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Towards Understanding the Origin of Cosmic-Ray Positrons and Electrons

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Precision measurements of cosmic ray positrons and electrons are presented based on 1.9 million positrons and 28.1 million electrons collected by the Alpha Magnetic Spectrometer on the International Space Station. The positron flux exhibits complex energy dependence with a sharp drop-off above 284 GeV. In the entire energy range the positron flux is well described by the sum of a term associated with the positrons produced in the collision of cosmic rays, which dominates at low energies, and a new source term of positrons with an exponential energy cutoff, which dominates at high energies. This shows that, at high energies, positrons predominantly originate either from dark matter annihilation or from other astrophysical sources. Contrary to the positron flux the electron flux does not have an energy cutoff. The different behavior of the cosmic-ray electrons and positrons measured by AMS is clear evidence that most high energy electrons originate from different sources than high energy positrons.

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