Abstract Submitted
for the DPP20 Meeting of
The American Physical Society

Photonic Doppler Velocimetry on Thick-Wire Surfaces Driven by Intense Current.[1] AIDAN KLEMMER, TREVOR HUTCHINSON, SETH KREHER, BRUNO BAUER, University of Nevada, Reno, DANIEL DOLAN, THOMAS AWE, BRIAN HUTSEL, Sandia National Laboratories, MAREN HATCH, University of New Mexico, Albuquerque, KEVIN YATES, Los Alamos National Laboratory
— Photonic Doppler Velocimetry (PDV) was used to measure the surface motion of thick-metal (6061 and 5N Al, 5N Cu, 4N Ni, and Ti) wires driven to 0.8 MA by the Sandia Mykonos generator. Magnetic compression of the solid wire at the start of the current pulse was observed for the first time. Untamped pure (5N) Al loads compressed 40 nm radially before expanding. In addition, the surface magnetic field at the start of expansion was found, and the distribution of surface velocities was measured for the first time. Surface velocity distributions were observed to broaden later in time, before plasma forms. Accurate magnetohydrodynamic (MHD) modeling of electrical explosions is currently challenging due to uncertainties in the equation of state (EOS) and electrical conductivity, especially during the metal-insulator transition. The experimental measurements are being used to benchmark MHD modeling, and thereby inform the choice of EOS and conductivity tables for modeling.

[1]Work supported by NNSA SSAP award no. DE-NA0003870. This work was funded in part by Sandias LDRD Program (Project No. 200269).

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Date submitted: 08 Jul 2020 Electronic form version 1.4