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A Strategy for Low-Mass Dark Matter Searches with Cryogenic Detectors in the SuperCDMS SNOLAB Facility

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The SuperCDMS Collaboration is currently building SuperCDMS SNOLAB, an experiment designed to search for nucleon-coupled dark matter in the 0.5-5 GeV/c^2 mass range. Looking to the future, the Collaboration has developed a set of experience-based upgrade scenarios, as well as novel directions, to extend the search for dark matter using the SuperCDMS technology in the SNOLAB facility. The experienced-based scenarios are forecasted to probe many square decades of unexplored dark matter parameter space below 5 GeV/c^2, covering over 6 decades in mass: 1-100 eV for dark photons and axion-like particles,1–100 MeV/c^2 for dark-photon-coupled light dark matter, and 0.05–5 GeV/c^2 for nucleon-coupled dark matter. They will reach the nucleon-coupled neutrino fog in the 0.5–5 GeV/c^2 mass range, and they will test a variety of benchmark models and sharp targets for electron-coupled dark matter. These upgrade scenarios rely mainly on dramatic improvements in detector performance based on demonstrated scaling laws and reasonable extrapolations of current performance, with no need for significant reductions in background levels beyond current expectations for SuperCDMS SNOLAB. The novel directions involve greater departures from current SuperCDMS technology but promise even greater reach in the long run. We describe these upgrade plans and their expected sensitivity.

Primary author: GOLWALA, Sunil

Co-author: SUPERCDMS COLLABORATION

Presenter: GOLWALA, Sunil

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