Abstract Submitted
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Generation of Long Plasma Waveguides by Optical Field Ionization with High Order Bessel Beams[1] LINUS FEDER, BO MIAO, JARON SHROCK, MIKE TOMLINSON, HARRY CORIN, HOWARD MILCHBERG, University of Maryland, College Park — Plasma waveguides will likely be an integral part of any future GeV-TeV laser-driven accelerators. In past work, plasma waveguides have been generated by laser-heated plasma hydrodynamic expansion [1] or capillary discharges [2]. In the former case, laser plasma heating has been produced either by inverse bremsstrahlung [1] or by excess electron kinetic energy from tunneling ionization [3,4]. We present recent experimental results demonstrating guiding over at least 10 cm in laser-generated plasma waveguides that do not mainly depend on hydrodynamic expansion for their formation. We show how a two-pulse Bessel beam scheme which uses an ultrashort J_0 pulse followed by a higher order J_n pulse can generate a hydrogen plasma waveguide with an optimal refractive index structure. In addition to guiding results, we present femtosecond interferometry measurements of the waveguide generation and evolution and longitudinal measurements of the Bessel beam-hydrogen target interaction. [1] C. G. Durfee III, et al, Development of a plasma waveguide for high intensity laser pulses, Physical Review E 51,2368 (1995) [2] Y Erlich,et al,Guiding of High Intensity Laser Pulses in Straight and Curved Plasma Channel Experiments,Phys. Rev. Lett. 77, 4186 [3] Lemos,et al. Guiding of laser pulses in plasma waveguides created by linearly-polarized femtosecond laser pulses. Scientific Reports. 8. 10.1038 [4] R. J. Shalloo, et al, Low-density hydrodynamic optical-field-ionized plasma channels generated with an axicon lens, Phys. Rev. Accel. Beams 22, 041302

[1]Guiding in long plasma waveguides generated by optical field ionization with high order Bessel beams

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