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Understanding the Origin of Cosmic-Ray Positrons

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We present the precision measurements of eleven years of the cosmic-ray positrons flux in the energy range from 0.5 GeV to 1.4 TeV based on 3.9 million positrons collected by the Alpha Magnetic Spectrometer on the International Space Station. The positron flux measured by the AMS exhibits complex and unexpected energy dependence. Its distinctive properties are: a significant excess starting from ~ 20 GeV and a sharp drop-off above 260 GeV. 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 $\sim 5\sigma$. These unique 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.

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