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(G*) Supporting measurements for dark matter experiments using the Argon-1 prototype

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The detection of dark matter (DM) is currently one of the leading challenges in particle physics. While many experiments attempt to detect dark matter in a variety of ways, the DEAP-3600 experiment uses roughly 3.3 tonnes of liquid argon in an attempt to detect the scintillation signal produced by a dark matter particle scattering on an argon nucleus. DEAP-3600 uses pulse shape discrimination to reject electromagnetic backgrounds by taking advantage of the difference in the time over which scintillation light is produced for various types of incident radiation and subsequently detected in the 255 photomultiplier tubes imaging the detector. The ability to understand and reject background interactions in the detector is key in ensuring a low-background dark matter search region.
In this talk, we discuss progress made on measurements benefiting current DM experiments like DEAP-3600 as well as future liquid argon detectors using Argon-1. Argon-1 is a modular single phase liquid argon detector located at Carleton University in Ottawa, Ontario, instrumented with two silicon photomultipliers (SiPMs) used to detect the scintillation light. We discuss pulse shape discrimination techniques employed using SiPMs, as well as studies on alpha particle quenching.

Keyword-1

Dark matter

Keyword-2

Research and development

Keyword-3

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