Abstract Submitted
for the SHOCK13 Meeting of
The American Physical Society

Model-Based Development of a Small-Scale Experiment for Non-Shock Ignition of High Explosives[1] BRADLEY W. WHITE, H.K. SPRINGER, J.E. REAUGH, Lawrence Livermore National Laboratory, Livermore, CA 97551 USA — We demonstrate a model-based approach for developing small-scale experiments for non-shock ignition of high explosives (HEs) that are representative of abnormal environmental conditions. While small-scale experiments are often favored over large-scale testing since costs are lower and samples sizes are amenable to early stage HE formulation, concerns remain about the ability to predict full-scale non-shock ignition response. Our approach is to perform simulations of full-scale systems (i.e., Skid test) to identify the localized material extrema states (e.g., pressure, pressure duration, shear stress, strain-rate) underlying the non-shock ignition mechanism. The extrema states then provide a metric for iterative model-based development of small-scale experiments using a drop-hammer system. We performed these simulations using the HERMES (High Explosive Response to MEchanical Stimuli) model in the multiphysics code, ALE3D. Optimized experimental geometries reach 10s MPa pressures over 1-3 ms durations while inducing a large degree of shear. The results of the experimental development and the effects of design variations on non-shock initiation response of Comp B will be presented.

[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: 26 Feb 2013 Electronic form version 1.4