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The SuperCDMS-HVeV Program: Results and New Directions

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The SuperCDMS-HVeV (High-Voltage with eV resolution) program is an R&D project focused on developing detectors with low energy resolution to search for low-mass dark matter (⌀ 1 GeV/c2), study charge-transport in cryogenically-cooled crystals, and probe unclassified backgrounds at low energy. The program utilizes gram-scale silicon detectors instrumented with TES (transition-edge sensor)-based phonon sensors. A high-voltage bias can be applied to the crystal to amplify phonon signals from ionizing interactions via the Neganov-Trofimov-Luke effect. Utilizing these tools, HVeV detectors have recently achieved sub-eV baseline energy resolutions and demonstrated competitive sensitivities to electron-recoil dark matter at masses below 1 MeV/c2. This talk will provide an overview of the latest developments in the HVeV program. This includes the results from a dark matter search conducted at the NEXUS underground facility which featured a new detector housing design to reduce backgrounds from dielectric materials used in previous designs. Preliminary results from the most recent data taking campaign at the SNOLAB deep underground laboratory will also be shown which employed new strategies for reducing the rate of single electron-hole pair events. Finally, I will preview new directions being explored for this technology that will enable new science capabilities for both the dark matter and neutrino coherent scattering fields.

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