Contribution ID: **36** Type: **Talk**

Feasibility of solar neutrino measurement with the CYGNO/INITIUM experiment.

Friday 24 March 2023 11:50 (15 minutes)

The CYGNO project aims to develop a gaseous high-precision Time Projection Chamber with an optical readout for directional Dark Matter searches and solar neutrino spectroscopy. The innovative features of CYGNO are the use of a He-CF_4 scintillating gas mixture, at atmospheric pressure and room temperature, together with a triple GEM amplification system optically coupled to PMTs and sCMOS cameras. By combining the information of the high-granularity camera with the fast sampling of the PMT, it is possible to perform 3D tracking with head-tail capability and particle identification down to O(keV) energy. The ERC project INITIUM, in synergy with CYGNO, aims to develop negative ion drift operations within the CYGNO 3D optical approach.

DM detectors are known to be sensitive to neutrino interaction through CevNS, which represents a nearly irreducible background if no directional information is employed to handle it. Directional DM detectors, as high precision gaseous TPCs, are not only able to discriminate this background from a DM signal but even better, to promote neutrino from an inconvenience to a physics case. Directionality can indeed be exploited not only on NR induced by CEvNES but also on ER generated by the elastic scattering of O(100) keV neutrinos on the target atomic electrons.

With a TPC, it is possible to well identify the signal by reconstructing the electron direction. The angular distribution of the electron recoil will show indeed a peak in the opposite direction of the Sun (produced by neutrinos) over a flat background component. In addition, because of the low density of the gas which determines a low multiple scattering, the reconstruction of the electron direction is feasible down to an energy of few tens of keV corresponding to about 60 keV threshold on neutrino energy.

In the presentation, we will show the latest results of the CYGNO experiment, with a particular focus on the overground commissioning of the LIME prototype, with a 33x33 cm^2 readout area and a drift length of 50 cm. We will discuss the development of the MC simulation of sCMOS images, and the data/MC agreement obtained between these and the X-ray data. We will then show, exploiting simulated data, the ability to reconstruct the direction of low-energy electron recoil, and we will finally illustrate the sensitivity limits for a solar neutrino measurement obtained by performing a bayesian analysis on the Monte Carlo.

Author: Mr TORELLI, Samuele

Presenter: Mr TORELLI, Samuele

Session Classification: Experiments