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Top and Bottom Counting Detectors for the ISS-CREAM experiment

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It is important to measure the cosmic ray spectrum to understand the origin, acceleration and propagation mechanisms of high-energy cosmic rays. The Cosmic Ray Energetics And Mass (CREAM) experiment will be launched in 2015 to the International Space Station (ISS) to measure cosmic ray elemental spectra up to energies beyond the reach of balloon instruments. The Top Counting Detector (TCD) and Bottom Counting Detector (BCD) are designed for separating electrons from protons using the difference between electromagnetic and hadronic shower shapes in the energy range of 300 GeV ˜ 800 GeV. The T/BCD each consists of a plastic scintillator read out by 20 by 20 photodiodes. The active detection areas in the T/BCD are 500 $\times$ 500 mm^2 and 600 $\times$ 600 mm^2, respectively. Before integration with the payload, the T/BCD was assembled and qualified with environment tests such as vibration and thermal vacuum tests to confirm the safety of the T/BCD in a space environment. The T/BCD has now been integrated with the payload. The TCD is located between the ISS-CREAM carbon target and its calorimeter, and the BCD is located below the calorimeter. Noise and calibration of the T/BCD have been tested with Ground Support Electronics (GSE) boards, and the capability of the T/BCD to separate electrons from protons has been studied with GEANT3 simulation. We present the design, construction, performance and simulation results of the T/BCD.

Collaboration

– not specified –

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