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Detecting low-mass dark matter with liquid argon

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Dual-phase liquid argon time projection chambers (LArTPCs) have demonstrated the capability of achieving sub-keV thresholds in the electron-counting S2-only channel, making them powerful tools for light dark matter searches and other low-energy applications. However, efforts to study the lowest accessible energies in these detectors are complicated by spurious electron (SE) signals that dominate the lowest energies. In this presentation, we will discuss observations of SEs in the DarkSide-50 LArTPC, along with potential interpretations that can inform R&D needs and the design of future detectors. We will also discuss the prospect of doping LAr to enhance its ionization yield, along with R&D needs to deploy such technology in a future detector, and the potential sensitivity of the DarkSide-LowMass experiment, currently being planned.

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