

Abstract Submitted  
for the DAMOP15 Meeting of  
The American Physical Society

**Analytic Model for Description of Above-Threshold Ionization by an Intense, Short Laser Pulse**<sup>1</sup> ANTHONY F. STARACE, University of Nebraska-Lincoln, U.S.A., M.V. FROLOV, D.V. KNYAZEVA, N.L. MANAKOV, Voronezh State University, Russia, J.-W. GENG, L.-Y. PENG, Peking University, Beijing, China — We present an analytic model for above-threshold ionization (ATI) of an atom by an intense, linearly-polarized short laser pulse.<sup>2</sup> Our quantum analysis provides closed-form formulas for the differential probability of ATI, with amplitudes given by a coherent sum of partial amplitudes describing ionization by neighboring optical cycles near the peak of the intensity envelope of a short laser pulse. These analytic results explain key features of short-pulse ATI spectra, such as the left-right asymmetry in the ionized electron angular distribution, the multi-plateau structures, and both large-scale and fine-scale oscillation patterns resulting from quantum interferences of electron trajectories. The ATI spectrum in the middle part of the ATI plateau is shown to be sensitive to the spatial symmetry of the initial bound state of the active electron owing to contributions from multiple-return electron trajectories. An extension of our analytic formulas to real atoms provides results that are in good agreement with results of numerical solutions of the time-dependent Schrödinger equation for He and Ar atoms.

<sup>1</sup>Research supported in part by NSF Grant No. PHY-1208059, by RFBR Grant No. 13-02-00420, by Ministry of Ed. & Sci. of the Russian Fed. Proj. No. 1019, by NNSFC Grant Nos. 11322437, 11174016, and 11121091, and by the Dynasty Fdn. (MVF & DVK).

<sup>2</sup>M.V. Frolov *et al.*, Phys. Rev. A **89**, 063419 (2014).

Anthony F. Starace  
University of Nebraska-Lincoln, U.S.A.

Date submitted: 29 Jan 2015

Electronic form version 1.4