Abstract Submitted
for the MAR09 Meeting of
The American Physical Society

Non-equilibrium Phonons in $CaWO_4$: Issues for Phonon Mediated Particle Detectors MADELEINE MSALL, Bowdoin College, TIMOTHY HEAD, DANIEL JUMPER, Abilene Christian University — The CRESST experiment looks for evidence of dark matter particles colliding with nuclei in $CaWO_4$, using cryogenic bolometers sensitive to energy deposition ~ 10 keV with a few percent accuracy. Calibration of the energy deposited in the phonon system depends upon the details of the evolution of the non-equilibrium energy in the $CaWO_4$ absorber. Our phonon images sensitively measure variations in angular phonon flux, providing key information about the elastic constants and scattering rates that determine the energy evolution. Phonon pulses, created by focused photoexcitation of a 150 nm Cu film, are detected after propagation through 3 mm of $CaWO_4$. The 20 ns Ar-ion laser pulse creates a localized (10^{-3} mm^2) source of 10-20 K blackbody phonons. The sample is at 2 K. Our images show that the elastic constants derived from ultrasonic velocities along high symmetry axes do not accurately predict the total phonon flux along non-symmetry directions. We present new data on the dependence of phonon flux on excitation level and discuss the influence of isotope and anharmonic decay on the shape of phonon pulses in these ultrapure samples. Thanks to J.P. Wolfe and the Frederick Seitz Materials Research Laboratory, Urbana, IL, for partial support of this work.

Madeleine Msall
Bowdoin College

Date submitted: 20 Nov 2008 Electronic form version 1.4