Abstract Submitted
for the SHOCK13 Meeting of
The American Physical Society

Investigating short-pulse shock initiation thresholds in HMX-based explosives with reactive mesoscale simulations[1] H.K. SPRINGER, C.M. MAY, C.M. TARVER, J.E. REAUGH, Lawrence Livermore National Laboratory, Livermore, CA, USA — Short-pulse loading experiments have demonstrated the probabilistic nature of shock initiation thresholds in a variety of explosives. The intensely loaded region of explosive adjacent to the flyer impact zone, and its potential hot spots, influences the overall sample shock sensitivity. As the size of this region decreases below the representative volume element size, the likelihood of sampling differing hot spot densities in it increases from sample to sample. We hypothesize that this variation in active hot spots contributes to the probabilistic nature of short-pulse shock initiation. We investigate the role of microstructure and explosive reactive properties on shock initiation response with mesoscale simulations of miniature flyer plate experiments. LX-10 (95%wt HMX, 5%wt Viton A) is the model explosive. To investigate the influence of microstructure, we vary void size and spatial position. While void volume fraction and HMX grain size distributions are fixed, assigning random spatial positions to these parameters leads to hot spot density variations over many microstructural realizations. HMX reactivity is also investigated. The influences of microstructure and reactivity parameters are discussed. This study enables the development of predictive shock sensitivity models with basic structure-property information.

[1]This work performed under the auspices of the U.S. DOE by LLNL under Contract DE-AC52-07NA27344. This work was funded in part by the Joint DoD-DOE Munitions Program.

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Date submitted: 05 Feb 2013 Electronic form version 1.4