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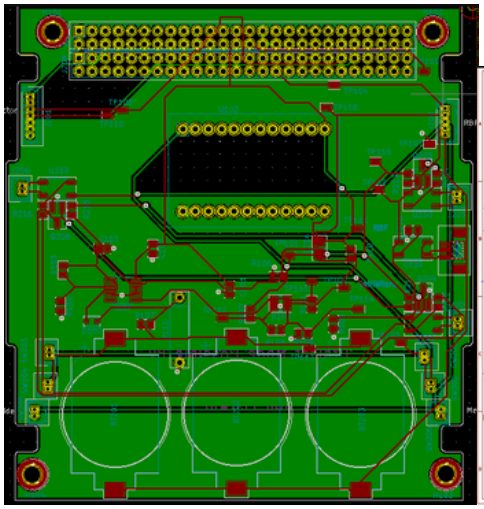
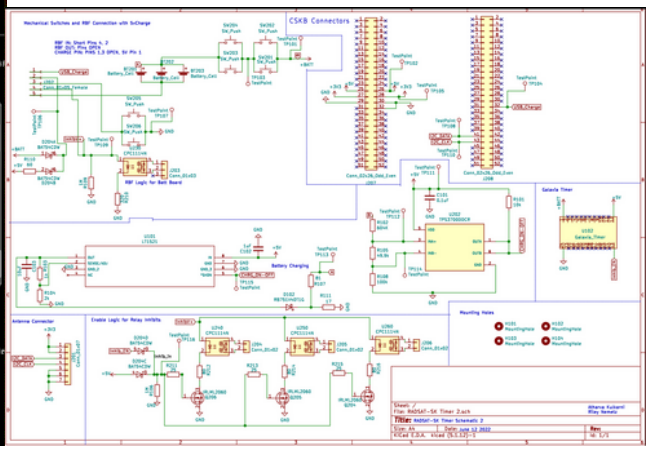
TIMER AND INHIBITS BOARD - RADSAT-SK





What?

- A PCB to count down 30 minutes and **turn the entire satellite on** using **solid-state relays** after 30 minutes have elapsed.
- Has rechargeable coin cells to charge the cells in space, in case of satellite reboots.

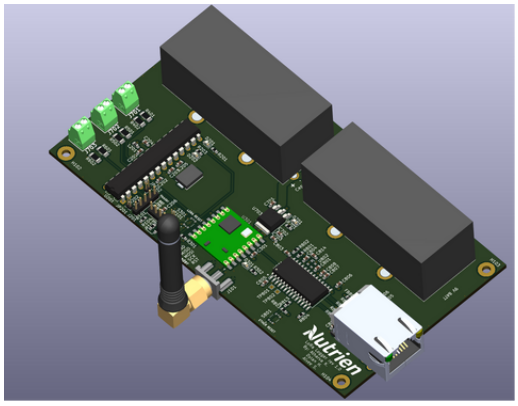
How?

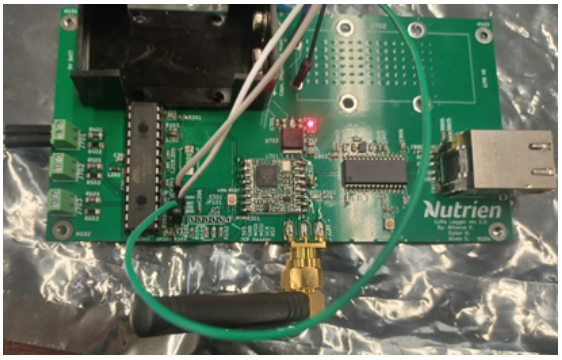
- Used **KiCad** to design the schematic and the PCB layout.
- Performed **Circuit Analysis** on the schematic.

