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Limits on the Multi-TeV Cosmic Ray Electron Flux from CREST (Cosmic Ray Electron Synchrotron Telescope)

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Electrons at energies greater than 1 TeV must originate in the local Galactic neighborhood, within a kpc or so, owing to their rapid energy loss rates during propagation. Only a few candidate acceleration sites exist within this horizon, such as the Vela, Monogem or Cygnus Loop supernova remnants, and thus a measurement of the multi-TeV cosmic-ray electron flux would be a very useful probe of the nearby high-energy universe. The CREST instrument was designed to detect multi-TeV cosmic electrons through their synchrotron x-ray emission in the Earth's magnetic field. It consists of an array of 1024 BaF₂ crystal detectors designed to detect the linear pattern of photons characteristic of synchrotron emission at these energies, surrounded by veto plastic scintillators to guard against chance alignments of charged particles in air showers. This instrument was successfully flown on a high-altitude balloon for 10 days in Antarctica during the 2011/2012 Long Duration Balloon campaign. In this paper we present the first experimental limits, derived from this flight's data, on the multi-TeV cosmic electron flux.

Collaboration

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