

Liquid argon energy response to nuclear recoils.

Abstract

Scintillation efficiency of low-energy nuclear recoils in noble liquids plays a crucial role in interpreting results from some direct searches for Weakly Interacting Massive Particle (WIMP) dark matter. With respect to other noble liquid targets, liquid argon exhibits a powerful rejection of electronic recoil backgrounds (>108 discrimination power) through the temporal pulse shape of the scintillation signal. The combination of this pulse shape discrimination technique and the use of argon extracted from deep underground, highly depleted in cosmogenic isotopes, makes liquid argon an ideal target for multi-ton detectors. The sensitivity of liquid argon detectors can be enhanced by constraining the parameters of the liquid argon response to interacting particles, such as the quenching of nuclear recoils and the electron-ion recombination effect.

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