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The SuperCDMS Simulation Framework

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The SuperCDMS experiment is a second-generation dark matter search under construction at the SNOLAB underground facility in Sudbury, Ontario. The experiment will consist of twenty-four ˜1 kg crystals of germanium or silicon, with readout for time-resolved phonon energy and ionization signals. Estimating the experimental sensitivity, which involves determining the effects of a multitude of background sources and modeling the response of the detectors to both signal and background interactions, requires a strong and comprehensive simulation framework.
In this report, we will present an overview of the SuperCDMS experiment and its simulation framework, with a focus on the design and performance of the main features of the simulation: a flexible and customizable set of geometry, physics and radiation source models; a detailed detector response simulation based on Geant4 and the G4CMP library; and a "fast parameterized" model of the detector response to support high-statistics simulations. The use of Geant4's importance biasing to evaluate the effectiveness of shielding will be presented separately.

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