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# Electron Lifetime Measurements in the LUX-ZEPLIN (LZ) Dark Matter Experiment

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The LZ experiment is a dual-phase liquid xenon Time Projection Chamber (TPC) located at the Sanford Underground Research Facility (SURF) to detect Weakly Interacting Massive Particles (WIMPs). Dual-phase TPCs are designed to observe interactions that either excite or ionize a medium via a prompt scintillation (S1) at the interaction site and a delayed amplified signal (S2) in the extraction region at the gas-liquid interface near the top of the detector. The prompt S1 signal is created by de-excitation and recombination of xenon atoms, while the delayed S2 signal is created after transporting the freed electrons from the interaction site to undergo electroluminescence in gaseous xenon via a strong electric field. Using the S1 and S2 signals, we can perform a three-dimensional reconstruction of an interaction. Calibrating and understanding how the detector response varies as a function of position and time is critical for event identification to distinguish background from signal. One aspect that can affect our S2 signal is electron lifetime, which reflects how many signal electrons are lost over time due to impurities in liquid xenon. Electron lifetime depends both on the purity of the medium and the strength of the drift electric field, both of which can vary over time and position in the TPC. This presentation will describe the results of LZ's electron lifetime analysis to understand the drift of electrons in the LZ detector, which plays a crucial role for event reconstruction.

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