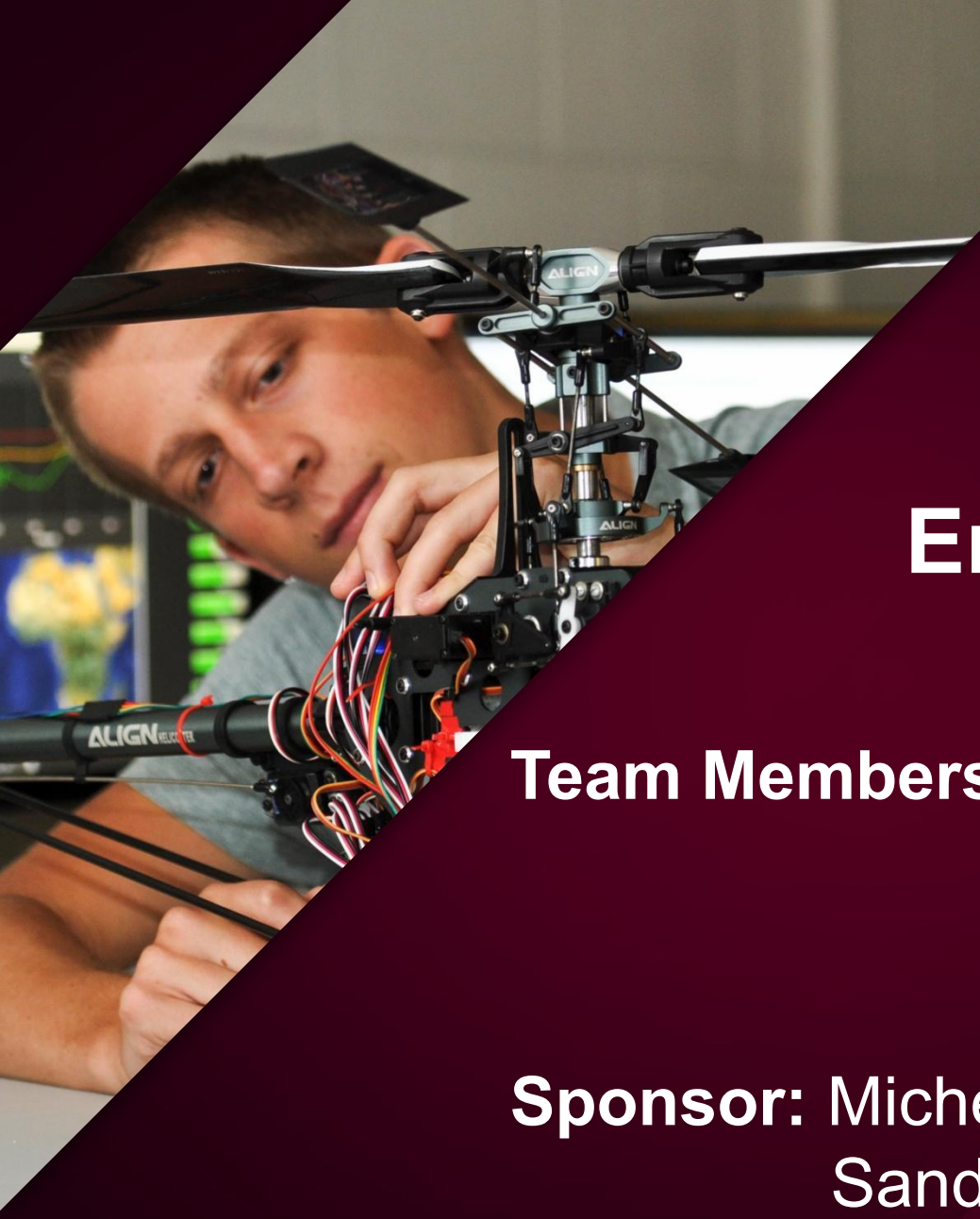



Dwight Look College of ENGINEERING
TEXAS A&M UNIVERSITY

# Portable High Energy Experiment (PHEE) DAQ

**Team Members:** Ethan Barnes
John Sabra
Sang Hoon Chung

**Sponsor:** Michelle Chatter
Sandia National Laboratories

**TA:** Logan Smith

# Project Summary

Sandia National Laboratories

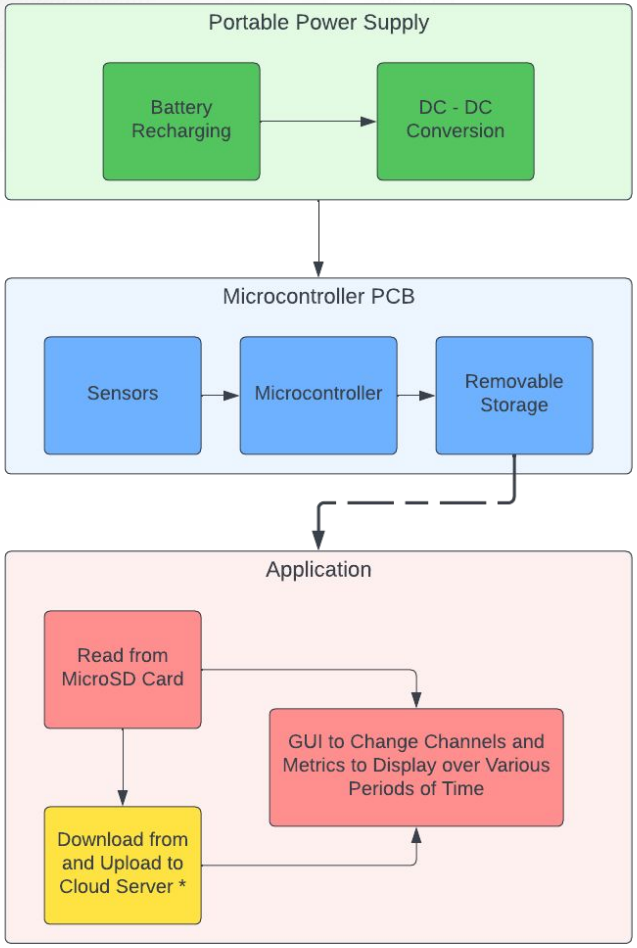
## Problem statement:

- The United States military possesses about 5500 nuclear weapons in its stockpile
- The security of these weapons and equipment is paramount when they are transported for storage and testing
- Sandia is interested in detecting explosive-type events in sensitive areas
  - Exact application for DAQ system may not be disclosed

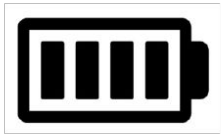
## The Portable High Energy DAQ System will:

- Protect government equipment by detecting and identifying explosives within a 100 ft range
  - Utilizes accelerometer and pressure sensor to classify if an explosive event occurred
- Write output to removable storage device
  - User will be able to refer to and perform analysis on past data

