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The CYGNO experiment, a directional detector for direct Dark Matter searches

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We are going to present the CYGNO project for the development of a high precision optical readout gaseous TPC for directional Dark Matter search and solar neutrino spectroscopy, to be hosted at Laboratori Nazionali del Gran Sasso (LNGS). CYGNO peculiar features are the use of sCMOS cameras and PMTs coupled to GEM amplification of a He-CF₄ gas mixture at atmospheric pressure, in order to achieve 3D tracking and background rejection down to O(keV) energy, to boost sensitivity to low WIMP masses. By measuring not only the energy, but also the direction of the nuclear recoils of the atoms of the gas, CYGNO (a CYGNus TPC with Optical readout) fits into the wider context of the CYGNUS proto-collaboration, for the development of a Galactic Nuclear Recoil Observatory at the ton scale with directional sensitivity.

We will illustrate the characteristics of the optical readout approach in terms of the effective energy threshold, the capability of 3D tracking, the possibility of inferring the absolute Z coordinate and the particle identification properties down to O(keV) energies.

The project time-line foresees in the next 2-3 years, the realisation and installation of a O(1) cubic meter TPC in the underground laboratories at LNGS to act as a demonstrator for the scalability of the technology and performance and hence, we will show its sketches and design, including a rather complex gas purification and recirculation system, the DAQ and the trigger system.

Finally, we will present the results and studies of the expected background from external and internal radioactivity and thus the expected Dark Matter sensitivities of the CYGNO demonstrator.

Collaboration

CYGNO collaboration

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