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Optical diagnostics on capillary waveguides for extension of laser wakefield acceleration lengths[1] C. MCGUFFEY, T. MATSUOKA, University of Michigan, M. LEVIN, Hebrew Univ., P. ROUSSEAU, V. CHVYKOV, G. KALINTCHENKO, V. YANOVSKY, University of Michigan, A. ZIGLER, Hebrew Univ., A. MAKSIMCHUK, K. KRUSHELNICK, University of Michigan — The electron beams produced from laser wakefield acceleration (LWFA) have been proposed for next generation electron accelerators and can be used for applications in imaging, microwave generation, and x-ray generation. The diffraction length achievable for LWFA can be extended by guiding the focused laser pulse using external guiding structures. This length is a fundamental limitation on the acceleration length and therefore maximum attainable electron energy. Capillary waveguides are used to setup guiding structure by creating a discharge plasma along the direction of laser propagation with varying plasma density radially. Two different waveguide schemes are being explored on the Hercules laser system (Ti:Sapphire, 30 fs, recently upgraded to 300 TW) - a purely ablative capillary discharge and a gas filled capillary discharge. The two schemes provide a range of differing characteristics such as lifetime, ionization state, and complexity. Diagnostics indicate that high intensity can be sustained over a few centimeters, with acceptable laser depletion.

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