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Laser ionized plasma sources for plasma wakefield accelerators ROBERT ARINIELLO, MICHAEL LITOS, Univ of Colorado - Boulder — Plasma wakefield accelerators (PWFA) have demonstrated multi-GeV/m accelerating gradients making them an attractive option for future particle accelerators. However, current PWFAs tend to increase the particle beam's emittance (area of the beam in transverse phase-space) as the beam propagates through the plasma. The emittance can be preserved by correctly focusing the beam into and out of the plasma. One technique is to carefully control the plasma density along the beam axis such that the Coulomb force from the ion column focuses the beam at a carefully prescribed rate into the plasma. We present simulations of an optical system capable of producing nearly arbitrary on axis plasma density profiles in a $1 \times 16\,\mathrm{cm}^{-3}$ Argon gas using an ultrafast Ti:sa laser pulse. Our simulations demonstrate that suitable plasma columns with lengths of up to a meter can be generated via laser ionization. Additionally, we examine how the laser pulse is distorted by refraction off of the ionizing plasma column.

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