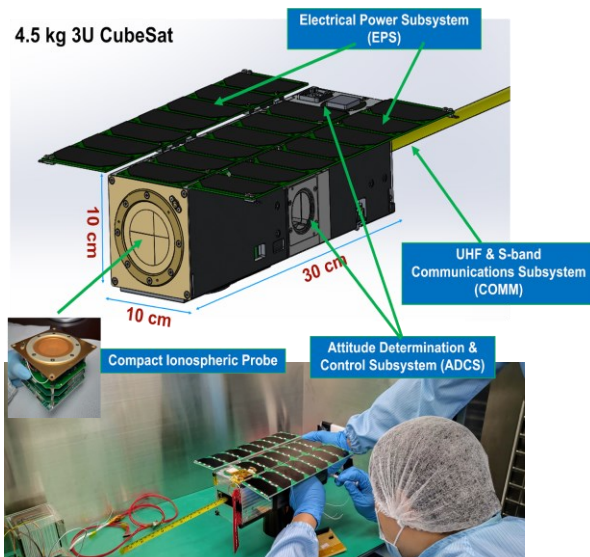


Deep Space Radiation Probe (DSRP): Taiwan's First Lunar Payload



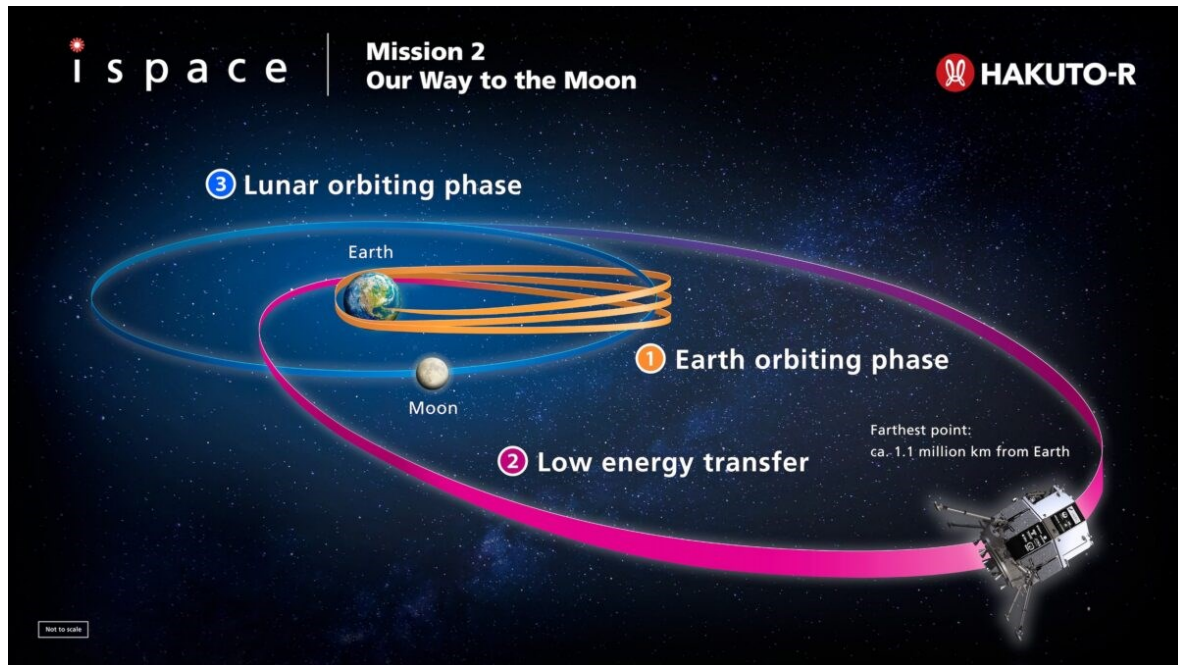
Chieh Lung
2025/11/03

Mission Background



The first CubeSat developed at NCU experienced a critical issue 22 days after launch due to a single event latch-up

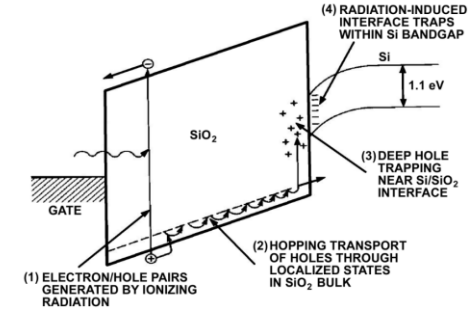
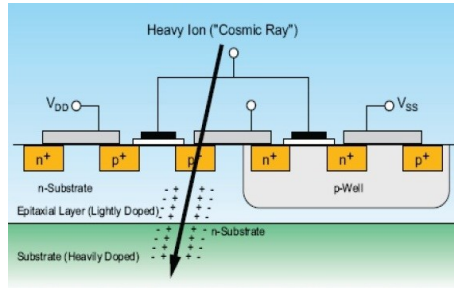
- <https://science.nasa.gov/science-research/earth-science/earths-magnetosphere-protecting-our-planet-from-harmful-space-energy/>
- <https://www.foxweather.com/earth-space/what-is-nasas-artemis-1-mission-going-to-do>
- <https://ispace-inc.com/news-en/?p=7032>



Mission Objective

M1. Total Ionizing Dose (TID)

The cumulative energy deposited in an electronic component due to long-term radiation exposure.

