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LOW MASS WIMP SEARCH WITH THE CDMS LOW IONIZATION THRESHOLD EXPERIMENT

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SuperCDMS employs cryogenic germanium detectors to search for interactions of Weakly Interacting Massive dark matter Particles (WIMPs) with ordinary matter. In standard operating mode phonon and ionization signals are measured for each event for an effective discrimination between background electron recoils and dark matter candidate nuclear recoil events down to a few keV, giving sensitivity for WIMPs down to about 4 GeV/c².

In the CDMS Low Ionization Threshold Experiment (CDMSlite) we apply a much higher potential for the charge collection, generating a large additional phonon signal from the drifting charge carriers and thus allowing the measurement of very low ionization signals through the phonon channels. This method compromises event-by-event discrimination but gives access to much lower recoil energies and thus lower mass WIMPs.

After an initial demonstration of the method, an extended CDMSlite run was performed in 2014, collecting ~70 kg days net exposure and reaching a threshold as low as 56 eV (electron recoil equivalent). Improvements in background were achieved in the analysis with a new fiducialization scheme. CDMSlite reached world leading sensitivity for spin-independent WIMP-nucleon cross sections between 1.7 and 5.6 GeV/c².

This presentation introduces the basic idea of voltage assisted phonon amplification which is the basis of this experiment, before discussing in detail the most important of the recent improvements and their effect on the final results.

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