UCI Samueli School of Engineering

UCI CUBESAT

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Mission Overview

- Develop and launch a 2U CubeSat into Low Earth Orbit (LEO)
- Execute research experiments in LEO for the payload: Variable Emissivity Device (VED)

COMMUNICATIONS

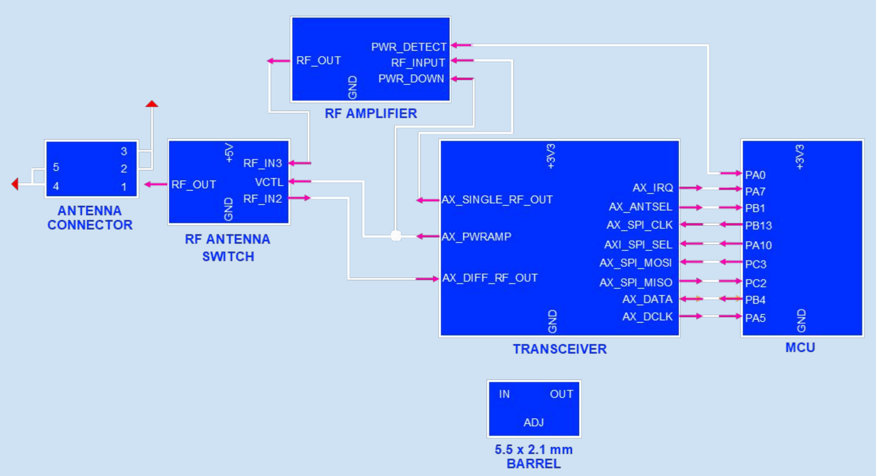

Figure 1: Embedded Communications 2nd Iteration of Transceiver Protoboard. Includes MCU and Transceiver chips

- Programming and installing an on-board transceiver system
- The transceiver consolidates all on-board data and packages for transmission.
- Ground station receives data and transmits commands to the satellite via a Software Defined Radio (SDR)

AVIONICS

- Utilizes a magnetorquer for attitude control
- Onboard computer runs with FreeRTOS on STM32 chip

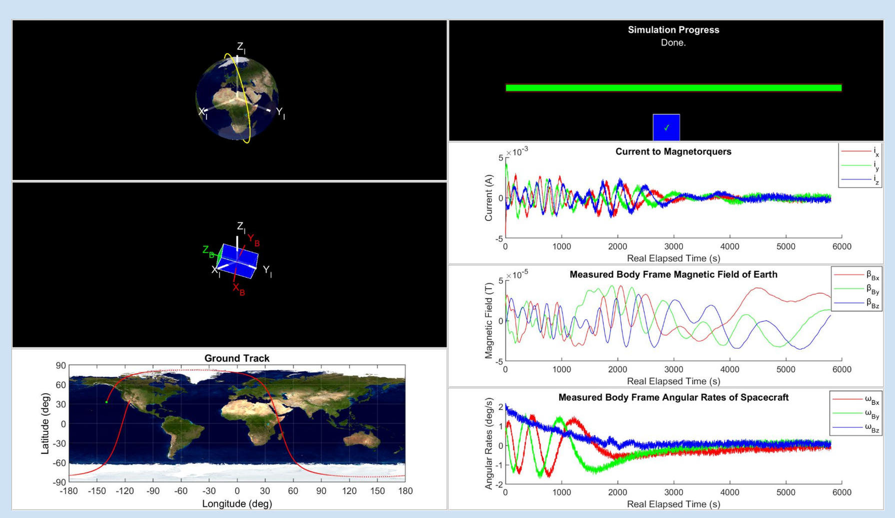

Figure 2: Depiction of ADCS Bdot simulation

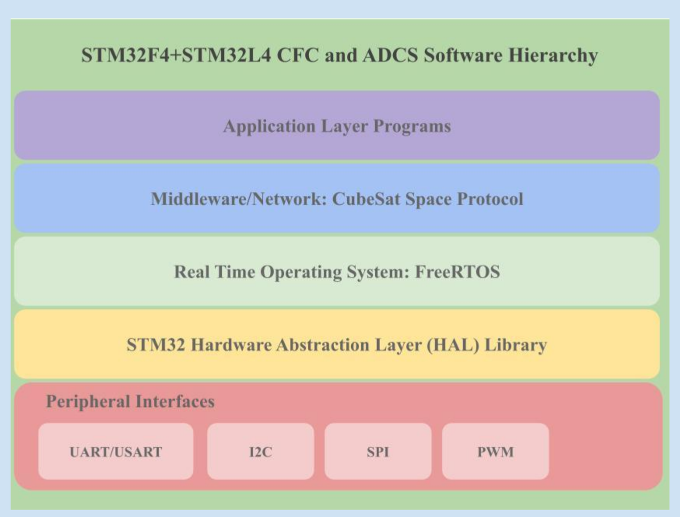

Figure 3: ADCS and CFC Software Hierarchy Diagram

PAYLOAD

- VED is a device that changes color and emissivity in response to varying voltage
- We want to test its performance in response to direct solar radiation.

