SIMULATING STRONG FIELD RESCATTERING USING ATTOSECOND LIGHT

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An atom or molecule interacting with an intense, ultrafast laser pulse is a fundamental problem in modern physics. At intensities that are approximately one-tenth an atomic unit of field (50 V/A) the physics is well described by a semi-classical 3-step model where an electron tunnel ionizes, driven by the strong-field and then rescatters with its parent core. The consequence of this physics has opened the areas of attosecond science and spatial-temporal molecular imaging. However in a strong field experiment, the exponential rate of tunnel ionization fixes the release phase of the electron wave packet (EWP) at the extreme of the laser field. In this talk, we will describe a method that allows for more precise studies of the strong field process. The approach simulates the 3-step model by replacing the tunneling step with single-photon ionization by an attosecond XUV pulse. A phase-locked intense low-frequency field drives the EWP mimicking steps (2) and (3) but with little or no ionization. We will present both experimental and theoretical results demonstrating the viability of this approach.