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Reconstruction and Particle Identification with CYGNO Experiment

Friday, 3 December 2021 16:10 (10 minutes)

CYGNO is developing a gaseous Time Projection Chamber (TPC) for directional dark matter searches, to be hosted at Laboratori Nazionali del Gran Sasso (LNGS), Italy. CYGNO uses He:CF4 gas mixture at atmospheric pressure and relies on Gas Electron Multipliers (GEMs) stack for the charge amplification. Light is produced by the electrons avalanche thanks to the CF4 scintillation properties and is then optically read out by a high-resolution scientific CMOS Camera (sCMOS) and Photo-Multiplier Tubes (PMT). sCMOS are designed for low readout noise, uniformity, and linearity and are therefore capable to track particles down to O(keV) energies. These high-resolution images (2D event projection) are combined with the PMT signal (relative z coordinate information) to obtain 3D reconstruction, with the aim of particle identification and to determine track direction of arrival.

sCMOS images are very well suited to be analysed with Machine Learning techniques (using Convolutional Neural Networks) because of their high granularity and low noise. We will present the CYGNO features and achieved experimental performance, and then focus on the MonteCarlo sCMOS images simulation, reconstruction algorithms to identify and track particles, and the use of Convolutional Neural Networks to classify them into different energy classes of Electron and Nuclear recoils.

Significance

References

Speaker time zone

Compatible with Asia

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Session Classification: Lightning talks session

Track Classification: Track 2: Data Analysis - Algorithms and Tools