



## Measurement of the cosmic ray positron spectrum with the Fermi LAT using the Earth's magnetic field

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**Abstract:** In addition to its primary purpose as a gamma-ray telescope, the Fermi Large Area Telescope is an excellent cosmic ray electron and positron detector and has measured their combined spectrum between 7 GeV and 1 TeV. Although the LAT itself cannot distinguish electrons and positrons, the Earth's magnetic field creates natural "shadows" from which particular charges are forbidden because their paths are blocked by the Earth. Using a precise tabulation of the geomagnetic field produced by an international collaboration of geophysicists, we trace particle trajectories in order to separate electrons and positrons. We have used this geomagnetic technique for the first time to measure the electron-only spectrum, the positron-only spectrum, and the positron fraction, all above 20 GeV. We also note the LAT's capability to identify secondary positrons produced by cosmic ray air showers.

**Keywords:** positrons, electrons, geomagnetic field, Fermi Large Area Telescope