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(G*) Argon-1: An R&D detector for next generation LAr experiments

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Increasing sensitivity in rare event search experiments requires the development and characterization of novel background rejection techniques and technologies. To aid in the development of these techniques for future liquid Argon (LAr) detectors, an R&D detector “Argon-1” has been commissioned at Carleton University. Argon-1 is a single phase 35 kg LAr test detector, employing 65+ channels of silicon photo-multipliers (SiPMs) for light readout. The detector will be used to test novel analogue and digital SiPM technologies, as well as background rejection techniques for next generation LAr detectors such as ARGO; a planned direct dark matter search experiment with a 300 tonne LAr target mass that aims to reach the so-called “neutrino floor”. The first major study will be a test of a novel surface background rejection technique using a layered scintillating surface. The technique works by placing a thin scintillating layer with a sufficiently long decay time constant on the surface of the detector. Events that originate from this pathologically difficult area can be identified readily through pulse-shape discrimination, and a similar technique is being utilized for the DEAP-3600 detector upgrades to target topological alpha backgrounds. In this talk we will discuss the commissioning and instrumentation of Argon-1, in-situ SiPM characterizations in LAr conditions, detector calibration, and present the status of the surface background rejection study.

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