Contribution ID : **1005** Type : **Poster**

Exploring SiPM-Based Calorimeter Readout for CREAM

Abstract content

Cosmic Ray Energetics And Mass (CREAM) is a balloon-borne experiment designed to study high energy cosmic-ray nuclei through direct measurements at the top of the atmosphere. CREAM incorporates a suite of detectors, including a 20 radiation length (X0) sampling tungsten/scintillating-fiber calorimeter. The calorimeter is comprised of 20 active layers of 0.5 mm diameter fibers grouped in 1 cm wide ribbons, interleaved with 20 tungsten plates, each 3.5 mm thick. Each ribbon is aluminized on one end to enhance light collection, with the other end read out using photo-detectors. To date, the CREAM calorimeter readout was based on hybrid photo diodes (HPDs), which provide highly linear, highly uniform readout with reasonable power, weight, and volume requirements. For future flights, we're exploring the possibility of replacing HPDs with silicon photo-multipliers (SiPMs). These new devices provide many of the same advantages as HPDs but with much higher gain, low operating voltage (60V vs. 6000V for HPD), and lower readout weight. The higher gain will allow CREAM to push the energy threshold below the originally proposed 1 TeV. The low operating voltage simplifies assembly by eliminating the need for potting the HV system. The weight reduction allows heavier ballast to be included in the payload, making longer flight durations possible. This paper will present a readout scheme, including MC simulations of the new design using ray tracing to establish optimal light-mixer geometry and SiPM sizes and locations on the light-mixer, along with lab measurements to validate the MC results. We also discuss in detail the advantages of the new readout scheme.

If this papers is presented for a collaboration, please specify the collaboration

Summary

Reference

Primary author(s) : Dr. GANEL, Opher (University of Maryland)

Co-author(s) : Dr. AHN, HoSeok (University of Maryland); WU, Jayoung (University of Maryland); YOO, JoonHyuk (University of Maryland); YOON, YoungSoo (University of Maryland); HAN, JiHye (University of Maryland); KIM, ChanHo (University of Maryland); KIM, KiChun (University

of Maryland); Dr. LEE, MooHyun (University of Maryland); LUTZ, Larry (University of Maryland); Dr. MALININ, Alexander (University of Maryland); Prof. SEO, Eun-Suk (University of Maryland); WALPOLE, Peter (University of Maryland)

Presenter(s) : Dr. GANEL, Opher (University of Maryland)

Session Classification : Posters 1 + Coffee

Track Classification : OG.1.5