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Understanding the Origin of Cosmic-Ray Electrons and Positrons

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The electron and positron fluxes measured by the Alpha Magnetic Spectrometer (AMS) exhibited complex energy dependencies. In the entire energy range the positron flux is well described by the sum of a power-law term associated with the positrons produced in the collision of cosmic rays, which dominates at low energies, and a new source term of positrons, which dominates at high energies. This new source has a finite energy cutoff, which is established with a significance of ~5σ. These experimental data on cosmic ray positrons show that, at high energies, they predominantly originate either from dark matter annihilation or from a new astrophysical source.

In the entire energy range the electron and positron spectra have distinctly different magnitudes and energy dependences. At high energies, AMS data show that the electron spectrum can be best described by the sum of two power law components and a positron source term. This is the first indication of the existence of identical charge symmetric source term both in the positron and in the electron spectra and, as a consequence, the existence of new physics.

Collaboration you are representing

AMS

Author: LI, Shanglin (中国科学院高能物理研究所)

Presenter: LI, Shanglin (中国科学院高能物理研究所)

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