MAR10-2010-020341

Abstract for an Invited Paper
for the MAR10 Meeting of
the American Physical Society

Attosecond dynamics of multi-electron re-arrangement during strong-field ionization

OLGA SMIRNOVA, Max Born Institute

Nonlinear interaction of intense infrared laser light with atoms or molecules converts incident radiation into its high harmonics, increasing the incident frequency by orders of magnitude. High harmonics are generated during radiative recombination of an electron liberated by strong field ionization with the hole left in the molecule. High harmonic spectroscopy records and analyzes information about molecular structure[1] and dynamics[2,3], encoded in harmonic amplitudes, phases and polarizations. Potentially, tens of eV broad harmonic spectra encode dynamics between ionization and recombination with attosecond temporal resolution. For absorption of multiple photons, attosecond dynamics of multi electron rearrangement during strong field ionization is not understood. The shape and location of the hole after ionization are determined by the relative phases of the participating electronic states. We show that these phases, which are set up by ionization and reflect dynamics of core rearrangement, are naturally recorded in high harmonic emission. We use high harmonic spectroscopy to find the shape and location of the hole by reconstructing the relative phases between different ionization channels set up by strong field ionization.

[1]M. Lein, M. J. Phys. B, 40, R135 (2007), W. Boutu et al, Nature Physics 4, 545,(2008)
[2]S. Baker, et al, Science 312, 424 (2006); S. Baker, et al, Phys. Rev. Lett., 101, 053901 (2008)
[3]O. Smirnova, et al, Nature, 460, 972 (2009)