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Planar Laser-Induced Fluorescence For Tailored Laser Plasma Accelerator Gas Jet Targets[1] LIONA FAN-CHIANG, University of California, Berkeley, HANN-SHIN MAO, HAI-EN TSAI, KELLY SWANSON, SAMUEL BARBER, SVEN STEINKE, JEROEN VAN TILBORG, CAMERON GEDDES, WIM LEEMANS[2], ERIC ESAREY, Lawrence Berkeley National Laboratory — The ability to pre- cisely shape gas jets for controlled injection of electrons in laser plasma accelerators (LPAs) is crucial for developing high quality electron beams. Verifying tailored density profiles has called for more detailed gas density diagnostics than those traditionally used. Most diagnostics give line-of- sight measurements which integrate over and blur sharp or asymmetric features. In this study, planar laser-induced fluorescence (PLIF) has been prototyped for characterizing LPA gas jet targets. PLIF has the distinct advantage of isolating thin slices of the gas plume using a laser sheet, providing more direct density information at regions of interest. This sheet can be scanned across the jet to map out a detailed 3-D gas plume profile. It was shown that PLIF is able to resolve critical fea- tures such as gas density shocks. Blade-in jets under low vacuum were characterized with PLIF. It was found that blade position dramatically alters characteristic flow parameters, affecting plume axis and effective Mach number. These results, together with simulations of gas flow, are being used to understand and design flow and shock regimes for LPA targets for several applications in the BELLA Center.

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