

The CYGNO/INITIUM project for directional Dark Matter searches

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We are going to present the CYGNO/INITIUM project for the development of a high precision optical readout gaseous Time Projection Chamber (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 a multiple GEM amplification structure to readout a TPC filled with an helium-fluorine based gas mixture at atmospheric pressure. With such characteristics, we aim to achieve 3D tracking with head tail capability and background rejection down to O(keV) energy, to boost sensitivity to low WIMP masses for both Spin Independent and Spin Dependent coupling. We will illustrate the staged shielded underground operation of the 50 L prototype LIME (the largest developed so far by the collaboration) and the analysis of the data collected with such setup. We will outline the design and prospects for the development of the already funded O(1) m³ demonstrator to be hosted in Hall F of LNGS and illustrate the physics reach of a possible future O(30) m³ experiment stemming from these developments. We will furthermore discuss the R&D results obtained by the collaboration towards the maximisation of the CYGNO potentialities, and in particular the recent demonstration of negative ion drift operation at atmospheric pressure with optical readout obtained in synergy with the ERC Consolidator Grant project INITIUM.

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