Abstract Submitted
for the DAMOP10 Meeting of
The American Physical Society

An investigation of non-sequential double ionization with ultrafast long wavelength lasers ANTHONY D. DICHIARA, EMILY SISTRUNK, COSMIN I. BLAGA, LOUIS F. DIMAURO, PIERRE AGOSTINI, The Ohio State University, Department of Physics — Long wavelength lasers allow access to tunneling ionization due to concomitantly large ponderomotive energies. Rescattering is known to occur when a tunnel ionized photoelectron is driven back by the field and collides with the parent ion. In this picture the wavelength of the laser field provides a 'control knob' for rescattering since the cycle averaged kinetic energy of a free electron is quadratic with wavelength. We study the non-sequential ionization of Xenon and Krypton atoms as a function of wavelength (3.6, 2.0, 1.7, and 1.3 μm) and consequently return energy. For these laser parameters the maximum return energy provides an unexplored regime for non-sequential ionization. For example, at the longest wavelength studied the maximum classical return energy is over one order of magnitude larger than the ionization potential of the ion. The experiment is motivated by the extreme nature of the wavelength dependent return energies. We observe an enhancement of doubly ionized Krypton as compared to Xenon that cannot be understood by interpreting known impact ionization cross sections.

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Date submitted: 27 Jan 2010 Electronic form version 1.4