

LAr R&D for Argo and DarkSide-LowMass at Queen's University

Tuesday, 19 May 2026 18:50 (1 hour)

To address the challenges of the “neutrino fog” in both high-mass and sub-GeV dark matter searches, a new cryogenic test facility is being commissioned at Queen's University. This facility validates innovative technologies for the future Argo (300-tonne LAr) and DarkSide-LowMass experiments.

A primary focus is the characterization of digital Silicon Photomultipliers, developed by the Université de Sherbrooke, in liquid argon. We will evaluate critical metrics including dark count rate, optical crosstalk, and afterpulsing. In parallel, the facility serves as a development bed for “smart” Data Acquisition systems. In collaboration with Sherbrooke, we are implementing AI-driven algorithms on FPGA hardware for real-time pulse-shape discrimination. This capability is essential for Argo to distinguish electron from nuclear recoils while managing the high data rates of a massive 300-tonne detector.

Furthermore, we will investigate Xenon-doped Argon to measure the impact of dopant concentration on scintillation yield and electroluminescence within a dedicated Time Projection Chamber. This work specifically supports the DarkSide-LowMass experiment's search for GeV–MeV scale WIMPs. By integrating advanced photon-counting, real-time machine learning, and optimized target chemistry, this facility provides a foundation for the next generation of LAr-based rare event searches.

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Session Classification: Welcome Reception (dinner) & Poster session

Track Classification: Technology