# Explorer-1 [Prime]: A Re-flight of the Explorer-1 Science Mission


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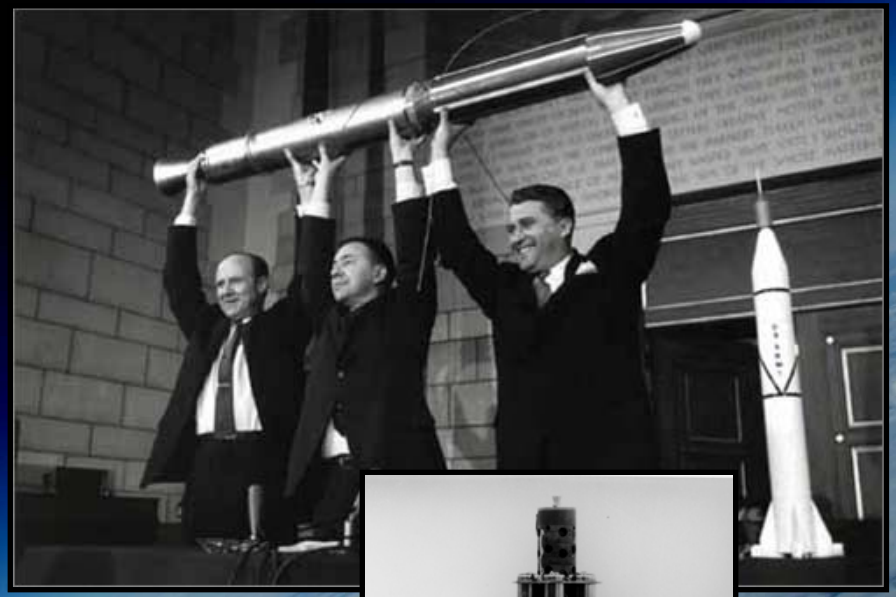
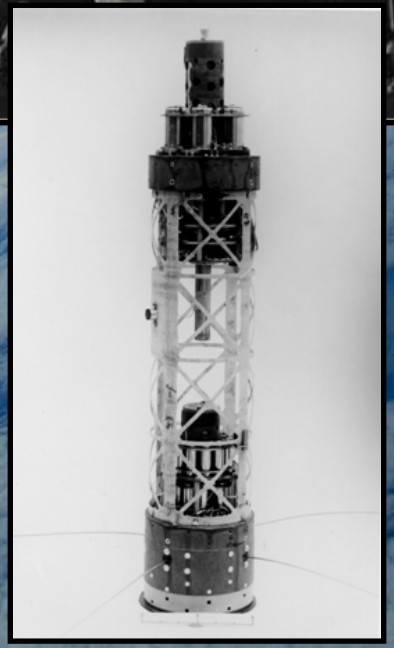
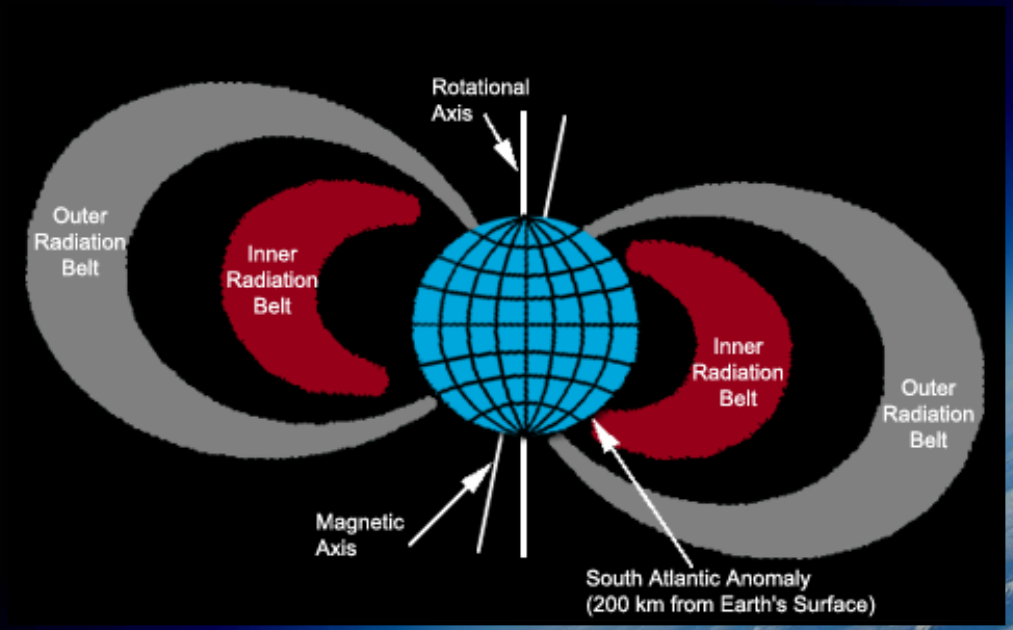
# 1958-Original Flight of Explorer-1

