EE/CprE/SE 492 WEEKLY REPORT 6

4/3/25 - 4/17/25

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 Hulinsky, Ryan Ellerbach

- **Bi-Weekly Summary:**
  - Over the past two weeks, the team has been focused on completing physical testing and preparing for the fabrication of our second board. During testing, we identified that one of the primary reasons our amplifier was delivering only 26 dB of gain—compared to the 42 dB observed in the prototype—was due to the quality of the cables being used. Notably, when the board was moved during testing, the gain would spike to 50 dB, further indicating that the wiring was a key issue. To address this, we have decided to order higher-quality replacement cables.
    In addition, the team experimented with electromagnetic (EM) shielding. However, after applying the EM shields, the gain decreased again. Interestingly, placing a conductor above the EM shield caused the gain to increase, suggesting that parasitic coupling effects were not properly managed, and we have to increase the amount of grounding on that device.
    We have also completed the design of a new PCB that incorporates improvements based on the insights gained from physical testing. These modifications include enhanced grounding, proper integration of the power supply, and corrected amplifier orientation to ensure optimal performance.
    The team has also finalized the components needed to build the Power Supply. This includes a 12V rechargeable battery supply as well as an LDO linear regulator (10V), some jacks to connect the power to the board, and a switch to choose between using a digital power supply, an 'off' setting, and the battery power supply. We communicated religiously over the past few weeks in order to make the final decisions for the project.

Past week accomplishments

- Yash Gaonkar: Started the design of the Power supply and helped with the board testing also helped with the selection of batteries for the power supply.
- Ethan Hulinsky: Assembled a new test board and tested performance with and without EM shield component. Researched causes of reduced gain when testing with the EM shield on, and determined layout choices that likely caused the issue. Worked on part selection and routing for final board.

- Ryan Ellerbach: Performed gain, bandwidth, connectivity, and EMI tests. Searched for new components, including product research. Made new components and footprints for PCB design. Applied changes to new design file on EasyEDA so we can order the final boards as soon as possible.
- Jon Wetenkamp: Assisted with board troubleshooting. Worked on revision 2 board schematic and layout. Updated BOM with new components for revision 2. Researched enclosures and discussed with the client and ETG and determined that it isn't necessary for noise reduction due to the channels already being isolated with individual RF shields. Also did research into batteries and connections between the board and the power supplies. Created Gerber files and sent them to the client with the BOM.

- **Pending issues**

1) We need to get confirmation to purchase the new board and components
2) We still must test the new board to make sure the board meets the specs given to us by our client and that the grounding issue has been resolved

- **Individual contributions**

NAME	**Individual Contributions** *(Quick list of contributions. This should be short.)*	**Hours this week**	**HOURS cumulative**
Jonathan Wetenkamp	Assisted with board troubleshooting. Worked on revision 2 board schematic and layout. Updated BOM with new components for revision 2. Researched enclosures and discussed with the client and ETG and determined that it isn't necessary for noise reduction due to the channels already being isolated with individual RF shields. Also did research into batteries and connections between the board and the power supplies. Created Gerber files and sent them to the client with the BOM.	16	66
Yash Gaonkar	Started the design of the Power supply and helped with the board testing.	6	45.5
Ryan Ellerbach	Performed gain, bandwidth, connectivity, and EMI tests. Searched for new components, including product research. Made new components and footprints for PCB design. Applied changes to new design file on EasyEDA.	20	71
Ethan Hulinsky	Assembled a new test board and tested performance with and without EM shield component. Researched causes of reduced gain when testing with the EM shield on, and	15	71

	determined layout choices that likely caused the issue. Worked on part selection and routing for final board.		

- **Plans for the upcoming week**

  In the upcoming weeks the team will wait for the new boards to arrive and plan fabrication and testing for the final product. Will work to get some of the paperwork (final design document, presentation and poster) done while waiting for boards and components to ship. Once they come, which should be about one week from this submission deadline, we will be able to start fabrication and testing of the final product.