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Capillary plasma waveguide to guide an ultrashort laser pulse HIROMITSU TERAUCHI, JIN-XIANG BAI, TAKESHI HIGASHIGUCHI, NOBORU YUGAMI, CORE, 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, high-order harmonic radiation, and x-ray lasers. To overcome this limitation, a waveguide which has a refractive index profile like an optical fiber is required [1]. We have developed a plasma waveguide using a capillary discharge- produced plasma with a length of 1.5 cm. Electron densities and its temperatures were observed to be the order of 10^{17} cm^{-3} and a few eV using a laser interferometer and a spectrometer coupled with an ICCD camera, respectively. The width of a plasma waveguide was 200-300 μm (FWHM). We have demonstrated the guiding of a laser pulse over length, which corresponded to 10 times the Rayleigh length. As a result, the accelerated electrons with the energy of 1 MeV was observed with the blue-shift of the optical pulse at the same time. [1] A.J.Gonsalves et al., Phys. Rev. Lett. **98**, 025002 (2007).

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