Abstract Submitted
for the SHOCK13 Meeting of
The American Physical Society

Sound velocity determination of PbTe under pressure[1]
MATTHEW JACOBSEN, School of Engineering and Centre for Science at Extreme Conditions, University of Edinburgh, United Kingdom, WEI LIU, BAOSHENG LI, Mineral Physics Institute and Department of Geoscience, Stony Brook University, New York, USA — Recent investigations[2] of PbTe have revealed interesting high pressure transitions resulting in improved thermoelectric performance. High pressure sound velocities of PbTe have been measured to 14 GPa using an ultrasonic interferometric method.[3] Elastic moduli and their pressure derivatives for phases in this range have been obtained using a finite strain approach. From this, an estimate of the acoustic phonon contribution to the thermal conductivity is made. By combining this with previous determinations of the thermal conductivity due to electrons, a significantly lower value than the previously determined total thermal conductivity is found. This is interpreted as evidence for coupling between the low-lying transverse optic (TO) and longitudinal acoustic (LA) modes allowing transfer of thermal energy between them. The application of pressure causes energy transference between the optical modes and electron population, which is likely the cause of the increased thermoelectric efficiency in the intermediate Pbnm state.

[1]1This research is supported by the DoE/NNSA under contract number DE-FG5209NA29458 to BL. WL is also supported by the NSF under contract number EAR-1045630.
[2]S. V. Ovsyannikov and V. V. Shchennikov, Appl. Phys. Lett. 90, 122103 (2007).
[3]B. Li, I. Jackson, T. Gasparik, and R. C. Liebermann, Phys. Earth Planet. Int. 98, 79 (1996).

Matthew Jacobsen
School of Engineering and Centre for Science at Extreme Conditions,
University of Edinburgh, United Kingdom

Date submitted: 14 Feb 2013 Electronic form version 1.4