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Spatial and Temporal Investigations of Laser Ablation Plasma Plume Density and Composition[1] JEREMY IRATCABAL, BERNHARD BACH, CUYLER BEATTY, ERIC DUTRA, TIMOTHY DARLING, PIOTR WIEWIOR, AARON COVINGTON, Nevada Terawatt Facility and Department of Physics, University of Nevada, Reno, NV 89557, USA — Laser ablation of solid targets with laser intensities of the order of 10^8-10^{11} W/cm^2 provides a rich platform for investigating the density and composition of coexisting molecular, atomic, and ion species in the resulting plasma plume. Experiments measuring the spatial- and temporal-evolution of laser ablation plumes have been performed to simultaneously characterize the multiple parameters related to the energy and momentum partitioning of the incident laser energy as the ablation process occurs. The temperature, density, and relative populations of different molecular, atomic, and ion species can be determined by the simultaneous measurement of optical and charged particle spectroscopy, fast imaging cameras, and optical interferometric diagnostics. Additionally, background gas pressure, density, and species were carefully varied. A comparison of density measurements obtained with multiple interferometric, spectroscopic, and fast imaging diagnostics for a carbon ablation plume expanding into vacuum and into background gases with different Reynolds numbers will be presented. Atomic, molecular, and ion species population evolution will be presented as measured with optical and charged particle spectroscopy.

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