

Towards Understanding the Origin of Cosmic-Ray Positrons

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Precision measurements of cosmic ray positrons are presented up to 1.4 TeV based on 3.4 million positrons collected by the Alpha Magnetic Spectrometer on the International Space Station. The positron flux exhibits complex energy dependence. Its distinctive properties are: (a) a significant excess starting from 24.2 GeV compared to the lower-energy, power-law trend; (b) a sharp drop-off above 268 GeV; (c) 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, which dominates at high energies; and (d) a finite energy cutoff of the source term at 887 GeV is established with a significance of 4.5σ . These experimental data on cosmic ray positrons show that, at high energies, they predominantly originate either from dark matter annihilation or from new astrophysical sources.

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