- Flown in the IGY
- Payload was a cosmic ray detector that produced 2 alternating tones every 16 counts
- When Explorer-1 flew through the Van Allen Radiation Belts, the tones went silent due to the Geiger-Müller tube being saturated



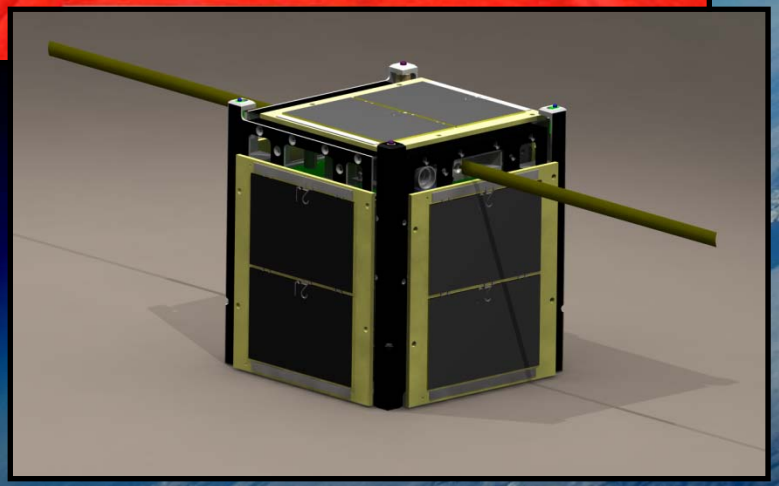


# Van Allen Radiation Belts




- Clouds of charged particles trapped in Earth's magnetic field
- Come closer to Earth's surface at the "horns" at northern and southern latitudes.
- Location of "horns" fluctuates due to solar influence
- Passing through the radiation belts effects the health of astronauts as well as aerospace electronics

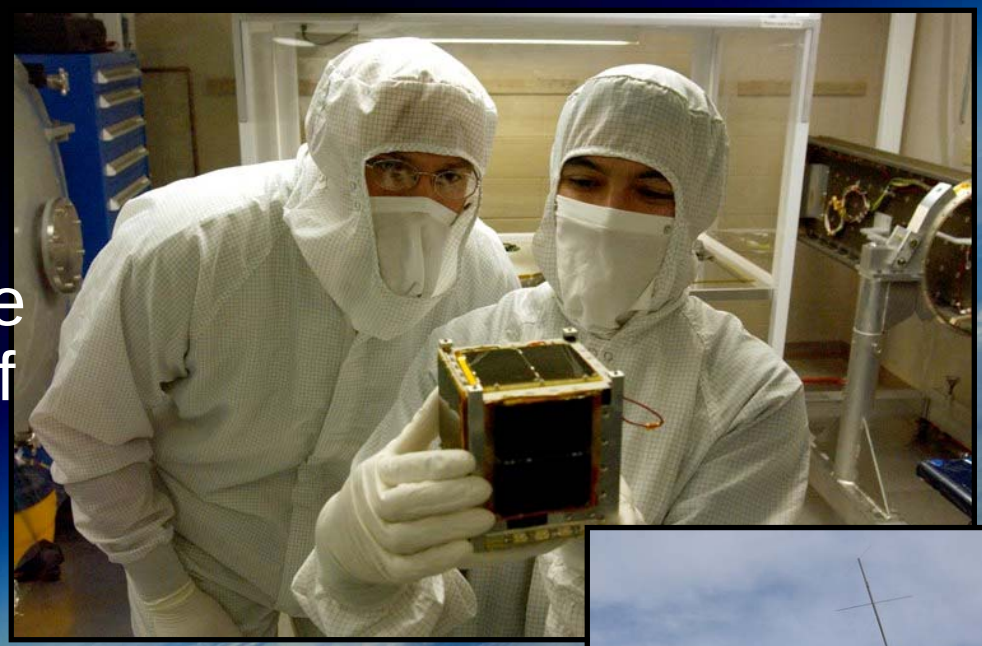
# History of Explorer-1 [PRIME]