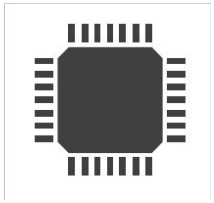
# Project/Subsystem Overview



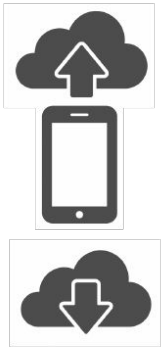

Johnny Sabra



Ethan Barnes



Sang Hoon Chung



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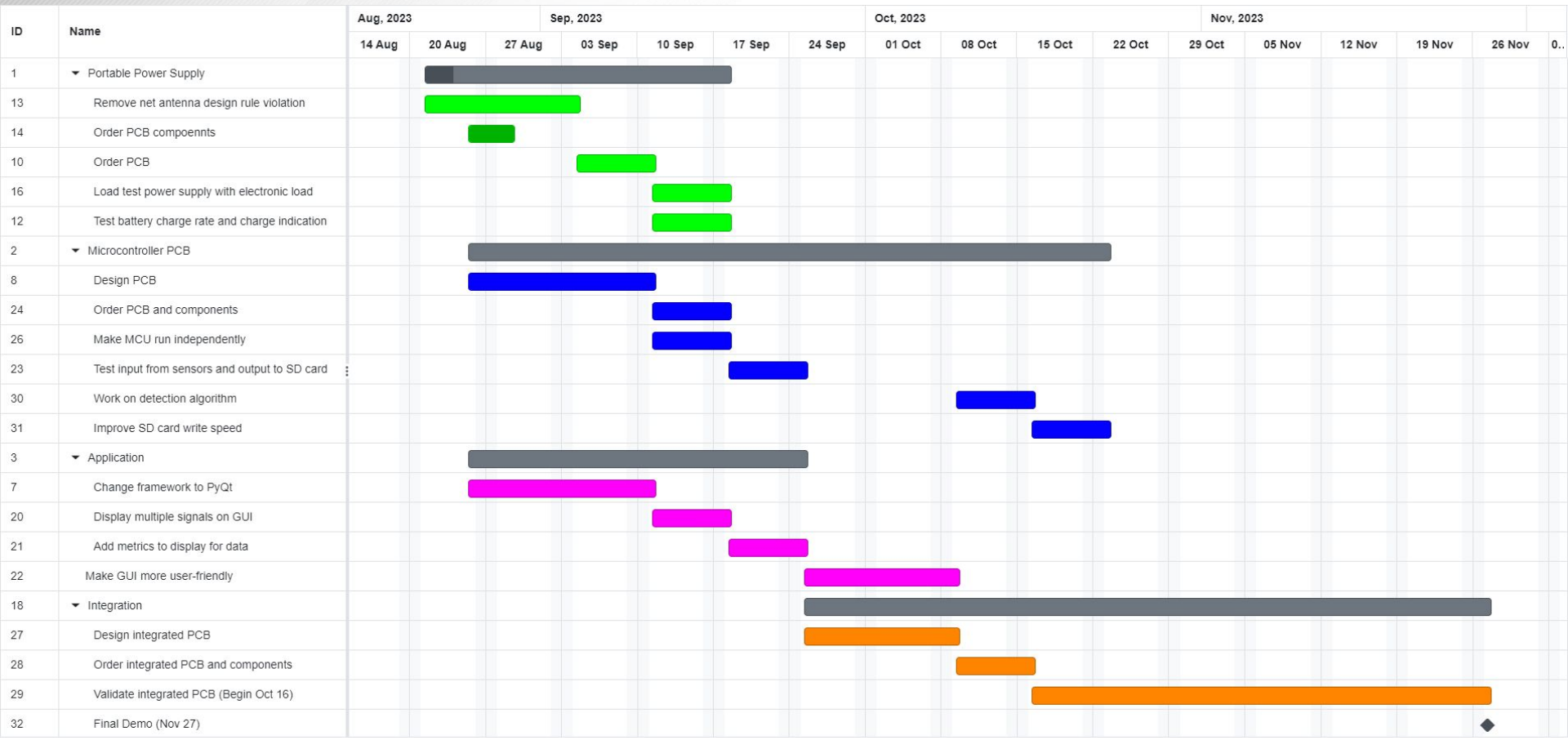
# Team: PHEE DAQ (Sandia)

| | 9/10 | 9/24 | 10/8 | 10/22 | 11/5 |
|---|---|---|---|---|---|
| **Johnny** | PCB Ordered | Power supply PCB validated | Charging feature validated | Integrated PCB design complete | Integrated PCB is functional |
| | Zero design violations in Altium | Regulates 3.3 V under 40mA load and 5 V under 120 mA load (estimated load current of MCU) | Can charge a 3-cell lipo battery at 1C rate | | |
| **Ethan** | PCB design complete | MCU runs independently | PCB is functional | Zero design violations in Altium | Can be powered with 3.3V source and can read from sensors and write to SD card at more than 2 kHz<br><br>Integrated PCB is portable with power supply regulating battery voltage to 3.3 and 5V under load |
| | Zero design violations in Altium | Program will start and stop from GPIO outside of debug mode | Powered with 3.3 V source, can write to SD card at ~2 kHz<br><br>Pressure sensors test pending | | |
| **Sang Hoon** | Change Framework to PyQt and Design multiple signals on GUI | Add more metrics to display for data | Make GUI more user-friendly | Finalizing the program and adopting the software | Validate and test communication between subsystems |
| | Check the application shows whole sensors data | Add more metrics and check availability of the result<br>Display via the application at next column | Ask opinions to other people about the design of GUI | Check the software works when we download the software itself as .exe file | Application can read data from SD card in desired format (time, explosion, pressure, acceleration) |

