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AXEL Experiment: Research and Development of a Novel Xenon Gas Scintillation Detector

Wednesday 27 August 2025 18:00 (2 hours)

A Xenon ElectroLuminescence (AXEL) experiment aims to search for neutrinoless double beta decay ($0\nu2\beta$) using a high-pressure xenon gas Time Projection Chamber (TPC).
The AXEL 180 L prototype detector, developed to demonstrate the feasibility of $0\nu2\beta$ search, determines the event start time—essential for reconstructing the z-position of ionization electron production—by directly detecting scintillation light using a VUV-sensitive photomultiplier tube.
However, the current scintillation light yield is insufficient, resulting in z-misreconstruction and, consequently, degradation of energy resolution.
To realize the world's highest sensitivity in a future ton-scale TPC for $0\nu2\beta$ search, a significant improvement in scintillation light collection is required to improve the energy resolution.
Currently, we are developing a novel scintillation detector that combines an expanded light collection area with wavelength shifting and photon trapping techniques. This detector is currently undergoing active performance evaluation.
In this poster, we present an overview of a novel scintillation detector concept and preliminary results from performance tests in high-pressure xenon gas.

Collaboration you are representing

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