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The DARWIN experiment and the development of assay techniques for large electrodes

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The current generation of liquid xenon (lXe) filled experiments searching for dark matter (DM) are achieving ever more stringent limits on the DM's interaction cross section with ordinary matter. These experiments feature dual-phase xenon time projection chambers (TPCs), employing 3.7 ton to 5.9 ton lXe in their fiducial volumes to search for nuclear recoils induced when weakly interacting massive particles (WIMPs) scatter on a xenon nucleus. The next generation of these detectors should have the capability to access the phase-space for WIMP detection down to the region where neutrino interactions on lXe become an irreducible background. DARWIN is a proposal for such a next generation experiment with sensitivity down to the neutrino fog. It will also search for other types of DM than WIMPS as well as for the neutrinoless double-beta decay of ^{136}Xe, and measure astrophysical neutrinos.

At its core DARWIN will be a dual-phase xenon TPC with a diameter and height $gtrsim2.6$ m. VUV sensitive and ultra-low background photosensors will read the scintillation light of the primary energy deposition (S1) and the electroluminescence light produced in the vapour phase above the liquid (S2). The latter occurs when the primary electrons are drifted to the lXe surface and extracted there in the high electric field between a gate electrode and an anode. Manufacturing these electrodes is challenging as they need to retain their performance after several cryogenic cycles, they can only be made of ultra-low background materials, they need to be as transparent as possible, and they must not develop high voltage instabilities over the lifetime of the experiment.

This talk will be an overview of the current research and development (R&D) status of the Darwin experiment. Furthermore, the ongoing R\&D work on electrode assay techniques at the Prisma Laboratory at the University of Mainz will be shown.

Collaboration

Darwin

Role of Submitter

I am the presenter

Primary author: DEISTING, Alexander (Universität Mainz)

Presenter: DEISTING, Alexander (Universität Mainz)

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