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Construction and beam test of a dual layer silicon charge detector (SCD) for the CREAM experiment

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The Cosmic Ray Energetics And Mass (CREAM) balloon-borne experiment is designed for direct measurement of high-energy cosmic-ray particles. The science goal is to measure the single-element fluxes of all cosmic-ray nuclei from hydrogen (protons) to iron with energies up to the "knee", or spectral index change, near 10¹⁵ eV observed in the all-particle spectrum. A dual layer Silicon Charge Detector (SCD-II) was designed for precise charge measurement of incident nuclei. Each SCD-II layer consists of 26 ASIC boards and 182 silicon sensors covering an active area of 77.9 x 79.5 cm². Each sensor is comprised of a 4 x 4 array of single-sided DC type silicon pixels with an active area of 2.1 cm². The detector was launched as part of CREAM-II on December 16th, 2005, stayed at float for 28 days, and was recovered successfully. The SCD-II was refurbished for the 3rd CREAM flight planned for December 2007, and tested at CERN October 2006. The construction and the beam test results of the SCD-II are reported.

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