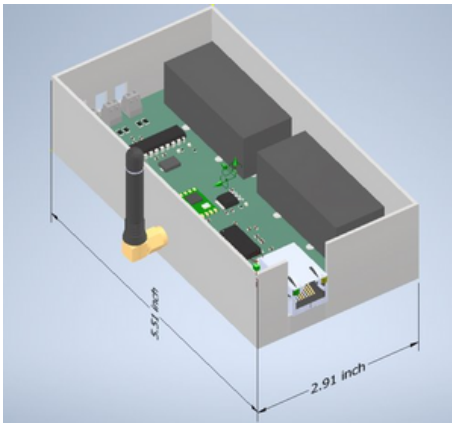
Learning Outcomes

- Learnt **Circuit Design, PCB Design and PCB manufacturing.**
- Learnt how **cell charging/discharging** works.
- Learnt how to use **relays as switches.**

MINE WIRELESS COMMUNICATIONS - NUTRIEN







What?

- A PCB to form an **RF chain** in the mines to create a mesh of data.
- Has a RF transceiver and capable of communicating over the **ethernet** protocol.
- **Software/Firmware** in **C/C++.**

How?

- Used **KiCad** to design the schematic and the PCB layout.
- Used **Inventor** to Design the 3D enclosure to survive harsh mine conditions.
- Performed **Circuit Analysis, RF link budged and breadboard prototyping.**

Learning Outcomes

- **DFM** when 3D modeling.
- **RF Propagation** in different environments.
- Firmware for **SPI, UART and Ethernet.**

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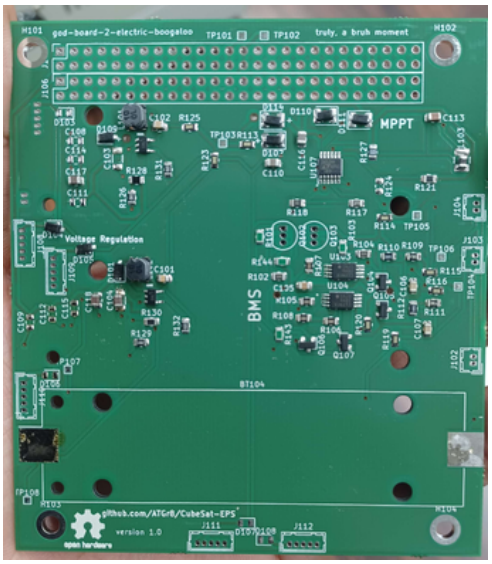
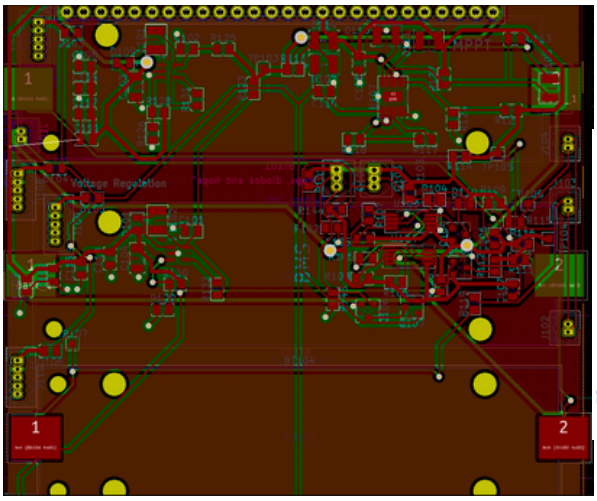
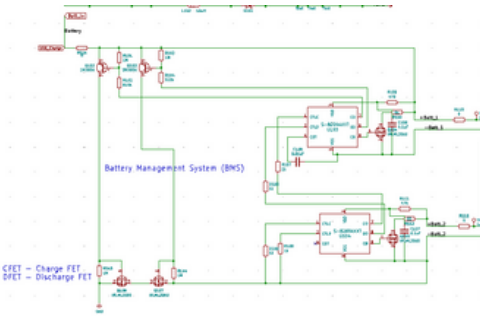
ELECTRICAL POWER SYSTEM/POWER BANK - FIRST ATTEMPT







What?

- First Attempt at a PCB that **regulates voltage** to 5V and 3v3, **charges 18650 LiPo Batteries** by taking **maximum point input** from solar panels.

