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Subcycle dynamics of strong-field ionization

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In previous studies of the attosecond scale temporal structure of strong-field ionization in atoms driven by few-cycle pulses using the “attoclock” scheme, a one-to-one correspondence between photoelectron momentum and time of ionization on the basis of outgoing electron trajectories has been used. We introduce a purely quantum mechanical and trajectory-free definition of the ionization time. For circular polarization, we show that the strongest ionization takes place without delay at the time of highest field strength. In contrast, the bicircular attoclock using two counter-rotating circular fields exhibits non-negligible ionization delays. We also show simulations results for rescattering beyond the electric dipole approximation in linearly polarized light, demonstrating considerable forward momentum shifts of the high-energy photoelectrons due to radiation pressure.

Primary author: LEIN, Manfred (Leibniz Universität Hannover)

Presenter: LEIN, Manfred (Leibniz Universität Hannover)

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