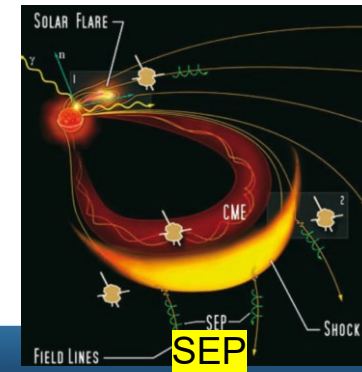
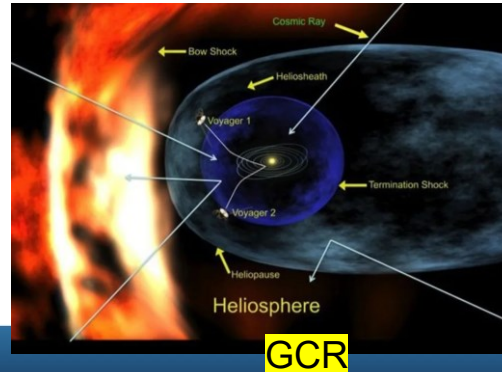


M2. Single Event Upset (SEU)

Occurs when a high-energy particle passes through a sensitive region in an electronic device, creating an ionization trail that can flip a bit or disturb circuit logic.

Space Radiation Environment

- Van Allen Belt
- Galactic Cosmic Ray (GCR)
- Solar Energetic Particle (SEP)



DSRP Measurement Method

RADFET

- Radiation-sensitive MOSFET
- Threshold voltage increases with accumulated radiation dose

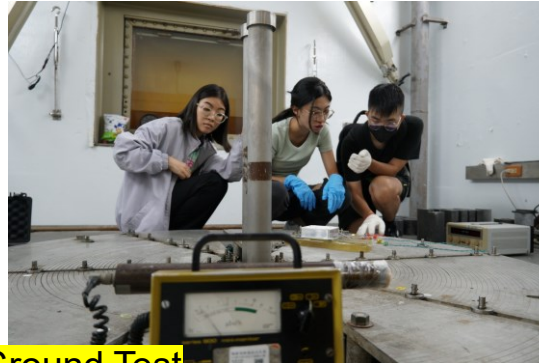
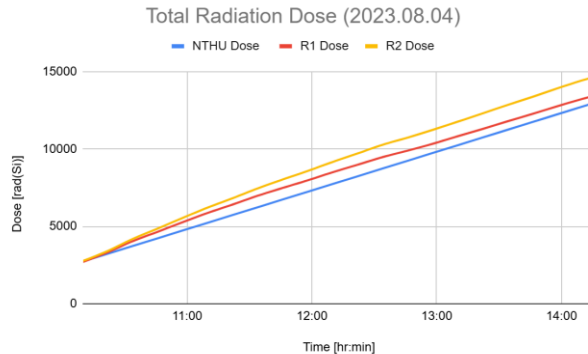
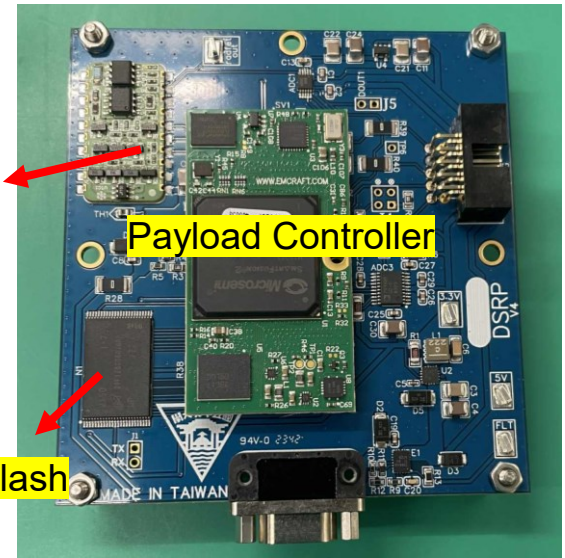
NAND Flash

- A designated section of its memory blocks is preprogrammed with known data
- Periodically scanned to count the number of bit flips

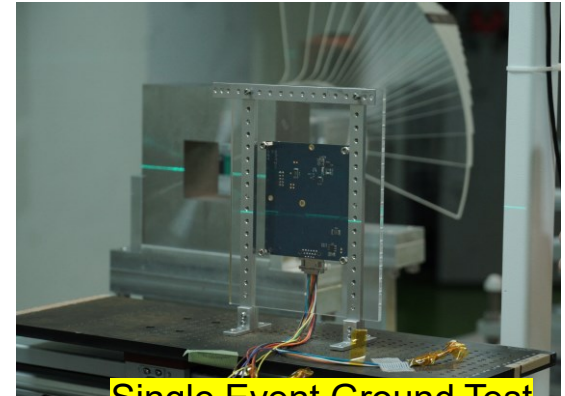
RADFET

Payload Controller

NAND Flash

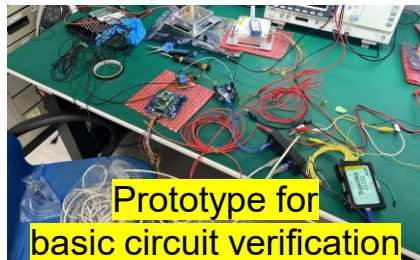


Total Ionizing Ground Test



Single Event Ground Test

DSRP Implementation and Verification



Prototype for
basic circuit verification

October 2022



EM v2 for ground test

May 2023



FM for acceptance test

October 2023



DSRP Final
Software Update

January 2024

2022

2023 Q1

2023 Q2

2023 Q4

2024

Mission kickoff
March 2022

EM v1 for fit check with lander
January 2023

EM v3 developed to
solve the issue found
in EM v2

FM Deliver
December 2023

