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Calibrating the scintillation and ionization responses of LZ for 8B neutrino and low-mass WIMP searches.

Detecting low-energy xenon recoils from dark matter or neutrino interactions requires a nuanced understanding of near-threshold signal yields in liquid xenon. This necessitates specialized neutron calibration. In this presentation, I will discuss recent measurements of scintillation and ionization yields in liquid xenon in the LUX-ZEPLIN (LZ) detector using a deuterium-deuterium neutron generator. Using a high-statistics analysis of single-scatter events produced by 2.45 MeV neutrons, we constrained critical xenon microphysics parameters, including electron-ion recombination and scintillation fluctuations. Our findings highlight significant discrepancies with previous xenon response models, emphasizing the need to update signal models for dual-phase xenon time projection chambers. These insights have refined our understanding of the near-threshold region of the LZ detector and were crucial for recent results on the coherent elastic neutrino nucleus scattering of the ^8B solar neutrinos and light WIMP searches.

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