Abstract Submitted
for the DAMOP10 Meeting of
The American Physical Society

Dynamics of Micro-Plasmas Generated in Noble Gases by Strong-Field Laser Pulses DMITRI A. ROMANOV, RYAN COMPTON, ALEX FILIN, ROBERT J. LEVIS, Department of Physics, Deparment of Chemistry, and Center for Advanced Photonics Research, Temple University, Philadelphia, PA 19122 — The ultrafast dynamics of micro-plasmas generated by an ∼80 fs laser pulse in noble gases has been investigated using four-wave mixing (FWM). The evolution patterns of the FWM signal are indicative of the gas species and ambient conditions. The signal is observed to reach higher intensity levels faster for Xe, with progressively lower scattering intensity and longer time dynamics for the noble gas series Xe, Kr, Ar, Ne, and He. The theoretical model for interpreting this temporal dynamics is based on initial tunnel ionization followed by electron impact ionization cooling. The model reproduces well the measured degree of ionization in atmospheric-pressure laser-induced plasmas and predicts quantitatively the intensity of four-wave mixing as a function of time for the series of five noble gases. The model also predicts the dynamics as a function of pump laser intensity and gas pressure. The findings open the way for effective control of micro-plasma dynamics.

Dmitri Romanov
Temple University

Date submitted: 22 Jan 2010 Electronic form version 1.4