# Execution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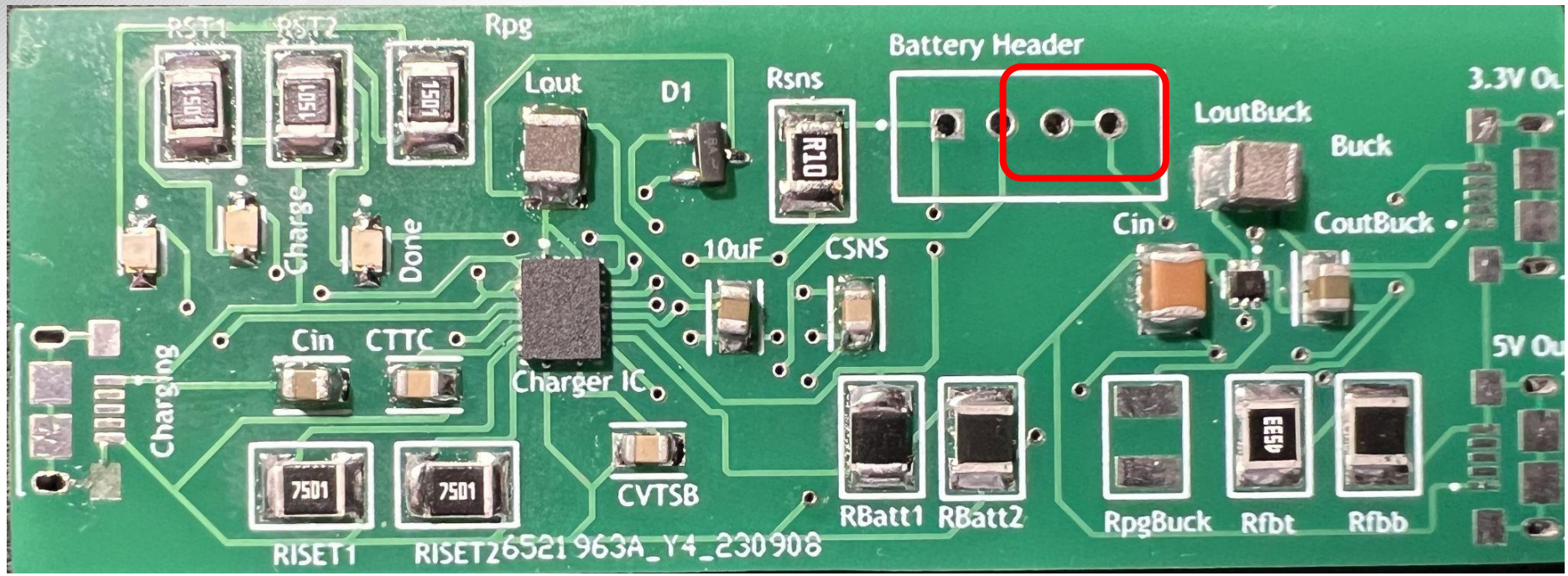
22 Oct
29 Oct
05 Nov
12 Nov
19 Nov
26 Nov
1 Portable Power Supply
13 Remove net antenna design rule violation
14 Order PCB compoennts
10 Order PCB
16 Load test power supply with electronic load
12 Test battery charge rate and charge indication
2 Microcontroller PCB
8 Design PCB
24 Order PCB and components
26 Make MCU run independently
23 Test input from sensors and output to SD card
30 Work on detection algorithm
31 Improve SD card write speed
3 Application
7 Change framework to PyQt
20 Display multiple signals on GUI
21 Add metrics to display for data
22 Make GUI more user-friendly
18 Integration
27 Design integrated PCB
28 Order integrated PCB and components
29 Validate integrated PCB (Begin Oct 16)
32 Final Demo (Nov 27)

# Portable Power Supply

Johnny Sabra

| Accomplishments since the last presentation<br><15> hrs | Ongoing progress/problems and plans until the next presentation |
|---|---|
| • PCB arrived and in hand<br>• All PCB components have been soldered onto the board<br>• Integrated PCB Micro SD reader circuit footprints completed | • Short discovered between the two ground pins of the battery connector causing header to melt therefore testing cannot be done with battery.<br>• DC power supply in lab cannot supply high enough input voltage to test accurately<br>• Must reroute traces to correct issue and order revised PCB |

