Circularly Polarized Attosecond Pulses for Attosecond Magnetism

by

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Circularly polarized,MHOHG,molecular high order harmonic generation is modelled from numerical solutions of Time-Dependent Schroedinger equations, TDSE's for the one-electron H2+ in the nonlinear nonperturbative regime of laser-molecule interaction [1]. It is shown that nonsymmetric molecular potentials are essential for producing circularly polarized harmonics by few cycle intense circularly polarized IR pulses (800 or 400 nm). An intense terahertz (4 um) pulse is added to force and control the recollision of the ionized electron with the parent ion,thus enhancing the efficiency of the MHOHG process. The phases of the x and y electric field components of each harmonic are shown to differ exactly by pi/2 and the harmonics are shown to be generated by “single” recollision of the ionized electron with the parent ion [2]. Superposition of these circularly polarized harmonics allows for the synthesis of circularly polarized pulses of duration of ~ 100 attoseconds.Such new ultrashort pulses allow for controlling electrons on their natural attosecond time scale .In particular it is shown that such pulses are new tools for creating “coherent” attosecond electronic currents inside molecules [3]thus generating attosecond magnetic field pulses, of intensity ~ 10-100 Teslas [4]. Similar results are obtained for benzene molecule in real time TDDFT calculations with correct asymptotic Coulomb functionals [5]

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