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Improving the Ionization Response of Two-Phase Argon Detectors by the Addition of Xenon[1] ETHAN BERNARD, Lawrence Livermore Natl Lab — Argon is kinetically advantaged relative to xenon in the detection of nuclear recoils from light WIMP dark matter and coherent elastic neutrino-nucleus scattering (CENNS). Two-phase xenon detectors can now resolve single ionization electrons, and their nuclear recoils yield 1.1 electrons at 300 eV. The analogous low-energy ionization signal of two-phase argon detectors is frustrated by the 128 nm argon electroluminescence light, which is released over microseconds and sensed indirectly through the fluorescence of wavelength-shifting materials. Adding xenon to a two-phase argon detector will shift the electroluminescence light to 147 nm and hasten its release, allowing for direct detection by SiPMs. Xenon undergoes Penning ionization in liquid argon, and this may raise the charge yield of mixtures relative to pure argon. These advances will improve the response of argon-based detectors of light WIMP dark matter and open opportunities in neutrino physics through the CENNS channel. This talk surveys the impact that xenon-doped argon will have on dark matter detection, reactor fuel-cycle monitoring, and searches for new neutrino physics.

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