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Thermal Characteristics of CREAM Calorimeter Components

Abstract content

The Cosmic Ray Energetics And Mass (CREAM) calorimeter is designed to measure energies of cosmic-ray particles from ˜10^{11} eV to ˜10^{15} eV. The calorimeter is comprised of 20 tungsten plates, each 3.5 mm, or 1 radiation length thick, interleaved with 20 layers of 0.5 mm thick scintillating fiber ribbons. The scintillation light generated in the fiber ribbons when a cosmic-ray particle interacts in the calorimeter are read out by photo sensors and converted into digitized signals by readout electronics. This type of calorimeter was flown on two successful long duration balloon (LDB) flights with a total duration of 70 days. As is widely known, scintillators, photonics and electronics all have temperature dependence that must be addressed to correctly reconstruct events. To address temperature-driven changes in pedestal values, pedestals were measured every 5 minutes in flight, allowing accurate pedestal subtraction for all events. Detailed tests of the calorimeter components were carried out at various temperatures to characterize the overall behavior. For example, to test the readout and trigger electronics, the pedestal values, noise levels, charge gain, trigger noise levels and trigger gain were all measured as functions of temperature. This paper presents the calorimeter component characteristics at different temperatures and shows how the effects are taken into account in the data analysis.

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

Summary

Reference

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