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## The global search for weakly-interacting dark matter using liquid argon

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Experiments with liquid argon are being developed for direct detection of dark matter into the neutrino fog, for mass scales from  $0.5 \text{ GeV}/c^2$  to  $>1000 \text{ TeV}/c^2$ . This builds on the work of the DEAP-3600 detector, currently running at SNOLAB, as well as on the DarkSide-20k detector, under assembly at the LNGS underground laboratory in Italy. Recent results from the analysis of DEAP-3600 data will be discussed, as well as the physics goals of DarkSide-20k, highlighting important Canadian contributions to the data acquisition, construction of the time projection chamber, deployment of surface coatings, construction of the calibration systems, and material assay and quality control for radiopurity.

Steps taken beyond DarkSide-20k are centred around the development of pixelated digital silicon photodetectors, which will be deployed in the  $\sim 1\text{m}$  scale single-phase prototype named ARGOLite to be deployed at SNOLAB in the Cube Hall, replacing DEAP-3600. These photon detectors will also be deployed in a time projection chamber (TPC) prototype to be located in Naples, and will further contribute to the development of the ALARM2 liquid argon detector for security applications at Canadian Nuclear Laboratories.

Physics and engineering design are underway for ARGO, a 300-tonne fiducial mass detector for deployment at SNOLAB. ARGO will require  $250 \text{ m}^2$  of digital photon detectors as well as a real-time intelligent data acquisition system. In addition, the cryostat for ARGOLite is being designed such that it could hold the DarkSide-LowMass detector. Building on the success of DarkSide-50, DarkSide-LowMass is a proposed tonne-scale TPC optimized as a low-threshold electron-counting measurement using only the ionization channel to have sensitivity to low-mass dark matter.

### Keyword-1

Dark matter

### Keyword-2

Liquid argon

### Keyword-3

Photodetectors

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