Abstract Submitted
for the SHOCK19 Meeting of
The American Physical Society

Exploring the Connections between Acoustic Nonlinearity and Performance Characteristics in Aged PETN Pellets[1] EMILY PITTMAN, PETER SCHULZE, Los Alamos National Laboratory, M-6, CARLY DONAHUE, Los Alamos National Laboratory, EES-17, JOSEPH MANG, Los Alamos National Laboratory, M-7, CHRISTOPHER ARMSTRONG, Los Alamos National Laboratory, M-6, TJ ULRICH, Los Alamos National Laboratory, Q-6, DAVID MOORE, Los Alamos National Laboratory, M-9, JAMES TEN CATE, Los Alamos National Laboratory, EES-17, LOS ALAMOS NATIONAL LABORATORY TEAM — Nonlinear wave propagation in consolidated granular material, such as sandstones, concrete or in this case, pressed pellets of pentaerythritol tetranitrate (PETN), is a function of the microstructure and can be influenced by poor sintering of the grains, microcracks and grain distribution. In this work, we use Nonlinear Resonant Ultrasound Spectroscopy (NRUS) to investigate nonlinear elastic wave propagation properties in pristine and artificially aged PETN pellets. NRUS is a tool that is able to measure the bulk hysteretic nonlinearity by resonating a sample at different amplitudes and observing the shift in resonant frequency. We hypothesize that nonlinear elastic wave propagation properties may be sensitive to detonation threshold in PETN, particularly since detonation is caused by a shock wave, which is a nonlinear phenomenon. Herein, we demonstrate that average hysteretic nonlinearity increases with time at temperature and we report our findings on the dependence of the nonlinear nonclassical hysteretic parameter on sensitivity to initiation.

[1]Research presented in this presentation was supported in part by the Laboratory Directed Research and Development program of Los Alamos National Laboratory under project number 20180578ER.

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Date submitted: 27 Feb 2019 Electronic form version 1.4