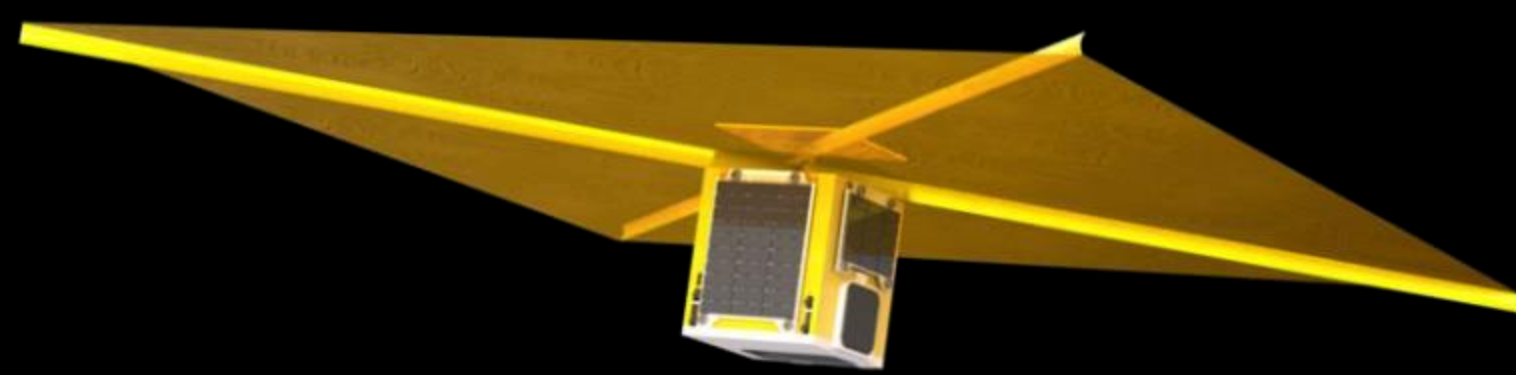


# EXPO

engineering  design

## Objectives

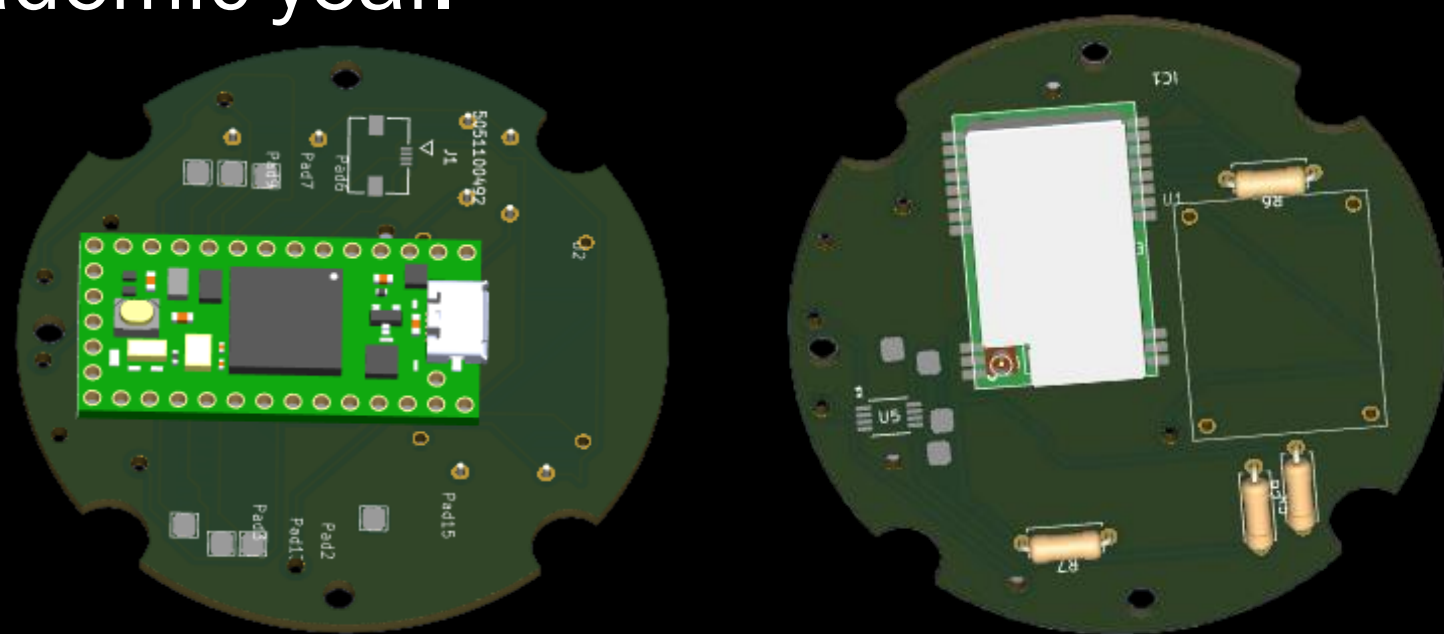
- Develop a Cube-Sat payload for TES-22
- Measure Radiation in Low Earth Orbit (LEO)
- Communicate with the Primary Satellite Controller.



