Classical-quantum correspondence in strong-field ionization by few-cycle pulses

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Abstract

The three-dimensional momentum distribution of electrons emitted from atoms by few-cycle strong-field pulses features a remarkable variety of intricate features including intracycle and intercycle interferences, a strongly broken inversion symmetry, and pronounced peaks very close to threshold. By comparing full-dimensional quantum simulations with Classical Trajectory Monte Carlo (CTMC) simulations and semiclassical approximations we explore the classical-quantum correspondence in the underlying ionization process. We focus on two prototypical cases of considerable current experimental interest: ionization by few-cycle mid IR pulses and "designer" two-color pulses with controlled relative phases. We identify a remarkable degree of classical-quantum correspondence. Even in the regime of pronounced interference structures, upon coarse-graining (i.e. averaging, e.g. over the focal volume) the correspondence is surprisingly close. This suggests a semiclassical extension of the CTMC method.

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