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Monte Carlo simulation of CYGNO, an optical readout TPC for directional Dark Matter search

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The CYGNO experiment aims at making use of the directionality of nuclear recoils produced in the sensitive volume of a gaseous TPC with optical readout to uniquely identify Dark Matter signals, whose direction would point to the Cygnus constellation.

As one of the steps towards the CYGNUS-TPC network of underground observatories for directional DM search at the ton scale, CYGNO collaboration is working at a 1 m^3 demonstrator operated with a He:CF_4 gas mixture at atmospheric pressure at Laboratori Nazionali del Gran Sasso. Light produced in a triple-GEM stack is read by a set of sCMOS cameras, providing the 2D projection of the track on the GEM plane, and photomultiplier tubes, to use the signal time structure to determine the component along drift direction. This readout approach will allow to exploit the topological signatures of the events providing a very good background rejection capability.

A complete Monte Carlo simulation based on results obtained from different software packages as Garfield, SRIM, GEANT4 has being developed as a crucial tool for the comprehension and optimization of detector performance. Latest results will be shown along with a detailed comparison with experimental data obtained with CYGNO prototypes.

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