Abstract Submitted
for the DPP17 Meeting of
The American Physical Society

Characterization and Comparison of Aluminum, Silicon, and Carbon Laser Ablation Plumes[1] JEREMY IRATCABAL, KYLE SWANSON, AARON COVINGTON, Nevada Terawatt Facility and Physics Department, University of Nevada, Reno — Laser ablation of solid targets produces plasma plumes with rapidly evolving temperature and density gradients. These gradients can be measured using laser interferometric techniques that allow for the study of the plasma as the plume expands from the target surface and the temperature and density decrease. A systematic study of the temperature and density of aluminum, silicon, and carbon plasma plumes produced with a 2 TW/cm^2 laser using spectroscopic, interferometric, fast imaging, and charge diagnostics will be presented. Carbon, aluminum, and silicon plumes are of interest because they are closely grouped on the periodic table but have very different material characteristics. Temporally and spatially resolved data was collected to characterize the evolution of the plasma in the plume. To probe the plasmas produced from these materials, optical spectroscopy was employed to identify and measure the temperature of the coexisting neutral and ionized atomic and molecular species. A Mach-Zehnder interferometer was employed to measure electron density. ICCD imaging and shadowgraphy were used to image the plume dynamics. A comparison of plasma evolution for each element will also be presented and will provide data to benchmark plasma codes.

[1]This work was supported by the University of Nevada, Reno, the U.S. DOE /NNSA Cooperative Agreement No. DE-NA0002075, and National Securities Technologies, LLC under Contract No. DE-AC52-06NA25946/subcontract No. 165819.

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Date submitted: 21 Jul 2017 Electronic form version 1.4