

EE / CPrE / SE 492 – sdmay21-07

## Small Rotor-Craft Obstacle Avoidance Radar System

### Week 6 Report

Fall 2020 – Spring 2021

Mar 29 – Apr 12

Faculty Advisor: Dr. Al Qaseer

#### Team Members:

Matt Bahr – Antenna Designer

Joshua Welton – RADAR Firmware/PCB Design

Felipe Varela Carvalho – Signal Processing

Matt McDermott – PCB Design

Mike Ostrow – Pi Data Flow

Leonardo Bertocello Machado – PCB Design

#### Weekly Summary

This week we ordered the final versions of the ADC board and the RF board. We were also able to fix our original antenna to work better with our advisor's testing equipment. We began testing in full this week with our updated antenna. We were able to get test results that proved that our design setup should work once a few issues get resolved. Finally, software was written that will provide a rough outline for an object's size and orientation with detected by our antenna.

#### Past Week Accomplishments

##### **Matt Bahr:**

- Finalized the antenna design to work with the advisor's testing equipment.
- Began communications to determine a suitable replacement for the ETG in terms of creating more antennas through the CNC process.
- Helped with the group testing session. Documented the testing process and took pictures for the equipment used in the process.
- Looked over software code with Felipe for determining a wire's orientation.

**Joshua Welton:**

- Finalized ADC Board design, and helped package design files for fabrication.
- Helped during group testing session. Took pictures of tests in progress for documentation.
- Helped with MATLAB script development, specifically how to call data from the special data variables.

**Michael Ostrow:**

- Helped during group testing session. Manned the computer interfaced with the testing apparatus and collected data.
- Helped develop the poster for end of semester documents.

**Leonardo Bertencello Machado:**

- Finalized designing the RF PCB and helped import the Gerber files for packaging.
- Took notes of test runs and conditions, including measurements of test setups.

**Felipe Varela Carvalho**

- Data processing on data acquired from testing.
- Graph generation and image generation

**Matt McDermott**

- Organized and ordered the remaining parts and PCB board from the ETG.
- Participated and implemented test object during test session as well as maneuvered the object for multiple measurements.

**Pending Issues**

**Everyone:** Problems with antenna detection range, detecting objects closer than the expected distance.

## Individual Contributions

<u>Name</u>	<u>Individual Contributions</u>	<u>Hours worked this week</u>	<u>Hours Cumulative</u>
Matt Bahr	<ul style="list-style-type: none"> <li>• Worked on antenna backup</li> <li>• Assisted in antenna testing</li> <li>• Looked over code</li> <li>• Worked on poster</li> </ul>	11	50
Joshua Welton	<ul style="list-style-type: none"> <li>• Worked on poster</li> <li>• Helped test antenna</li> <li>• Looked over code</li> </ul>	8	43
Felipe Varela Carvalho	<ul style="list-style-type: none"> <li>• Worked on data processing</li> <li>• Worked on test validation</li> <li>• Worked on image processing</li> </ul>	10	38
Matt McDermott	<ul style="list-style-type: none"> <li>• Finalized part orders</li> <li>• Worked on poster</li> <li>• Assisted in test measurements</li> </ul>	8	37
Michael Ostrow	<ul style="list-style-type: none"> <li>• Helped test antenna</li> <li>• Assisted on poster</li> </ul>	5	27
Leonardo Bertoncello Machado	<ul style="list-style-type: none"> <li>• Helped antenna testing</li> <li>• Worked on the poster</li> <li>• Finalized PCB</li> </ul>	6	48

Note: Hours Cumulative is for this semester of class only.

## Plans for the Upcoming Week

### **Matt Bahr:**

- If any modifications are needed, they will be done to the antenna for better testing results
- Continue communication with other sources of CNC creation for future antennas
- Aid in further testing and final documents

### **Joshua Welton:**

- Solder ADC PCB when it arrives
- Test ADC PCB to ensure it can convert a differential input into 16-bit number
- Test daisy-chain capability of ADCs
- Work on final documents

### **Michael Ostrow:**

- Work on final documents
- Continue to test antenna in Dr. Al Qaseer's lab

### **Felipe Varela Carvalho**

- Continue working with test data to validate testing.
- Continue working with data visualization