# Power Supply PCB



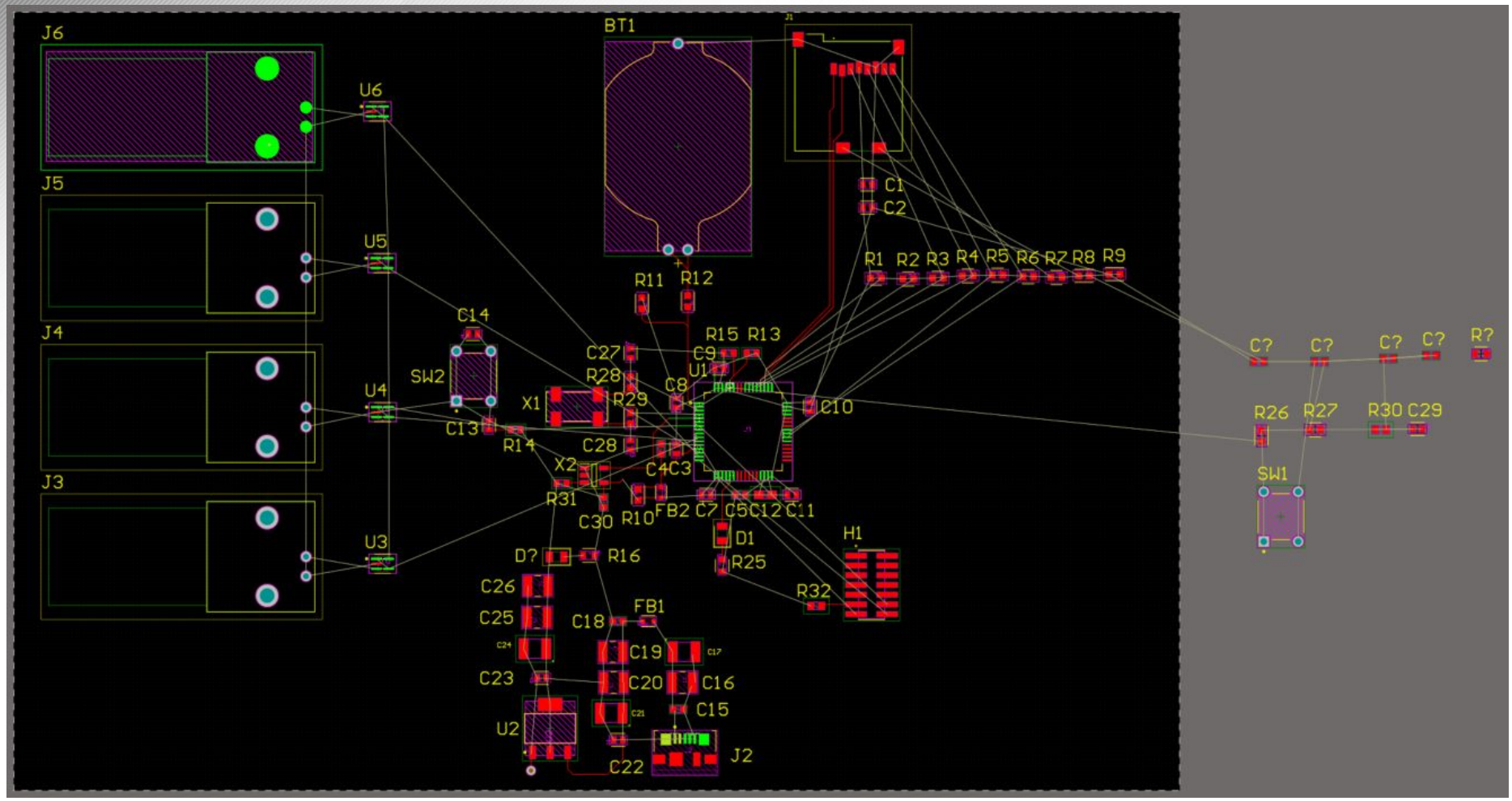

- Battery header shorted between ground pins
- Was tested with 6V input voltage (should be 11.7V)

