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Supporting Measurements for Current and Future Dark Matter Detectors with Argon-1

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The detection of dark matter remains a central challenge in particle physics. Liquid argon (LAr) based experiments, like DEAP-3600, must understand potential background signals mimicking dark matter in order to achieve maximum sensitivity. Argon-1, a modular LAr detector at Carleton University utilizing silicon photomultipliers, provides a platform to study key background sources, aiding not only DEAP-3600 but also future detectors like the 400-tonne ARGO detector and its prototype, ARGOlite.

This talk presents measurements by Argon-1 of alpha scintillation quenching, a process through which a fraction of the energy deposited is not converted to scintillation light, with quenching factors depending, in general, on energy. These results complement the DEAP-3600 collaboration's 2024 publication, extending quenching factor measurements into energy ranges inaccessible to DEAP-3600 due to contamination risks. Additionally, Argon-1's contributions to benchmarking simulations for ARGO and ARGOlite are discussed, in preparation for the next generation of argon-based dark matter detectors.

Your Email

michaelperry3@cmail.carleton.ca

Affiliation

Carleton University

Supervisor

Mark Boulay

Supervisor Email

markboulay@cunet.carleton.ca

Your current academic level

PhD student

Primary author: PERRY, Michael (Carleton University)

Presenter: PERRY, Michael (Carleton University)

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