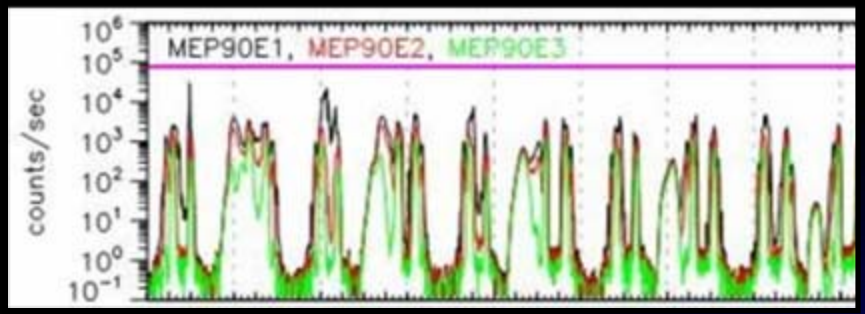
- Began life as MEROPE
- Dr. James Van Allen took an interest
  - Referred to mission as Explorer-1 [PRIME]
  - Donated Geiger tubes to SSEL
- After the loss of MEROPE, SSEL used lab heritage and began developing Electra… later renamed Explorer-1 [PRIME]

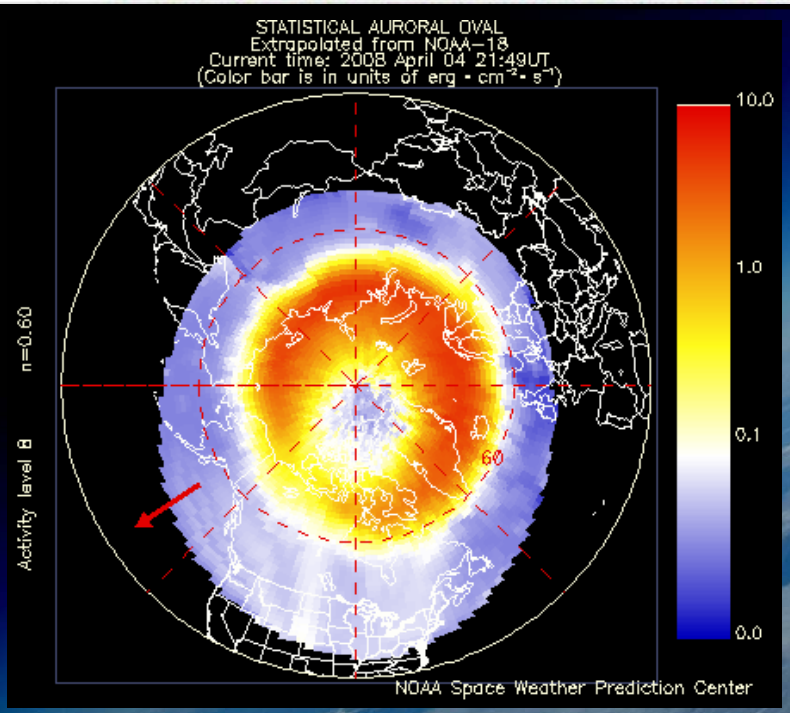
# Explorer-1 [PRIME]'s Mission

- Launch during the 50th anniversary year of Explorer-1
- Monitor variations in the location and intensity of the Radiation Belts
- Majority of the satellite is being built and designed by MSU students
- Encourages public involvement from the amateur radio community