3D Render of TES – 22 By James Adams

## Value Proposition

In designing space experiments there is typically a significant delay between experiment readiness and actual launch date. The Cube Satellite platform provides the means to go from research inception to collecting data in an accelerated time frame. Our team will be constructing a payload which will attach to a CubeSat that will gather radiation data in Low Earth Orbit (LEO). Additionally, this payload will be ready for deployment in the third quarter of 2024, thereby going from inception to deployment in one academic year.



Model of Payload PCB

## Requirements

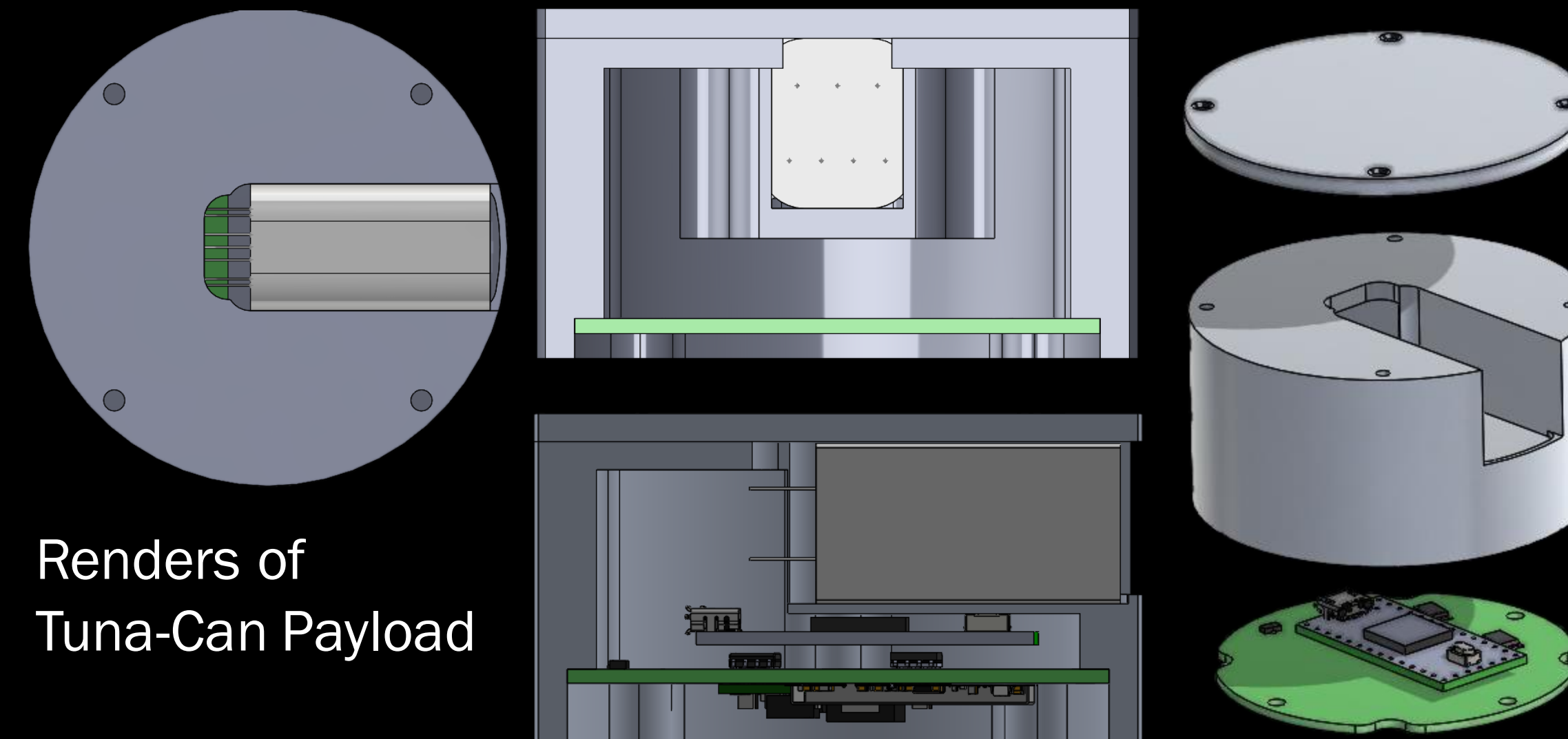
- Fit in Dimensional & Weight Constraints.
- Measure Radiation Data.
- Interface with Primary Cube-Sat's Controller.
- Integrate Components onto a Printed Circuit Board.

