

Abstract Submitted
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Physics of background discrimination in liquid xenon-based dark matter detectors¹ CARL DAHL, Princeton University, XENON COLLABORATION — Dual-phase xenon detectors, as used for direct detection of WIMPs, discriminate between nuclear and electron recoils based on a ratio of ionization and scintillation signals. The underlying physics is the recombination of ions at the event site, which translates some fraction of the ionization signal into scintillation. We find the recombination-independent sum of the two signals and construct from this an energy scale with advantages in linearity and resolution over scales based on ionization or scintillation alone. From the improvement in resolution, we infer the magnitude of recombination fluctuations in electron and nuclear recoil tracks down to WIMP recoil energies. These fluctuations determine the fundamental discrimination capability of liquid xenon-based detectors. This work uses data from the Xenon collaboration prototype at Case Western and from the Xenon10 detector at Gran Sasso.

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Carl Dahl
Princeton University

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