### **Leonardo Bertoncello Machado**

- Help solder the ADC PCB and testing the board
- Work on final documents

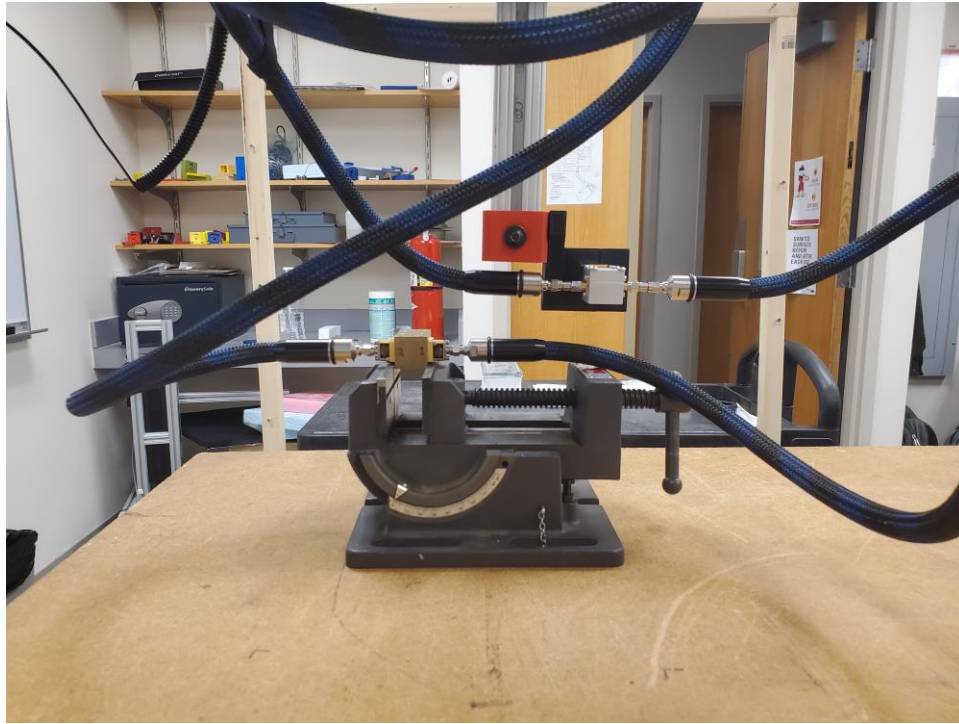
**Matt McDermott**

- Will help solder board components and test both PCBs.
- Correspond with ETG and obtain all PCB components
- Work on final documents

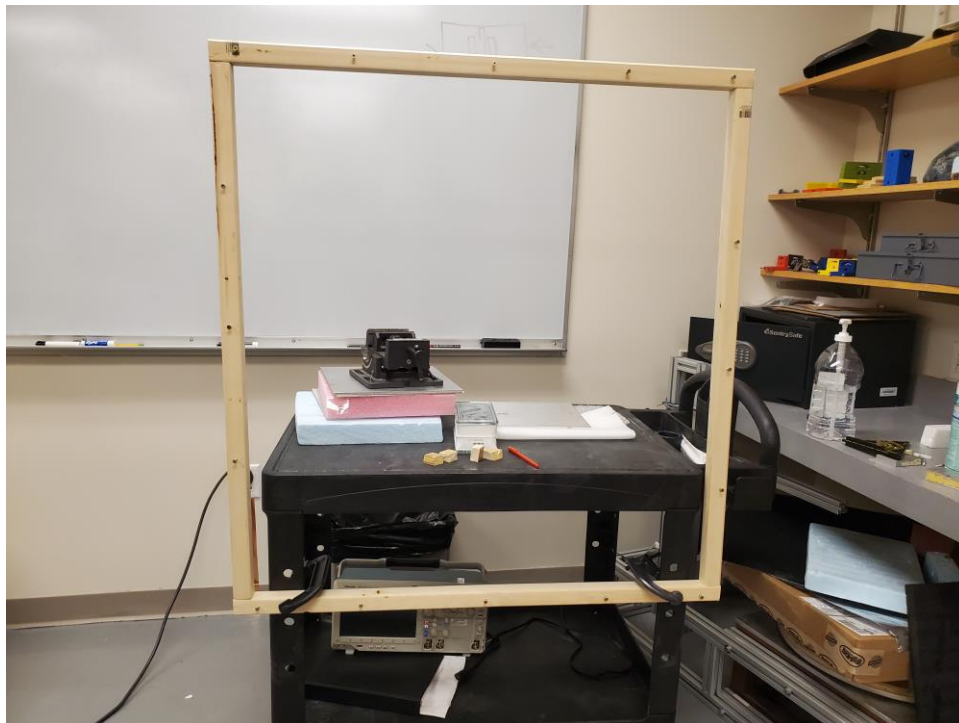
[Summary of Weekly Advisor Meeting](#)

During our last Advisor meeting, we finalized the design for the main printed circuit board, and we were given permission to order the board. After discussing the PCB, we discussed the prior data we collected from testing our antenna. Felipe developed MATLAB script to show s-parameters of the antenna, and he developed script to show phase of each test by frequency. This will be used to determine the orientation of the objects in front of the antenna apparatus. We also discussed end of the semester documentation required for our project, with Dr. Al Qaseer offering to look over the documents to ensure we produce as high of quality documentation as we can.

Appendix – Screen Shots of Progress



**Figure 1: Testing setup for the antenna**



**Figure 2: Frame for mounting wires for detection**



**Figure 3: Entire setup for testing with the frame and the antennas**