# Microcontroller PCB

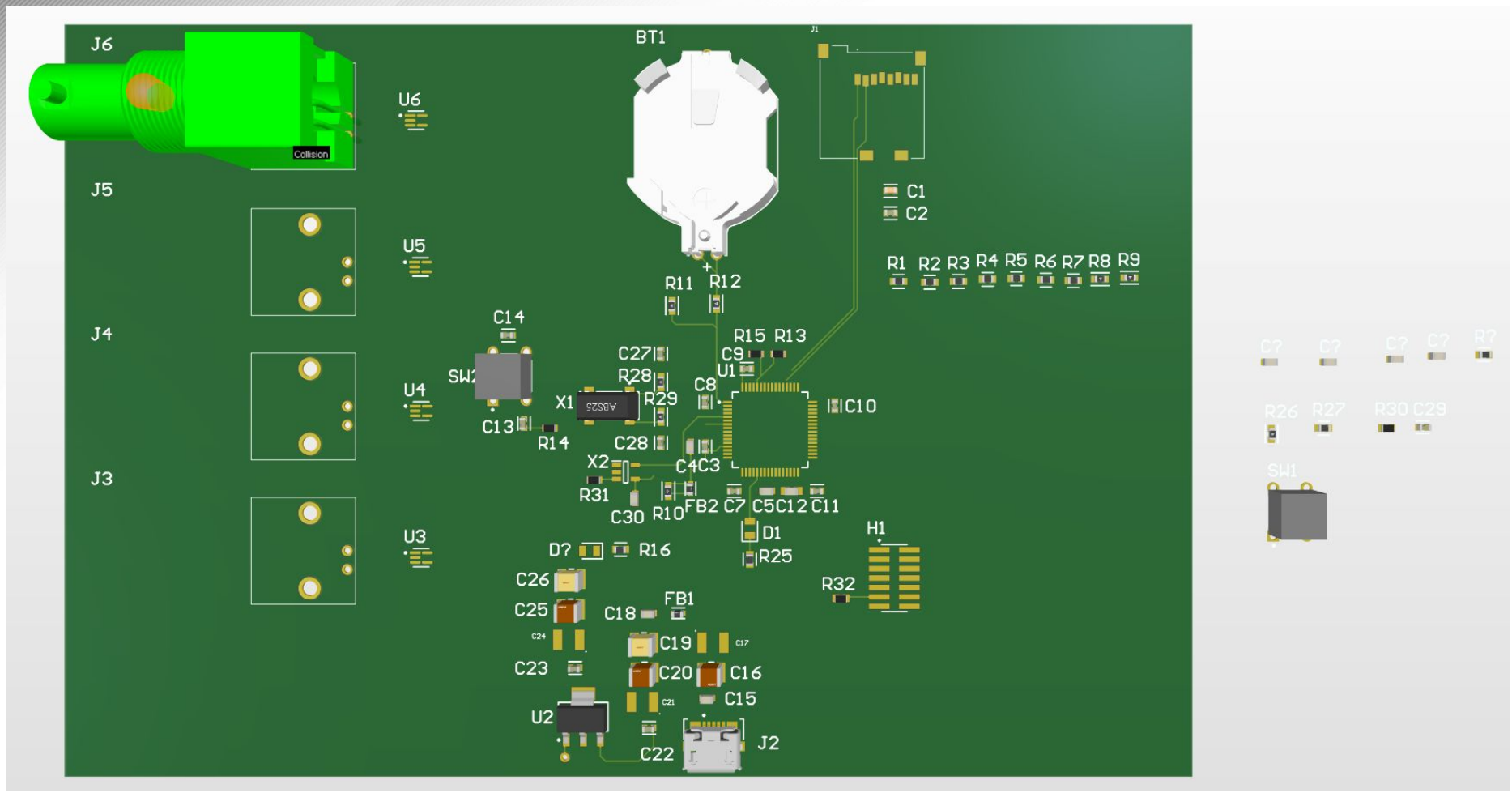
Ethan Barnes

| Accomplishments since the last presentation<br><20> hrs | Ongoing progress/problems and plans until the next presentation |
|---|---|
| • Completed PCB schematics | • Finishing PCB layout and order this week<br>• Continue integration with power supply PCB |

- Ran into problems with sensor signal input sensors and micro USB power supply
- Resolved issues with help from peers and professors




