

Abstract Submitted  
for the DPP07 Meeting of  
The American Physical Society

**Guiding of an intense, ultrashort laser pulse in a discharge-produced capillary plasma for electron acceleration application** TAKESHI HIGASHIGUCHI, MASAFUMI HIKIDA, HIROMITSU TERAUCHI, KUN LI, NOBORU YUGAMI, Utsunomiya University, RYOSUKE KODAMA, ILE, Osaka University — Guiding of an intense laser pulse is supported today's advanced technology such as laser wakefield acceleration, x-ray lasers, high-order-harmonic generation, and inverse Compton scattering. The laser-matter interaction length of a focused laser pulse is fundamentally limited by diffraction to the order of the Rayleigh length, and is further restricted by ionization-induced refraction. We developed a plasma waveguide for propagating intense laser pulse by use of a capillary discharge plasma. The alumina capillary had a diameter of 300  $\mu\text{m}$  and a length of 10 mm. For present work, the discharge peak voltage and current were 30 kV and 500 A with a pulse width of 100 ns (FWHM), respectively. The guiding experiments used the laser pulse of the central wavelength of 800 nm from a CPA Ti:sapphire laser with a pulse width of 130 fs (FWHM). A peak intensity of the laser pulse was  $1 \times 10^{16} \text{ W/cm}^2$  with a spot diameter of 30  $\mu\text{m}$  (FWHM) in vacuum. We demonstrated guiding of a laser pulse over length of up to 10 mm, which corresponded to 10 times the measured Rayleigh length. In addition, we also observed an electron acceleration of around 1 MeV by use of a 1- cm long gas-filled capillary waveguide at the discharge time of 150 ns.

Takeshi Higashiguchi  
Utsunomiya University

Date submitted: 25 Jul 2007

Electronic form version 1.4