# Explorer-1 [PRIME]'s Science

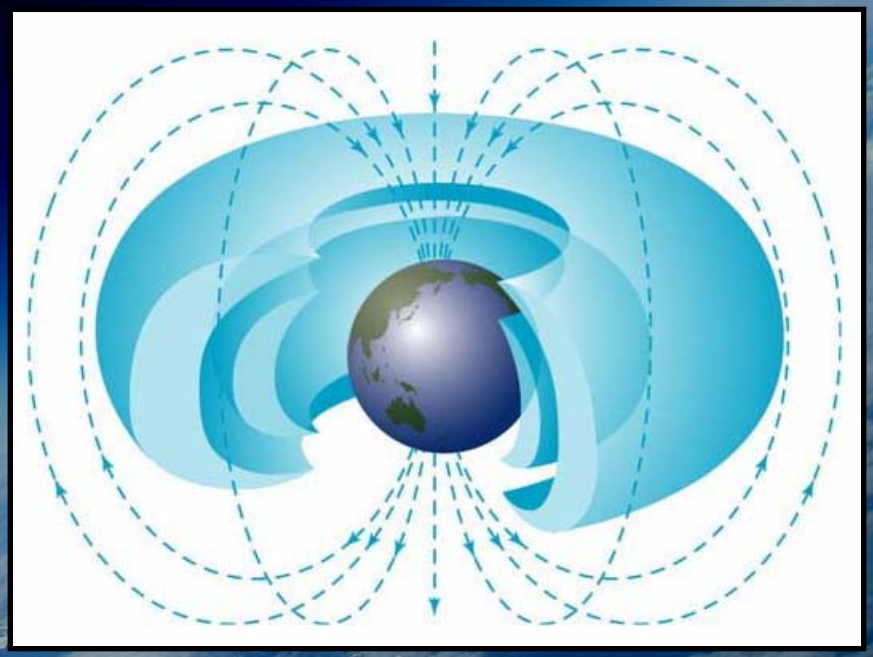



- Detect electron flux without saturating Geiger tube
- Record and store data for at least a 24 hour period
- Measure location of Van Allen Radiation Belts' boundaries

