{50\times10^{3}}{1+6.28\times10^{3}\times50\times10^{3}} = \frac{23.7}{1+6.28\times50\times10^{3}\times23.7\times10^{-9}} = \boxed{23.54}$$

$$\textcircled{2} \quad \frac{1}{2\pi f \cdot c} = \frac{1}{6.28\times10^{6}\times10^{-9}} = \frac{1}{6.28\times10^{-3}}$$

$$\frac{1000}{6.28} = \qquad f \to \infty$$

$$\frac{R}{1+2\pi FCR}$$