

Gas active targets: a window to high-energy gamma-ray polarimetry with conversions to e^+e^- ; experimental demonstration with the HARPO TPC (time projection chamber) prototype.

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gamma-ray astronomy is polarization-blind as no significant polarimetry of a cosmic source has been performed since the OSO-8 measurement on the Crab nebula in the X-ray band.

gamma-ray polarimetry would enable to tag the curvature-synchrotron radiation transition in pulsars, to decipher leptonic from hadronic radiation models for blazars .. and much more.

We demonstrated that with a low-density homogeneous active target such as a gas TPC (time projection chamber), the single-track angular resolution is so good after a low radiation-length thickness that polarimetry should be possible with gamma conversions to e^+e^- pairs.

With a TPC prototype in a gamma-ray beam, we demonstrated experimentally the effective polarimetry with an excellent polarization-asymmetry dilution *AstroPart. Phys.* 97 (2018) 10.

Spin-offs of interest to the community:

An analytical analysis of the single-track angular resolution with an optimal tracking à la Kalman, an optimal method to measure a track momentum in a non-magnetic tracker from the analysis of the deflections due to multiple scattering (Kalman helping Molière), interest to silicon-detector based telescopes (Fermi-LAT, AGILE, e-ASTROGAM, AMEGO) *NIM A* 867 (2017) 182.

An exact Monte carlo event generator of the five-dimensional (5D) Bethe-Heitler differential cross section (polarized or not, nuclear or triplet conversion, pure QED or with electron cloud screening) and strictly energy-momentum conserving, to appear in *NIM A*. Good hope of a deployment of the G4BetheHeitler5DModel physics model in the 10.5beta Geant4 release at the end of June 2018.

Primary author: Dr BERNARD, Denis (LLR, CNRS/IN2P3)

Presenter: Dr BERNARD, Denis (LLR, CNRS/IN2P3)

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