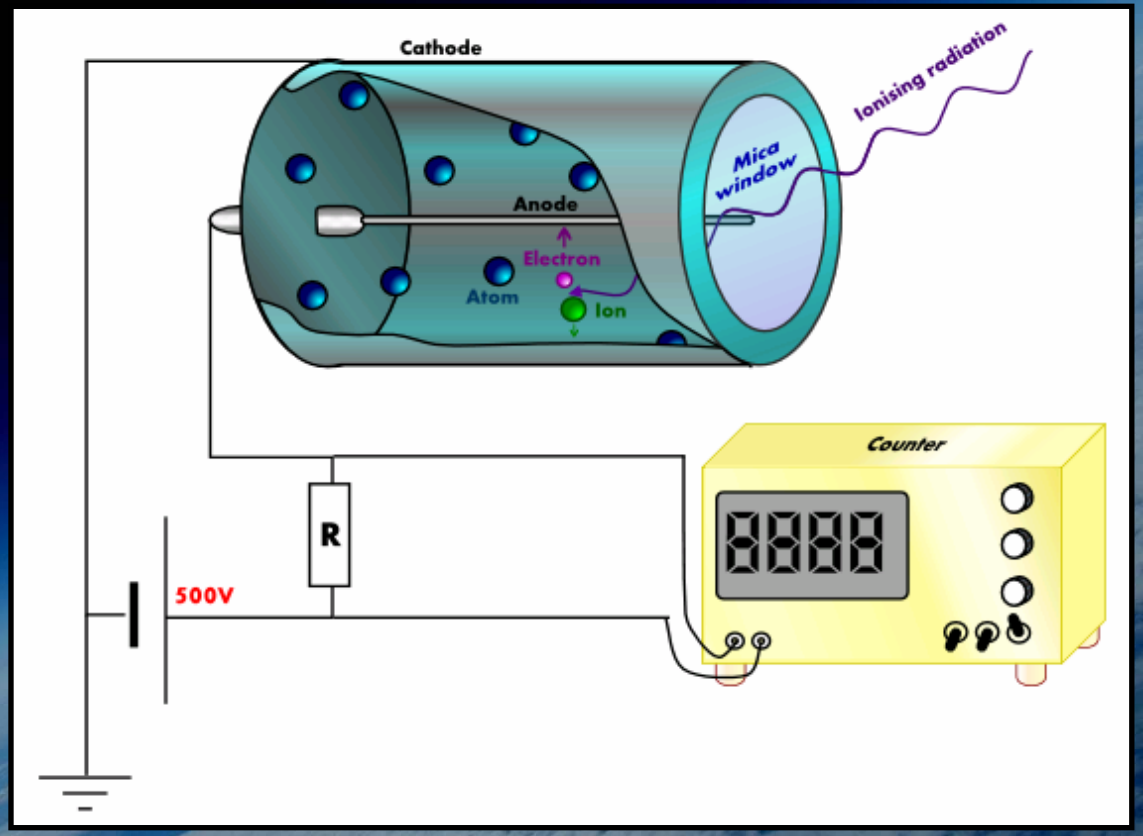
# Measuring the Radiation Belts

- Explorer-1[PRIME]'s nominal orbit will be in LEO at a high inclination intersecting the "horns" at the northern and southern boundaries
- Measurements taken will establish the positions of the "horns" and later

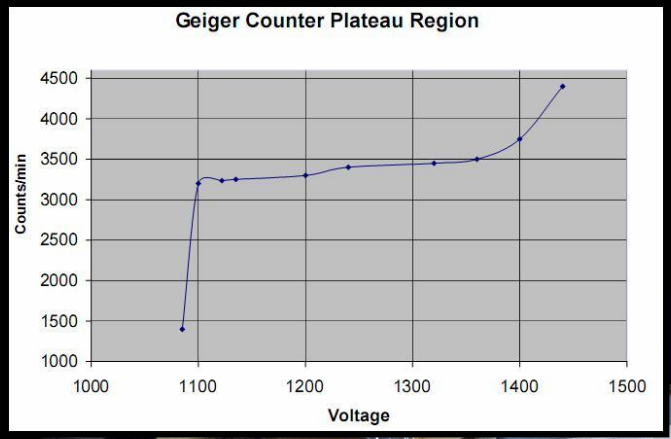


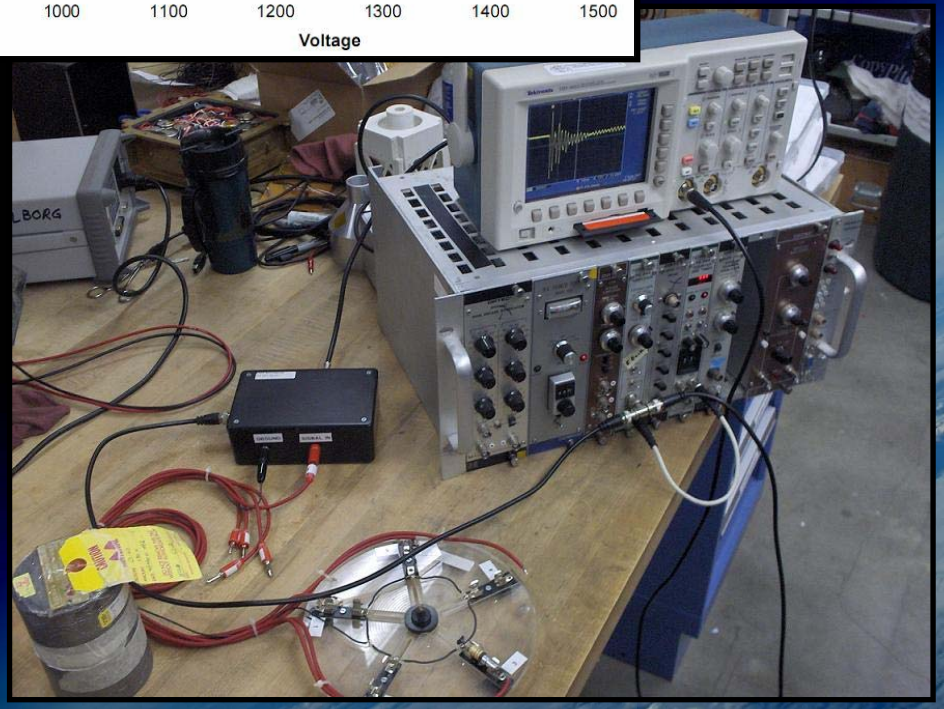
# What is a Geiger Counter?

