

Abstract Submitted
for the DPP10 Meeting of
The American Physical Society

Plasma parameters of a capillary plasma channel for laser guiding

TAKESHI HIGASHIGUCHI, Utsunomiya University, NADEZHDA BOBROVA, Institute for Theoretical and Experimental Physics, HIROMITSU TERAUCHI, NOBORU YUGAMI, Utsunomiya University — Optical guiding of an ultrashort and intense laser pulse with long interaction length is important in many applications such as laser-driven plasma accelerators. To overcome this limitation, a waveguide which has a refractive index profile like an optical fiber is required [1]. We demonstrated the production of an optical waveguide in a capillary discharge-produced plasma using a cylindrical capillary. Plasma parameters of its waveguide were characterized by use of both a Normarski laser interferometer and a hydrogen plasma line spectrum. A space-averaged maximum temperature of 3.3 eV with electron densities of the order of 10^{17} cm^{-3} was observed at a discharge time of 150 ns and a maximum discharge current of 200 A. An ultrashort, intense laser pulse was guided by use of this plasma channel.

[1] T. Higashiguchi *et al.*, Rev. Sci. Instrum. 81, 046109 (2010).

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Date submitted: 17 Jun 2010

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