Abstract Submitted for the DPP05 Meeting of The American Physical Society

Intense Laser-Cluster Interaction: Effect of hot electrons on propagation and studies with longer pulse widths A. GUPTA, T. ANTONSEN, T. TAGUCHI, J. PALASTRO, H. MILCHBERG, University of Maryland — The non-linear interaction of intense short laser pulses with gases of atomic clusters has applications in areas such as x-ray and energetic particle generation, and nuclear fusion. We model the propagation of laser pulses through a medium of Argon clusters (14 to 54 nm diameter) and un-clustered Argon atoms. Our goal is to understand the competing effects of the non-linear dielectric response of the clusters and that of the free electrons on self-guiding. In our propagation model, the effective dielectric constant of the medium evolves in time due to the hydrodynamic expansion of clusters, ionization of un-clustered monomer gas atoms as well as due to the creation of 'hot' electrons during the laser-cluster interaction. Hot electron generation is based on the PIC simulation of laser-cluster interaction<sup>[1]</sup>. Our simulation results show that for moderate intensities  $\sim 6 \times 10^{15} \text{ W/cm}^2$  the hot electrons lead to enhancement in self-guiding. We also investigate the dynamics of cluster explosion for a range of pulse lengths. Preliminary results suggest that early in the pulse cluster expansion is governed by hydrodynamic forces while kinetic effects dominate later in the pulse. [1] T. Taguchi et. al. PRL **92**, 205003 (2004).

> John Palastro University of Maryland

Date submitted: 25 Jul 2005

Electronic form version 1.4