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Gas Electroluminescence in a Dual Phase Xenon-Doped Argon TPC

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Two-phase liquid argon detectors measure ionization signals by detecting electroluminescence light produced by ionization electrons extracted from liquid into gas under a strong electric field. Xenon-doping of argon at the few percent level in the liquid phase populates xenon in the gas phase at the 10s of ppm level, which perpetuates energy transfer from 128 nm Ar₂ dimer light to 147 nm and 178 nm light. We discuss the most recent results from the CHILLAX experiment at LLNL, which operates a ~40 g active target dual phase argon detector doped with percent level xenon in the liquid phase. We summarize the observed improvements to the S2 signal and discuss the mechanisms and implications for future experiments.

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