Microcontroller PCB Layout 2D

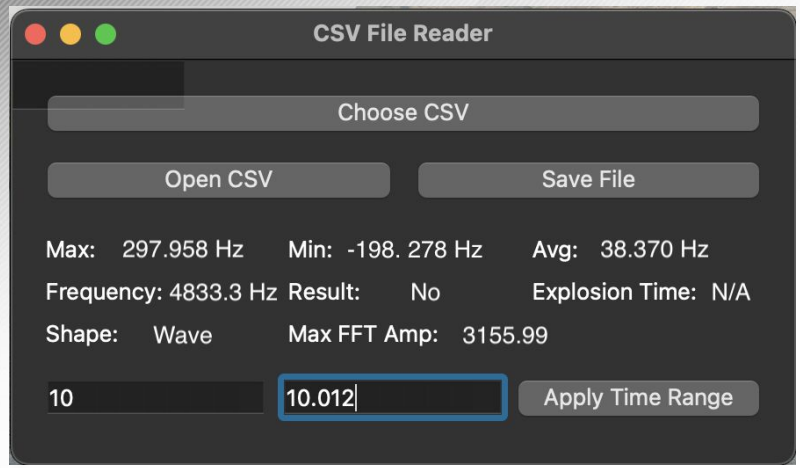


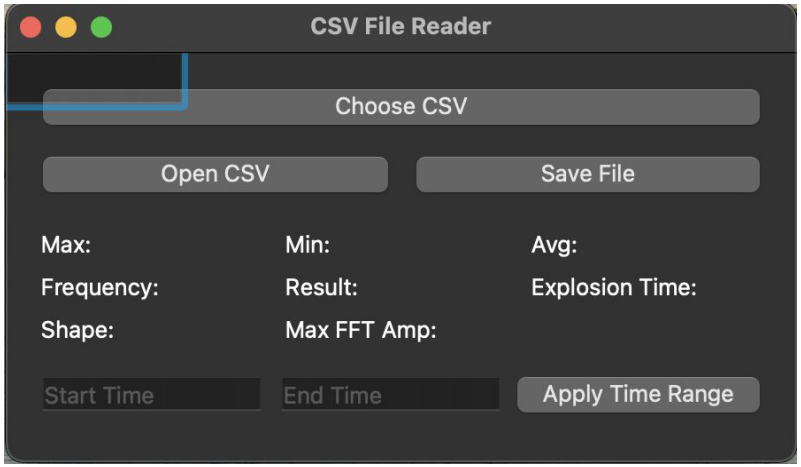

Microcontroller PCB Layout 3D

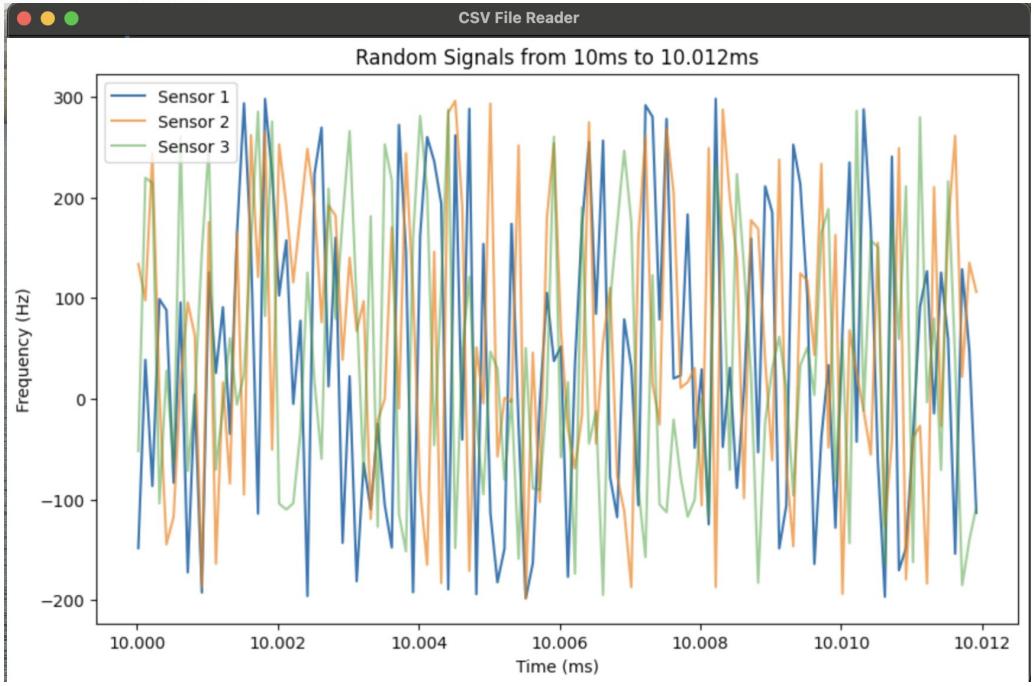
# Application

Sang Hoon Chung

| Accomplishments since the last presentation<br><20> hrs | Ongoing progress/problems and plans until the next presentation |
| --- | --- |
| • Link to Google Drive with using Google API<br>• Read multiple signals from sensors | • Add 2nd and 3rd sensors' signal analysis(Depends on the MCU result).<br>• Edit the design of the GUI more user friendly. |




When we run the app, a small window will appear. When you select the file you want to view and open it, a graph will appear in a pop-up window.

Add the units of the metrics and the GUI shows the multiple signals from .csv file.

# Thank you!

# Questions?