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Plasma heating by ultra-short laser pulses creates waveguides suitable for guiding J.M. DIAS, NUNO LEMOS, J. BERARDO, N. LOPES, G. FIGUEIRA, F. FIUZA, GoLP/Instituto de Plasmas e Fusão Nuclear, Instituto Superior Técnico, Lisboa, R.C. ISSAC, D.A. JAROSZYNSKI, Department of Physics, University of Strathclyde, Glasgow G4 ONG, UK, L.O. SILVA, GoLP/Instituto de Plasmas e Fusão Nuclear, Instituto Superior Técnico, Lisboa — Several important applications using ultra-short laser pulses require laser guiding over distances greater than the Rayleigh length. Nowadays the most promising guiding schemes are based on thermally driven laser-induced plasma expansion. Until now it was thought that laser pulses with 100s of ps were needed to heat the plasma through inverse Bremsstrahlung. Nevertheless ultra-short intense laser pulses can heat the plasma through the ionization mechanism allowing the generation of plasma channels. This work presents an experimental study using ∼60fs and ∼400fs laser pulses to characterize the time evolution of expanding plasma columns created with different gases. Simulations show that the dominant effect, which contributes for the initial plasma temperature for plasmas created by ultra-short laser pulses, is associated to the ionization process. Also circular polarized light can contribute for a higher initial plasma temperature.

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