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CDMSlite Run 2 Results

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SuperCDMS searches for dark matter in the form of Weakly Interacting Massive Particles (WIMPs) using germanium detectors operated at a few tens of mK. Particles are detected via the change in resistance of a superconducting transition edge sensor heated by lattice vibrations (phonons) from the interaction. A bias voltage applied across the detector drifts electron-hole pairs produced in an interaction to the electrodes, producing additional phonons (Neganov-Luke effect). The CDMS low ionization threshold experiment (CDMSlite) applies a higher voltage than is normal for these detectors leading to a phonon signal which is strongly dominated by the Neganov-Luke phonons. Through this effect, a much lower energy threshold can be achieved than at lower voltages. Here, we present the results of the second run of CDMSlite which operated at 70 V for 70 kg days and reached a threshold for electron recoils as low of 56 eV. Improvements to the operation of the experiment and the analysis, particularly a fiducial volume cut, allowed for great improvement upon the results from the first CDMSlite run. The fiducial cut is needed because the electric field of this high voltage is distorted at the edges of the detector leading to a reduced Luke amplification at high radius, i.e higher energy backgrounds in this part of the detector fall into the low energy region used for WIMP search. A radial fiducialization based on a new pulse fitting algorithm was applied to drastically reduce this background. New parameter space for the spin-independent WIMP-nucleon cross section is probed for WIMPs with mass between 1.6 and 5.5 GeV/c^2.

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