Abstract Submitted
for the SHOCK19 Meeting of
The American Physical Society

High-Order Lagrangian Hydrodynamics Computations of Surface Perturbations in Shock-Driven Metal[1] FADY NAJJAR, LEO KIRSCH, ROB RIEBEN, Lawrence Livermore Natl Lab, LAWRENCE LIVERMORE NATL LAB TEAM — Ejecta represent a cloud of the particles being emitted from a free material surface when impacted by a shock. Such ejecta particulates play a key role in a wide variety of natural and engineering applications, including supernovae explosions, asteroid strikes, inertial confinement fusion, and hazards on spacecrafts and satellites due to debris impact. Detailed computations are performed using a high-order Lagrangian hydrodynamics code to understand the generation and evolution of ejecta from imposed surface perturbations. Specifically, we utilize the high-order finite-element Arbitrary Lagrangian-Eulerian (ALE) capability of MARBL, a next-generation multi-physics code in development at LLNL. We studied conical perturbations being impact by strong shocks and the surface evolution creating ejecta particulates. We apply this analysis to a recent experimental campaign on laser-driven ejecta where micron-sized divots have been fielded. We investigate the sensitivity to generate melt-on-release ejecta with platform geometry, mesh refinement, and material type strength model and equations of state. Preliminary simulations show that asymptotic bubble and spike velocities are nonlinear with the divot perturbations non-sinusoidal effective-wavelength and corresponding amplitude.

[1]LLNL-ABS-767743. This work was performed under the auspices of the U.S. Department of Energy by LLNL under contract DE-AC52-07NA27344.

Fady Najjar
Lawrence Livermore Natl Lab

Date submitted: 13 Feb 2019 Electronic form version 1.4