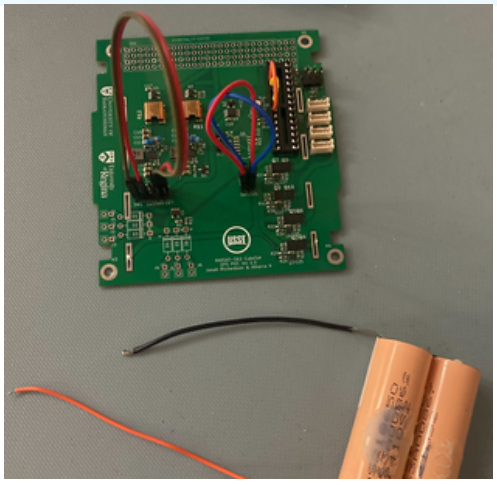
How?

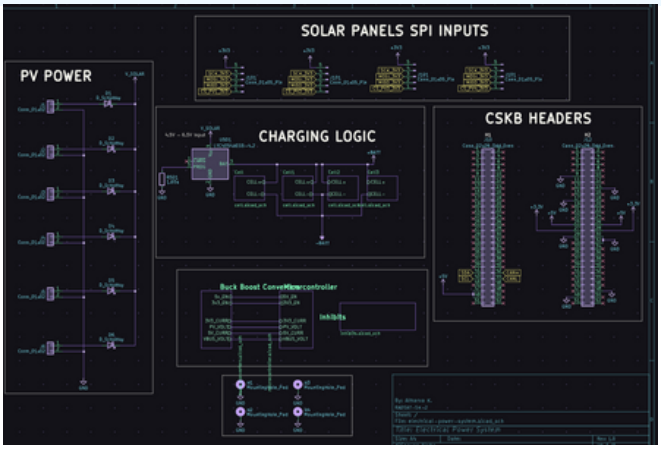
- Designed on **KiCad.**
- **Reflowed** SMD components.

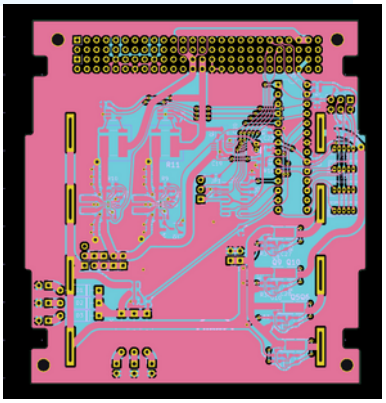
Learning Outcomes

- Electronic Debugging
- **Did not work**, another attempt was made based on lessons learnt.

ELECTRICAL POWER SYSTEM/POWER BANK - SECOND ATTEMPT







What?

- Successful attempt at a PCB that **regulates voltage** to 5V and 3v3, **charges 18650 LiPo Batteries** by taking **maximum point input** from solar panels.

How?

- Designed using **KiCad.**
- **Reflowed** SMD components.

Learning Outcomes

- Battery charging, Buck boosting and MPPTs.
- Layout of **Mixed signals PCB**.

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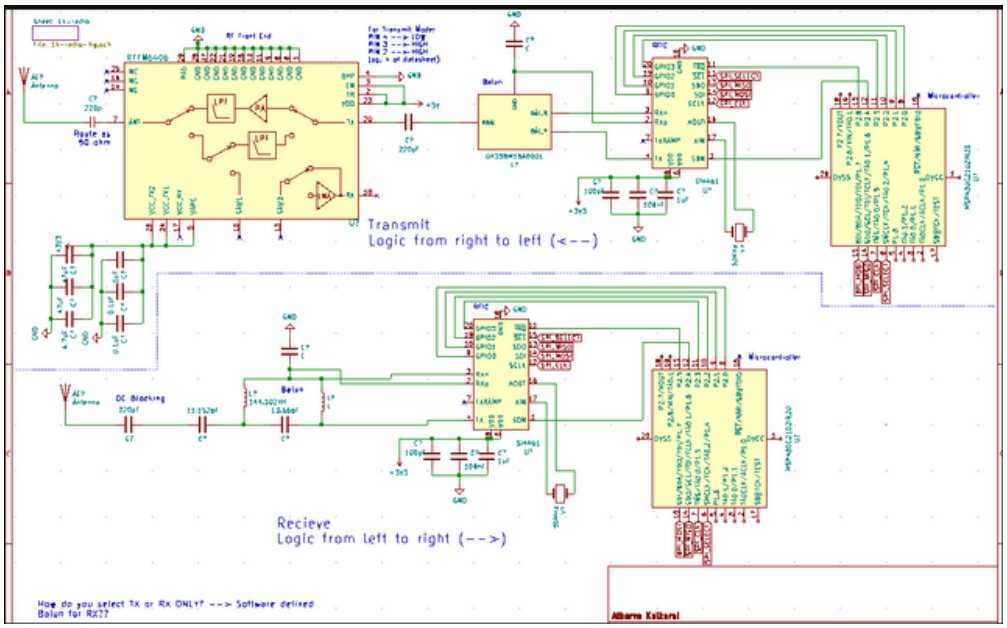
TRANSCEIVER (RF BOARD)