# THE UNIVERSITY'S FIRST FORAY INTO CUBESAT PAYLOAD DEVELOPMENT

Team Members: Conner Wiench (CS), Dre Mata (EE), Lucien Lee (CS), Lyna Tran (ME), Nathan LaVoie (BE), & Sydney Munson (ME)  
Advisors: Kip Sikes and Feng Li



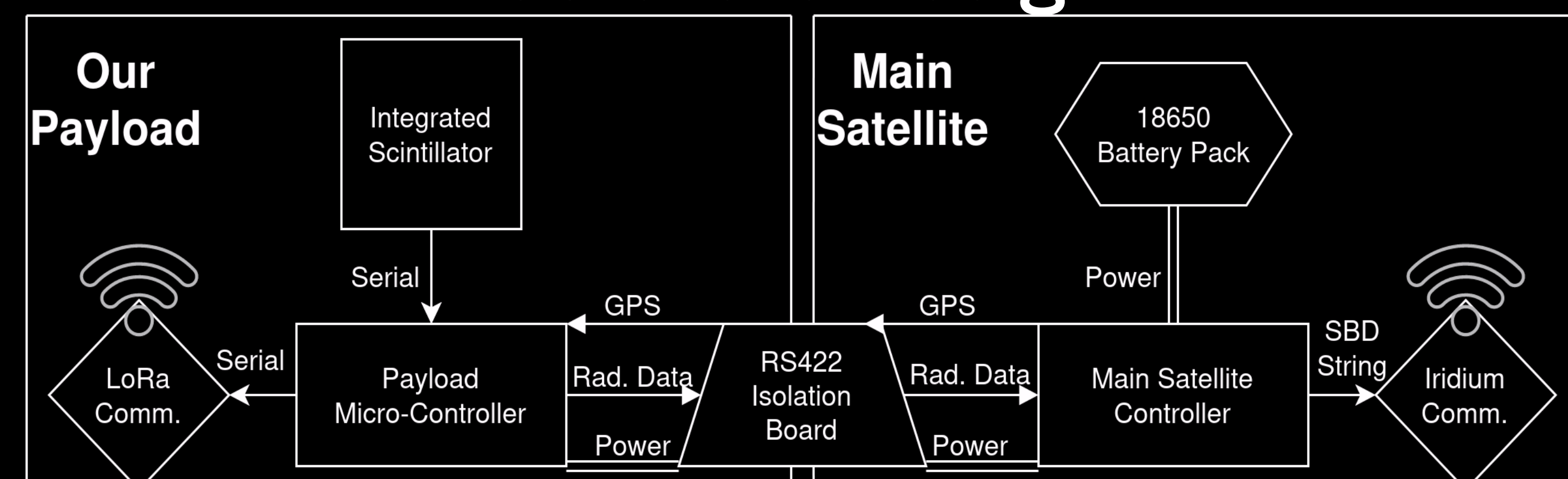
## Hardware Design



Renders of Tuna-Can Payload

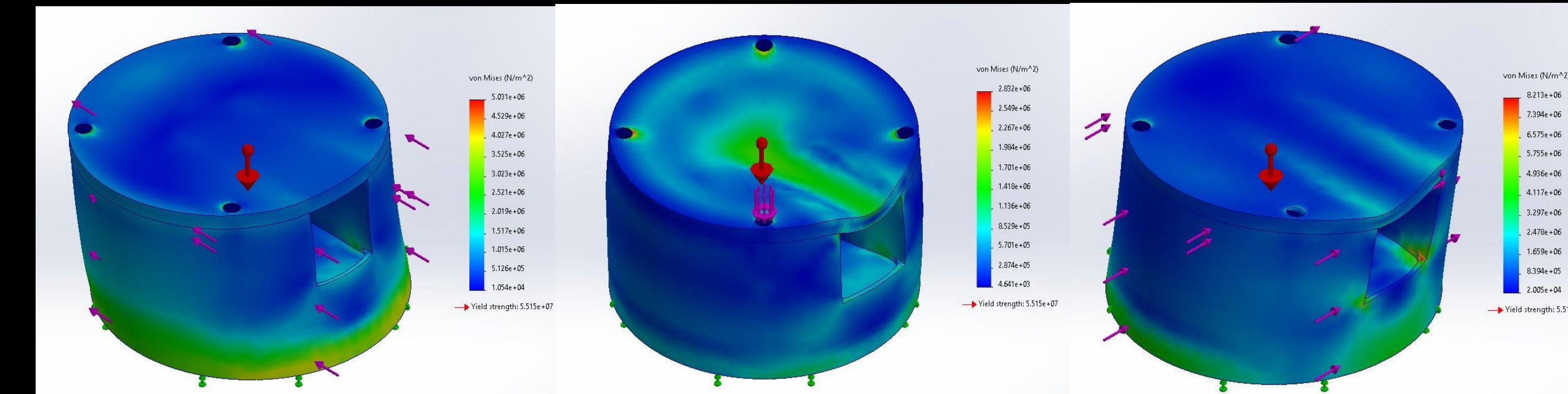
- Interface with standard 1U (100mm cubed) CubeSat.
- All hardware confined to a 64mm x 35mm cylinder.
