Abstract Submitted
for the SHOCK11 Meeting of
The American Physical Society

Elastic Limit of Quartz under Uniaxial Strain Compression: Loading Rate Dependence BRANDON LALONE, YOGENDRA GUPTA, Institute for Shock Physics and Department of Physics, Washington State University — To examine the effect of the compressive loading rate on the elastic limit of quartz, shockless and shock wave uniaxial strain compression experiments were conducted on x-cut and z-cut quartz crystals to peak stresses as high as 18 GPa. The shockless compression experiments were performed at loading rates near $10^5 s^{-1}$ using a compact pulsed power generator. Plate impacts generated the shock wave compressions at loading rates greater than $10^7 s^{-1}$. Particle velocity histories, measured using a velocity interferometer, demonstrated that the elastic limit of quartz was up to 90% higher under shockless loading than under shock wave loading for both orientations. The increase in the elastic limit with decreasing loading rate is contrary to the expected loading rate dependence of material strength. A phenomenological model was developed to explain the observed loading rate dependence of the elastic limit. Work supported by DOE/NNSA.

Brandon LaLone
Institute for Shock Physics and Dept of Physics,
Washington State University

Date submitted: 14 Feb 2011 Electronic form version 1.4