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Theoretical study of half-cycle pulse assisted ionization and recombination in Rydberg atoms[1]

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We perform a fully quantum-mechanical calculation of the dynamics and ionization of both radial and angular wave packets of a Rydberg electron when kicked by successive terahertz half-cycle pulses (HCPs) in arbitrary directions. We study HCP-assisted recombination and ionization processes experimentally studied by Ziebel and Jones (Phys. Rev. A, **vol**, pg, (2003)). The wave packets are represented on a nonlinear radial grid, and a truncated angular momentum basis; and the unitary propagation is carried out by an implicit finite-difference method. The HCP interaction is modelled as an impulse, or momentum boost of the wavefunction. We present comparisons of our results with the experimental and classical calculations of Ziebel and Jones. We further investigate the recombination & ionization of radial *and* angular wavepackets (produced by a first HCP) assisted by a second HCP polarized in an arbitrary direction from the first.

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