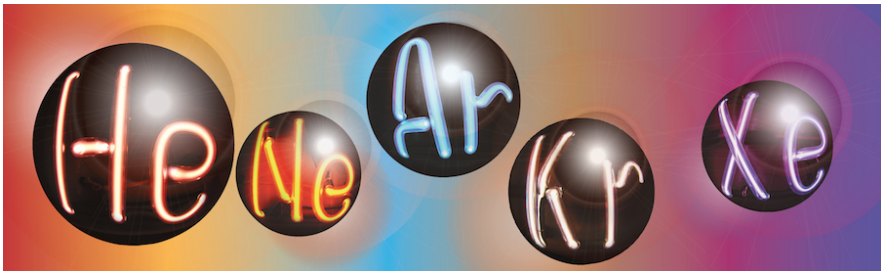

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Energy Resolution of LZ detector to High Energy Electron Recoils

Friday, 23 September 2022 14:05 (15 minutes)

The LUX-ZEPLIN (LZ) detector is a 10-ton liquid xenon dual-phase time projection chamber operating at the SURF laboratory (South Dakota, USA). As reported in June 2022, after 60 live days of the search for Weakly Interacting Massive Particles (WIMPs), LZ demonstrates a world record sensitivity to spin-independent WIMP-nucleon interactions for WIMP masses above 9 GeV [1]. Given its large target mass and low backgrounds, the LZ scientific program also includes the search for the neutrinoless double beta decay of 136Xe, highlighting the importance of achieving a good energy resolution at 136Xe Qββ value of 2.46 MeV.
This work presents the detector's energy resolution for single scatter interactions emphasising the high energy search region (>2 MeV). The detector demonstrates a linear response to electron recoils in the 160–2700 keV energy range. A novel technique to correct the non-uniformity of the light collection in a scintillation detector, based on the knowledge of the light response functions of individual photosensors, will be described. With this technique, we report, at a very early phase of the detector operations, a state-of-the-art performance on the energy resolution for the whole fiducial volume. The comparison of the measured energy resolution in the 160–2700 keV energy range with other liquid xenon particle detectors and the predictions of the NEST model will also be presented.

References

[1] Aalbers, J., et al. "First Dark Matter Search Results from the LUX-ZEPLIN (LZ) Experiment". vol. 33, 2022. Available: http://arxiv.org/abs/2207.03764

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