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Polarimetry of gamma rays converting to e+e- pairs: performance of silicon strip detectors-based telescopes

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The polarimetry of gamma rays converting to an e+e- pair would open a new window on the high-energy sky with, among other things, providing insight into the radiation mechanism in young pulsars (curvature or synchrotron) or deciphering the composition of the gamma-ray emitting jets in blazars (leptonic or lepto-hadronic).

The performance of polarimeters based on homogeneous active targets (gas detectors (MeV, HARPO) or emulsions (GeV, GRAINE)) has been studied both with simulation and by the analysis of data collected with telescope prototypes on linearly-polarized gamma-ray beams, and found to be excellent, but the present (Fermi-LAT, AGILE) and project (AMEGO, ASTROGAM) gamma-ray missions are using active targets based on silicon strip detectors (SSD). After past attempts to demonstrate a non-zero effective polarization asymmetry with SSDs failed, be it only with simulated data, published sensitivity estimations had to be obtained from an assumed value of the effective polarization asymmetry.

I will present a characterization of the potential of SSD-based active targets for polarimetry with gamma ray conversions to pairs, and the development of various methods to improve on the sensitivity. These results were obtained using data simulated with my home-made, exact, five-dimensional, event generator and a dedicated event-reconstruction method. This work could pave the way to providing the polarimetry of the brightest gamma-ray sources of the sky from the decade of data collected by the Fermi-LAT and by AGILE, and to guiding the design of future missions.

Track

Analysis Techniques

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