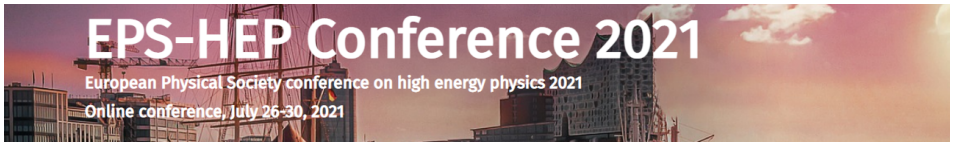

Contribution ID: **583** Type: **Parallel session talk**

CYGNUS –Directional Identification of Nuclear and Electron Recoils from Dark Matter and Solar Neutrinos

Monday 26 July 2021 16:30 (20 minutes)

Recent advances in development of gaseous Time Projection Chambers (TPCs) with ability to reconstruct the direction of ionisation tracks at low energy, opens the possibility of building a nuclear recoil observatory capable of detecting directional signals from WIMP dark matter and coherent elastic neutrino-nucleus scattering (CEvNS) events from solar neutrinos. CYGNUS aims to achieve this through construction of an array of large-scale TPCs, distributed in multiple deep underground laboratories at different latitudes with multiple target nuclei, including He, C, F and S. Such an observatory would allow sensitivity to WIMP-nucleon scattering below the so-called neutrino floor, would open a new window on solar neutrino physics in channels so-far unexplored, and allow exploration of new Beyond the Standard Model (BSM) physics. Simultaneous reconstruction of low energy electron recoil tracks is also feasible to enhance background discrimination but also to open further channels for exploration. With CYGNUS we can envisage a definitive confirmation of the galactic origin of WIMPs and eventually mapping of the local velocity distribution even to low WIMP mass. Smaller pathfinder detectors, backed by simulations of directional sensitivity and background discrimination power, are now being developed and run to allow optimisation of the technologies and the cost-effectiveness of CYGNUS. These devices can nevertheless contribute short-term physics goals, for instance observation of the Migdal effect. Progress towards realisation of CYGNUS, its potential sensitivity in different scenarios, and results of recent R&D will be outlined, including discussion of new results on operation with SF6 negative ion gas with novel charge readout systems designed to achieve directional sensitivity to low mass WIMPs.

Collaboration / Activity

CYGNUS

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