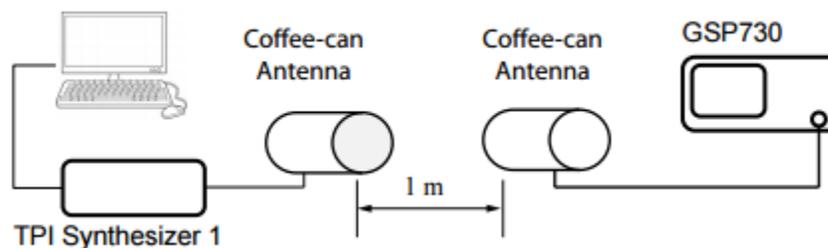


134 Senior Design

My role in the group was to work on multiple aspects of the project and push my group to move forward. My role included working on calculating the gain of the antennas, the second try soldering the quarter 2 PCB system, troubleshooting our quarter 1 system, financial responsibilities and working with the team to collaborate and progress.

We didn't have very definite roles in our group. I know certain groups assigned roles for things like signal processing and PCB design. We worked together most of the time to figure out our problems and we found it better when the whole group put their heads together to think of a solution.

I worked on calculating the gain of the coffee can antennas and then also the Alfa APA-M25 2.4 GHz patch antennas that we ordered from Amazon. I used the Friis Equation to find the gain of the antennas and I used the setup from Lab Manual 5 shown below. The transmitted power is from the TPI synthesizer and the power received is displayed on the Spectrum Analyzer. The wavelength is found from the frequency that we used which was at 2.4 GHz.



We found that our can antennas had a gain of 6.37 dBi while our patch antennas had a gain of 8.4 dBi. From our testing, we found that one patch as transmitter and one can as receiving gave us the best results and cleanest signals.

I then worked to solder our Quarter 2 PCB for the second time. We found it hard to use solder paste to solder such small SMD components, so I wanted to try and solder it again with a more accurate method. I used solder paste that was in the form of small beads and this allowed me to use a very small amount. I could accurately solder the amplifier and mixer pins without shorting them. I then used an oven which could ramp the temperature up slowly to harden the solder paste. All the amplifiers were drawing the correct current so I thought that the PCB was soldered correctly. But I could not get a correct power output from the transmitting side. The amplifiers were not amplifying the signal and it was hard to understand why. After troubleshooting for a while we eventually moved back to our quarter 1 because of the time crunch.

I also had the financial responsibilities of the group. I had access to the OPS website and had to maintain our budget and make sure we had enough money to purchase the things we needed. The budget is shown below in the table and each of our orders are shown. We stayed within our budget and used up to \$257.77. We were going to buy a raspberry Pi to work on the signal processing but it was too expensive and out of our budget.

Orders	Cost
MCP	7
RF Adapter	7.95
9V battery	7
Coax-Clips	29.86
HMC667	44.09
First Digi-Key Batch	96.19
MicroSD	7

Antennas	51.67
Diligent Batch	14.01
Total	257.77
Left Over	42.23

A lot of the system troubleshooting was done by all the members of the group. We worked together so that more solutions would be brainstormed. While we tried to figure out the problems of our quarter 1 system we had to test each component individually. We also had to troubleshoot the baseband and the function generator circuit. Then we took the system outside and tried to test the distance with more amplifiers. This whole troubleshooting situation took a long time because it was hard to pin point the exact problem. We eventually got everything to work and then had a working system out at the competition. We could record a very far distance but this factor was not considered in the final competition.