Contribution ID: **96** Type: **Oral Contributions**

Gamma-ray polarimetry in the pair regime with the HARPO TPC

Monday, 12 September 2016 15:00 (15 minutes)

I will first describe the experimental setup with which we took data at different photon energies from 1.7MeV to 74MeV, and with different polarisation configurations.
I will present the software I developed to reconstruct the photon conversion events, especially for low energies.
I will also introduce the complete detailed simulation I made of the detector.
Finally I will present the performances of the detector, and in particular its sensitivity to polarisation, as extracted from this analysis and compare them to results from models and simulations.

Summary

Current gamma-ray telescopes suffer from a gap in sensitivity in the energy range between 100keV and 100MeV, and no polarisation measurement has ever been made on cosmic sources above 1MeV.
A higher angular resolution is needed to improve the sensitivity to point sources, and to access the polarisation of the photons.
We demonstrated that this is possible only with an active gaseous detector.
The measurement of the polarisation of gamma sources will allow us to probe the physical structure of their magnetic fields thus enabling us to better understand the acceleration mechanisms at work in the sources and to place constraints on emission models.
These measurements will also allow us to address new physics topics like Lorentz Invariance Violation.

HARPO is an R&D program to characterize the operation of a gaseous detector (Time Projection Chamber or TPC) as a high angular-resolution and sensitive telescope and polarimeter for γ-rays from cosmic sources.
It represents a first step towards a future space instrument.

We built and characterised a 30cm cubic demonstrator, and put it in a polarised gamma-ray beam at the NewSUBARU accelerator in Japan.
From this we measure polarisation and angular resolution capabilities of the technology.

Our beam-test qualification of a gas TPC prototype in a gamma-ray opens the way to high-performance gamma-ray astronomy and polarimetry in the MeV-GeV energy range in the next future.
A concept for a larger module to be operated in a stratospheric balloon, with realistic signal and background, will be introduced.

Primary author: GROS, Philippe (Centre National de la Recherche Scientifique (FR))

Presenter: GROS, Philippe (Centre National de la Recherche Scientifique (FR))

Session Classification: Gamma-ray astrophysics

Track Classification: Gamma-ray astrophysics