What?

- **Full duplex RF Transceiver**. Range 100-1050 MHz.
- UHF and VHF bands.
- **To be used on a rocket** by the Usask Rocketry team.

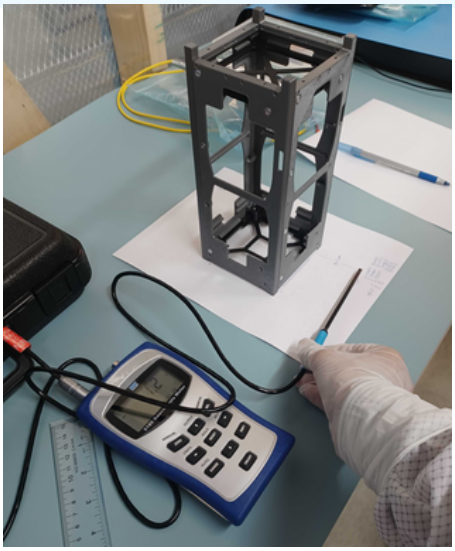
How?

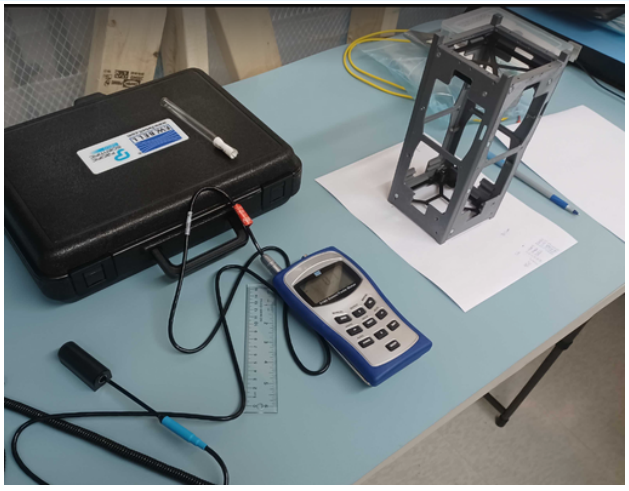
- Used **KiCad** to draw schematic.
- Software in progress - written in C.

Learning Outcomes

- RF design.
- Baluns and **impedance matching**.

PERMANENT MAGNET TESTING - RADSAT-SK





What?

- Test permanent magnets going to be put on the RADSAT-SK satellite for ADCS.
- **Measure the strength of magnetic field** in each axis 10 cm away from the satellite.
- Make sure it **meets Nanoracks and CSA requirements.**

How?

- Using a **Guass Meter** and 3D printed Satellite Frame,

Learning Outcomes

- Magnetic Fields.
- **Passive ADCS system** design.