- Window allowing sensor direct contact with radiation activity.
- Use of automotive electronics that can withstand extreme temperatures.
- Avoided the use of heat dissipating electronic components

## Software Design

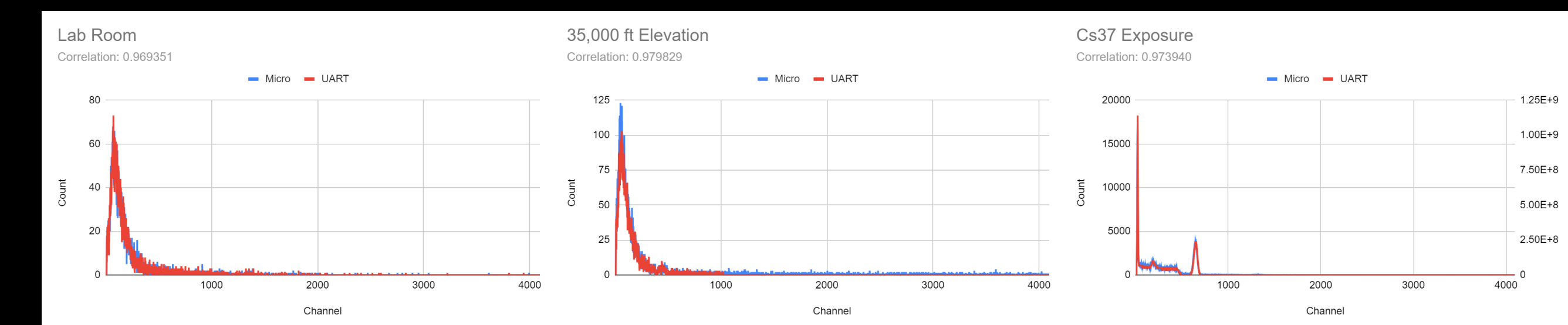


- Payload driven off a Teensy 4.0 Microcontroller
- Communication through physical RS422 UART connection and the onboard LoRa Module
- Nanopb Proto-buffers to store and encode gathered data

