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The CYGNO project for directional Dark Matter searches

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We are going to present the CYGNO/INITIUM project for the development of an 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 GEMs amplification of an helium-fluorine based gas mixture at atmospheric pressure. The goal is 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 commissioning and the underground operation of the 50 L prototype LIME, the largest developed so far by the collaboration, and its capability to measure and identify low energy nuclear and electron recoils. 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 emerging 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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