- Consists of a Geiger-Müller tube, power supply, amplifier, and a counter
- Detects energetic particles as they enter the window



# Geiger Tube Selection

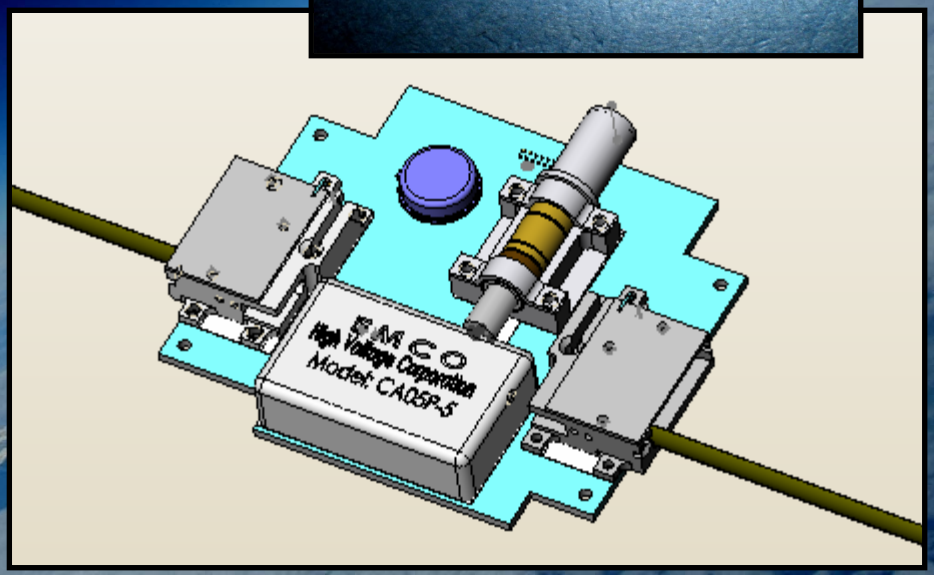


- Dr. Van Allen donated approximately 15 tubes to the lab
- Since each tube has unique electrical characteristics, they must each undergo a thorough selection process to qualify for flight

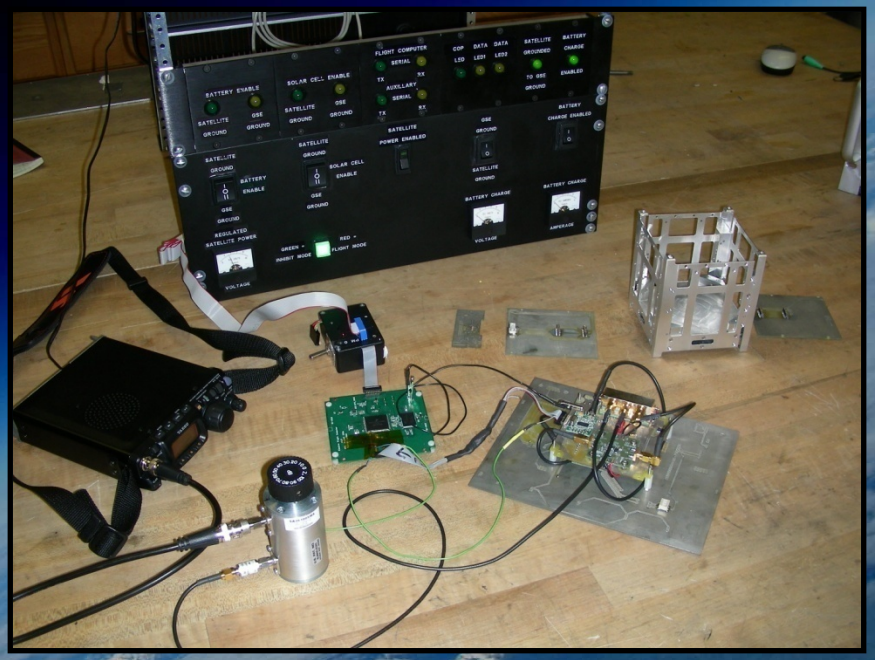
# Payload Design

- To prevent saturation, the Geiger tube holder's window must be adjusted to allow fewer particles to enter
- Tube must be faced perpendicular to the Earth's magnetic field



# Summary

- Commemorating the 50th anniversary year of Explorer-1
- Using a Geiger tube, we are trying to collect particle count data in the radiation belts, then correlate the results with possible solar events



For more information, visit www.ssel.montana.edu