Abstract Submitted
for the DAMOP09 Meeting of
The American Physical Society

Quantitative rescattering theory for laser-induced high-energy plateau photoelectron spectra ZHANGJIN CHEN, A.T. LE, Physics Department, Kansas State University, Manhattan, Kansas 66506-2604, USA, TORU MORISHITA, Department of Applied Physics and Chemistry, University of Electro-Communications, 1-5-1 Chofu-ga-oka, Chofu-shi, Tokyo, 182-8585, Japan, C.D. LIN, Physics Department, Kansas State University, Manhattan, Kansas 66506-2604, USA
— We present a quantitative rescattering (QRS) theory to describe high-energy photoelectrons generated by intense laser pulses. In the QRS, the momentum distributions of these electrons are expressed as the product of a returning electron wave packet with the elastic differential cross sections (DCS) between free electrons with the target ion. We show that the returning electron wave packets are determined mostly by the lasers only, and can be obtained from the strong field approximation. The validity of the QRS model is examined by checking against accurate results from solving the time dependent Schrödinger equation. We further show that experimental photoelectron spectra for a wide range of laser intensity and wavelength can be explained by the QRS theory, and that the DCS between electrons and target ions can be extracted from experimental photoelectron spectra.

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Date submitted: 22 Jan 2009 Electronic form version 1.4