Figure 4: Variable emissivity sample changing in response to solar radiation

ANTSAT 01

Figure 5: Preliminary SolidWorks model of AntSat 01

SPONSORS

NORTHROP GRUMMAN

GENERAL ATOMICS

ACKNOWLEDGEMENTS

Thank you to Northrop Grumman, General Atomics for their financial support provided, and STMS for technical support on the VED.

STRUCTURES

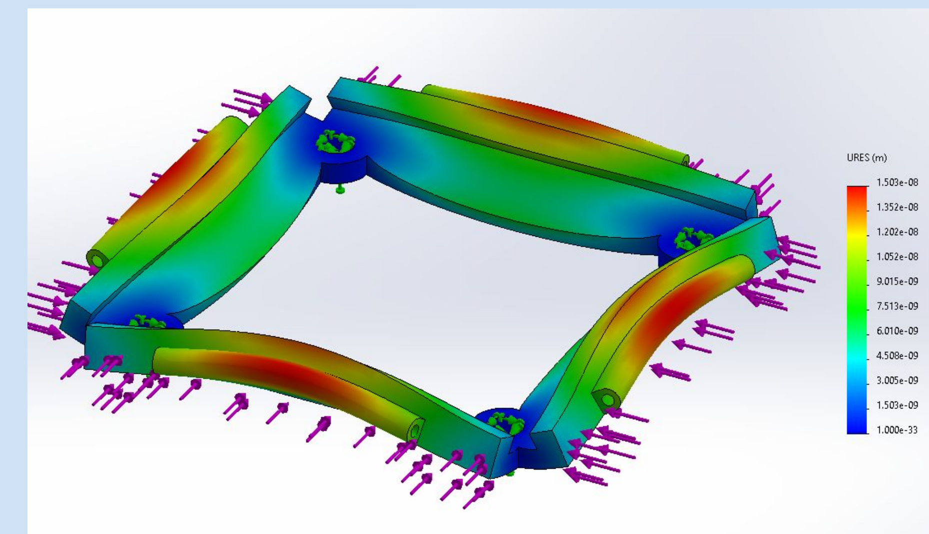

Figure 6: Panel deployment static sim

- Coordinate with other subsystems to plan hardware deconflict during systems integration
- Prototype panel deployment mechanism and support structures as well as conduct static, thermal, and vibrational tests for launch conditions.

Developer Operations

- Create developer automations, server administration, and develop internal software tools.
- Implementing continuous integration pipeline to automatically test and statically analyzes firmware for MISRA C conformance

MISRA

Figure 7: MISRA Logo

POWER

- Developing an Electric Power System (EPS) using battery cells, solar panels, and heaters
- EPS controls, regulates power budget, and maintains operational temperature.

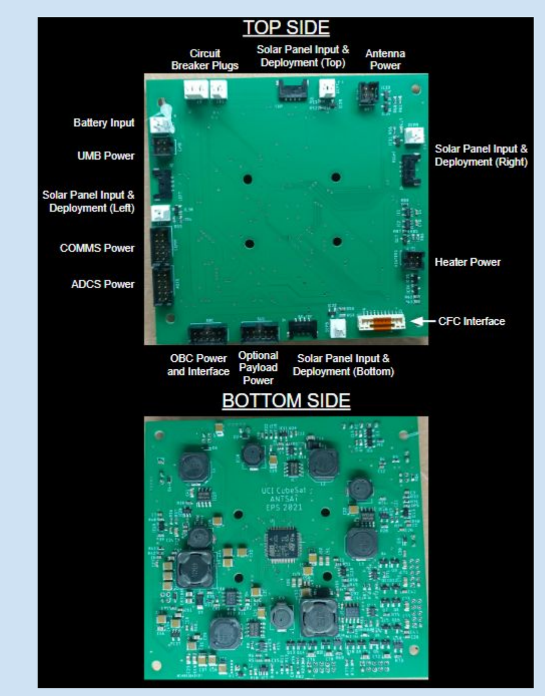

Figure 8: First iteration EPS PCB including headers for power input and output and control interface.

CONCLUSION

Future Improvement

- Begin work on plans to integrate VED into satellite
- Develop testbeds to demo software
- improve deployment systems and conduct further testing

Impact

- VED experiment will hopeful lead to accessible methods of thermal management on future spacecraft
- Future generations of students to gain experience developing space systems