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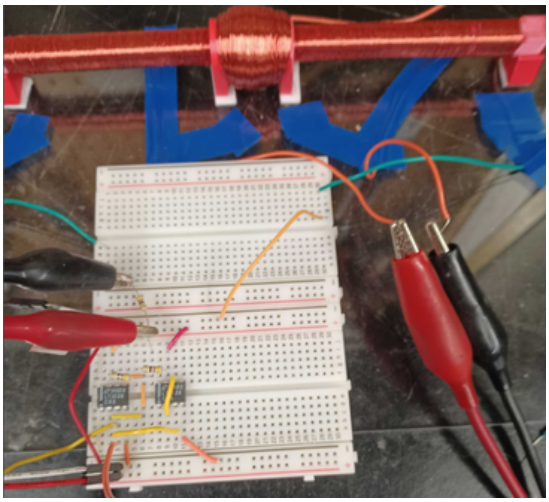
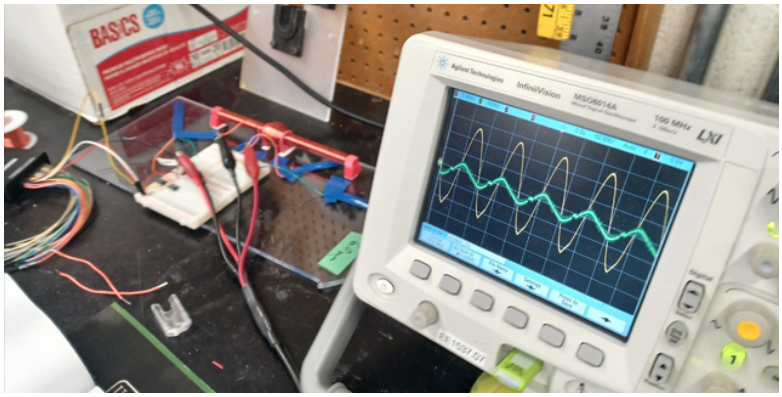
HYSTERESIS RODS TESTING - RADSAT-SK





What?

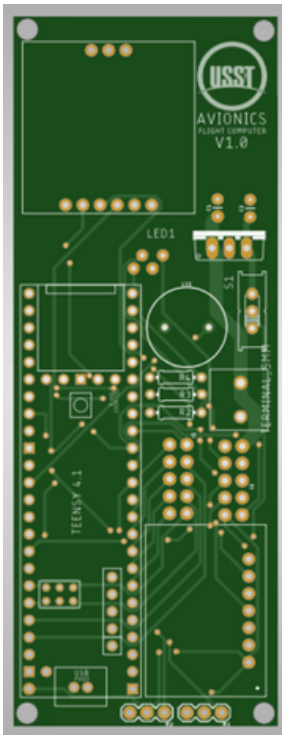
- Hysteresis rods are being used on the RADSAT-SK as a way of passively stabilizing spin.
- Tests to measure hysteresis properties of the hysteresis rods.

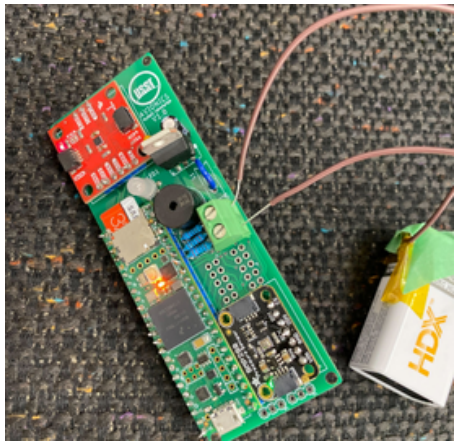
How?

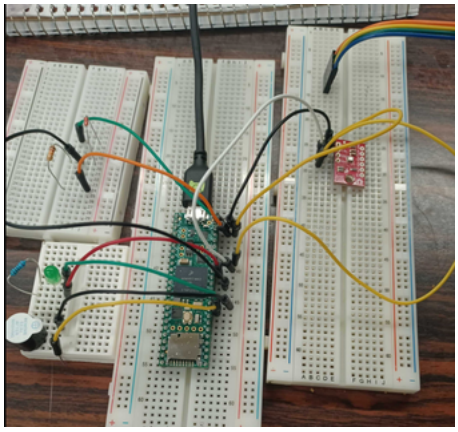
- **Breadboard circuit.**
- **Oscilloscope** for data collection.
- ADLM2000 for **signal generation.**
- Used python to graphically plot raw data.

- **Learning Outcomes**
- **Op-Amps** for **Current Amplification.**
- Circuits with an **inductive load.**
- **Data Analysis.**

ROCKET AVIONICS







What?

- **Flight computer for** the Usask's Rocketry Team's **rocket.**
- Prototype PCB. Using a **Teensy 4.1 as the computation unit** and **various sensors.**

How?

- Designed in **EAGLE.**
- Breadboard prototyped before making the PCB.

- **Learning Outcomes**
- Software for the BMU and IMU sensors.
- **Linear voltage regulators**.