T0124-B Gannon Univ's Cosmic-Ray Calorimeter (GU-CRC)

Problem Statement

- Develop undergrad interest in STEM (particularly aerospace technology) for the benefit of future employers and the overall scientific community by:
  - Providing an opportunity for undergrad research experience
  - Gaining laboratory skills, general understanding of technology development, presentation skills,
  - Increasing overall interdisciplinary knowledge and collaboration
- Study high-energy particles (cosmic rays) to "discover how the universe works"

Technology Development Team

- Principle Investigator:
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- National Aeronautics and Space Administration Grant No. NNX13AR55G through the Science Mission Directorate
- Also supported in part by a grant from the Pennsylvania Space Grant Consortium.

Proposed Flight Experiment

Experiment Readiness:

- The payload is expected to ready by January 2015.

Test Vehicles:

- High-altitude balloon

Test Environment:

- The high-altitude balloon will fly at the top of the atmosphere (~120,000 ft).

Test Apparatus Description:

- Alternating layers of light-producing scintillating crystals and metal absorber form a calorimeter that is read out with light detectors (which convert light into electrical signals)

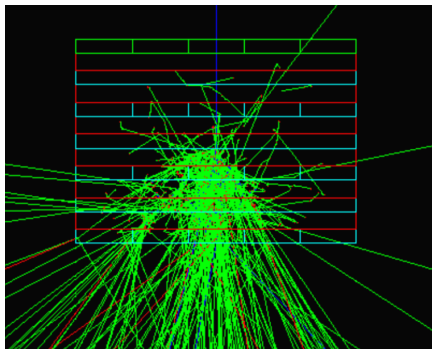

Figure 1
Simulation of cosmic ray interaction inside a calorimeter

Technology Maturation

- Team members current TRL 3-4
  - Newer members (3) will need time to familiarize and develop the necessary working knowledge of physics, engineering, and technology
  - More developed students (4) aiming to achieve TRL 6 (equivalent to a BA/BS) will need to be able to conceptualize and theorize solutions to research and scientific questions with high levels of success
- The payload is TRL 4 (key functions and basic validation). To achieve TRL 7 software needs to be fully developed and the finished payload needs to successfully operate at balloon-float altitudes.

Objective of Proposed Experiment

- Excite and engage undergrad students in space science
  - Involve a diverse group of students (year, gender, ethnicity, and educational focus)
- Detect high-energy cosmic rays in order to measure the ratio of protons to helium to help "discover how the universe works."

List the applicable Technology Areas addressed by your technology: TA08.3.1

9/2014