

Abstract Submitted  
for the APR18 Meeting of  
The American Physical Society

**Progress Towards a Sub-GeV Dark Matter Search Using Superfluid Helium-4** ANDREAS BIEKERT, UC Berkeley, SCOTT HERTEL, UMass Amherst, JUNSONG LIN, VETRI VELAN, DANIEL MCKINSEY, UC Berkeley — Weakly interacting dark matter direct detection experiments are rapidly approaching sensitivity levels where neutrino scattering background events will overwhelm any potential signal in the 10-100 GeV dark matter mass range. Since no experiment has provided conclusive evidence of dark matter in this mass range—and with its accessible parameter space shrinking—new models of sub-GeV dark matter have generated interest. We present a detector design based on superfluid helium to probe low-mass weakly interacting dark matter parameter space. Our proposed design reads out energy from recoils in the helium by detecting atoms ejected from the superfluid surface by roton and phonon excitations. These helium atoms are detected by surface binding to bolometry suspended in the vacuum above the detector mass, which also amplifies the signal energy. To discriminate event types, bolometers submerged in the liquid helium detect scintillation photons from recoil events. In this talk we present simulation work predicting the sensitivity of this detector concept to new areas of low-mass parameter space and progress with experimental neutron scattering efforts to characterize helium scintillation in nuclear recoil events.

Andreas Biekert  
UC Berkeley

Date submitted: 11 Jan 2018

Electronic form version 1.4