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Prospects for Measuring the Positron Excess with the Cherenkov Telescope Array

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The excess of positrons in cosmic rays above ~ 10 GeV has been a puzzle since it was discovered. Possible interpretations of the excess include acceleration of positron secondaries in local supernova remnants or pulsars, or the annihilation or decay of dark matter particles. To distinguish between these interpretations, the measurement of the positron fraction must be extended to higher energies. One technique to perform this measurement is using the Earth-Moon spectrometer: observing the deflection of positron and electron moon shadows by the Earth's magnetic field. The measurement has been attempted by previous imaging atmospheric Cherenkov telescopes without success. The Cherenkov Telescope Array (CTA) will have unprecedented sensitivity and background rejection that could make this measurement successful for the first time. In addition, the possibility of using silicon photomultipliers in some of the CTA telescopes could greatly increase the feasibility of making observations near the moon. Estimates of the capabilities of CTA to measure the positron fraction using simulated observations of the moon shadow will be presented.

Collaboration

CTA

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