DAMOP16-2016-000488

Abstract for an Invited Paper
for the DAMOP16 Meeting of
the American Physical Society

Applications of Elliptically Polarized, Few-Cycle Attosecond Pulses[1]

ANTHONY F STARACE, The University of Nebraska-Lincoln

Use of elliptically-polarized light opens the possibility of investigating effects that are not accessible with linearly-polarized pulses. This talk presents two new physical effects that are predicted for ionization of the helium atom by few-cycle, elliptically polarized attosecond pulses. For double ionization of He by an intense elliptically polarized attosecond pulse, we predict a nonlinear dichroic effect (i.e., the difference of the two-electron angular distributions in the polarization plane for opposite helicities of the ionizing pulse) that is sensitive to the carrier-envelope phase, ellipticity, peak intensity I, and temporal duration of the pulse[2]. For single ionization of He by two oppositely circularly polarized, time-delayed attosecond pulses we predict that the photoelectron momentum distributions in the polarization plane have helical vortex structures that are exquisitely sensitive to the time-delay between the pulses, their relative phase, and their handedness[3]. Both of these effects[2,3] manifest the ability to control the angular distributions of the ionized electrons by means of the attosecond pulse parameters. Our predictions are obtained numerically by solving the six-dimensional two-electron time-dependent Schrödinger equation for the case of elliptically polarized attosecond pulses. They are interpreted analytically by means of perturbation theory analyses of the two ionization processes[2,3].

[1]This work is supported in part by the U.S. Department of Energy (DOE), Office of Science, Basic Energy Sciences (BES), Award No. DE-FG03-96ER14646.

[2]J.M. Ngoko Djiokap, N.L. Manakov, A.V. Meremianin, S.X. Hu, L.B. Madsen, and A.F. Starace, Nonlinear dichroism in back-to-back double ionization of He by an intense elliptically-polarized few-cycle XUV pulse, Phys. Rev. Lett. **113**, 223002 (2014).

[3]J.M. Ngoko Djiokap, S.X. Hu, L.B. Madsen, N.L. Manakov, A.V. Meremianin, and A.F. Starace, Electron Vortices in Photoionization by Circularly Polarized Attosecond Pulses, Phys. Rev. Lett. **115**, 113004 (2015).