Abstract Submitted for the DAMOP12 Meeting of The American Physical Society

**Post-Ionization Medium Response to a Femtosecond Laser Pulse**<sup>1</sup> DMITRI A. ROMANOV, Department of Physics and Center for Advanced Photonics Research, Temple University, ROBERT J. LEVIS, Department of Chemistry and Center for Advanced Photonics Research, Temple University — When an intense, femtosecond laser pulse ionizes an atmospheric-pressure gas, the optical response of the medium differs drastically from that of a regular weakly-ionized plasma. The initial charge distribution resulting from ionization is microscopically inhomogeneous, with the average electron density of  $10^{15}$ - $10^{16}$  cm<sup>-3</sup>. We considered the oscillations of virtually isolated and expanding electron clouds forced by the laser electric field. A simple analytical model predicts the amplitude of these forced oscillations as a function of time. This amplitude, as well as the related polarization of the medium, undergoes considerable enhancement when the system evolves through the transient resonance with the laser carrier frequency. The results impact the currently accepted picture of laser filamentation dynamics and call for modifications in existing theoretical models.

<sup>1</sup>We gratefully acknowledge financial support through the AFOSR MURI grant FA9550 10-1-0561.

Dmitri A. Romanov Department of Physics and Center for Advanced Photonics Research, Temple University

Date submitted: 31 Jan 2012

Electronic form version 1.4