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Low Energy Background Spectrum in CDMSlite

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One trend in dark matter direct detection is the development of techniques which will lower experimental thresholds and achieve sensitivity to light mass dark matter particles. In doing so, it is necessary to have an understanding of the low energy spectrum and the major background components. Geant4.10 has a number of specialized low energy physics processes that can be implemented when simulating an experimental geometry. To understand this low energy region for the Super Cryogenic Dark Matter Search (SuperCDMS), a variety of these models have been simulated and compared against theoretical calculations and SuperCDMS data. Most of the low energy processes include a more complete description of the atomic structure, allowing us to observe the phenomenon of Compton steps in the simulation which has been detected experimentally in silicon detectors. An important application of this low energy background modeling is for the SuperCDMS-Low Ionization Threshold Experiment (CDMSlite). CDMSlite has reached world-leading sensitivities in the search for low mass weakly interacting massive particle (WIMP) dark matter. Using Neganov-Luke phonon amplification, CDMSlite has achieved a threshold of less than 60 eV. The sensitivity of this current data can be improved by understanding and modeling the experimental backgrounds down to this threshold. The recent decommissioning of SuperCDMS-Soudan has allowed for specific measurements of the radiogenic activity and surface contamination of certain components of the experiment. This will enable us to construct a more informed simulated spectra for background subtraction. Development of the machinery for creating a low energy background model will also be useful in the future SuperCDMS-SNOLAB experiment which will run multiple high voltage detectors in CDMSlite mode.

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