Abstract Submitted
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Development of a Xenon-Doped Dual-Phase Argon Time Projection Chamber[1] ELI MIZRACHI, University of Maryland, College Park, NATHANIEL BOWDEN, Lawrence Livermore National Laboratory, IGOR JOVANOVIC, University of Michigan, ETHAN BERNARD, SERGEY PEREVERZEV, TEAL PERSHING, Lawrence Livermore National Laboratory, DAVID TRIMAS, University of Michigan, JINGKE XU, Lawrence Livermore National Laboratory — Utilizing a ppm level of xenon dopant in the gas region of a dual-phase argon time projection chamber (TPC) presents the enticing prospect of enhanced electroluminescence with xenon, and low-mass particle detection with argon. However, at low temperatures xenon is known to remain in the liquid bulk due to its low vapor pressure, and it is liable to deposit on surfaces when exposed to cold components in the gas phase. This further complicates circulation, which must maintain a stable mixture and composition without disturbing equilibrium between the liquid and gas phases. These details introduce novel technical challenges, as successfully boosting electroluminescence requires at least 10ppm of xenon in the gas phase. Nevertheless, the possibility of realizing the benefits from both argon and xenon has compelled the development of CoHerent Ionization Limits in Liquid Argon and Xenon (CHILLAX), a new xenon-doped, dual-phase argon TPC. This talk will examine the specially tailored systems used in CHILLAX that are expected to avoid xenon freezeout, including direct detector cooling, and gas-phase circulation. Recent developments with CHILLAX, as well as the relevant technical background behind cryogenic mixtures of xenon and argon will also be discussed.

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