

XeLab: Electrode Studies for Future LXe TPCs

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With the increasing size of dual-phase liquid xenon time projection chambers (LXe TPCs), several technological challenges arise, in particular concerning the scalability and stability of high-voltage electrodes. Large-area electrodes are increasingly exposed to mechanical sagging, electrostatic distortions, and backgrounds from spurious electron emission.

The XeLab project addresses these challenges by developing an original concept of spacer-assisted floating electrodes (SAFE) for efficient electron extraction, which introduce mechanically supported structures into the conventional gate-anode system. In this approach, electrode planarity is ensured by insulating spacers and an optimised balance of forces at the liquid-gas interface.

The construction of the XeLab cryogenic system and its dual-phase TPC has been completed. Novel cooling systems based on liquid nitrogen, together with a fully open slow-control architecture, have been commissioned and are now operational. We will present the current status of the XeLab facility and ongoing studies on novel electrode concepts.

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