

Abstract Submitted
for the APR16 Meeting of
The American Physical Society

Average Energy Expended Per Electron-Hole Pair in Germanium Detector for Dark Matter Searches WENZHAO WEI, LU WANG, DONGMING MEI, Univ of South Dakota, CUBED COLLABORATION — The value of ε , the average energy expended per electron-hole pair, plays a critical role in determining the energy threshold of a bolometer detector with germanium in dark matter searches. We propose an independent method to estimate the value of ε down to milli-Kelvin range, which is the operating temperature for a SuperCDMS-like detector. A theoretical model and experimental analysis algorithm are developed in this work to estimate the value of ε based on the relationship between ε , detector energy resolution (Fano factor) and the primary phonon energy. We also investigated the energy threshold for a SuperCDMS-like detector with the value of ε calculated from our model. In this work, we present our theoretical calculation and show how to use experimental data to evaluate the value of ε . Subsequently, we report the temperature dependence of ε and its value at 50 milli-Kelvin. This work is supported by NSF in part by the NSF OIA 1434142, DOE grant DE-FG02-10ER46709, and the State of South Dakota.

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Date submitted: 07 Jan 2016

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