## Validation



FEA Analysis under 35g



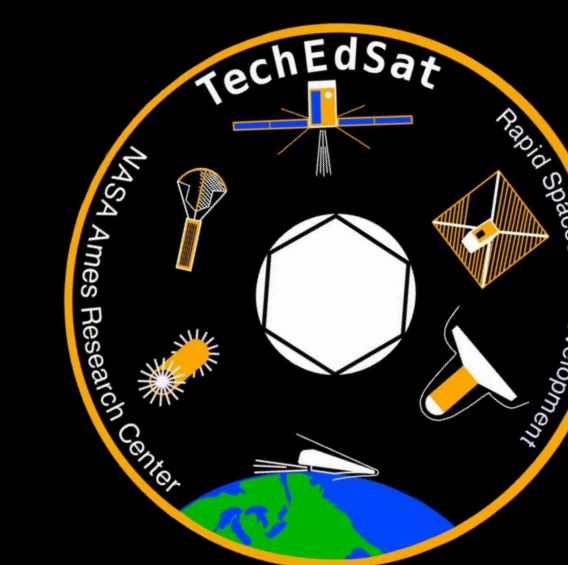
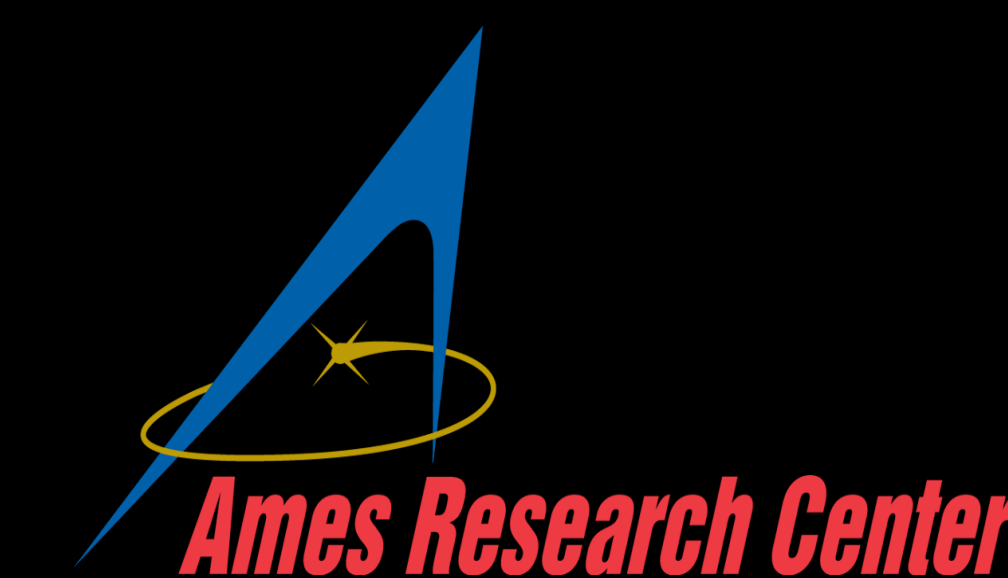
Micro USB vs UART radiation data

## Summary

- TES – 22 is set to launch onboard a SpaceX Transporter mission in August 2024.
- In harmony with the main CubeSat body, TES – 22 will orbit the Earth for up to 5 years gathering radiation data.

## Acknowledgements

TechEdSat Team  
Avery Brock  
Malachi Mooney-Rivkin  
NASA Ames Research Center



2024 Capstone Project