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Sub-cycle dynamics of multiphoton ionization[1] DMITRY A. TELNOV, St. Petersburg State University, Russia, K. NASIRI AVANAKI, SHIH-I CHU, University of Kansas — Sub-cycle oscillatory structures are revealed in calculated time-dependent multiphoton ionization rates. Both atomic and molecular targets manifest multiple ionization bursts per one optical cycle of the laser field. Using the accurate and efficient time-dependent generalized pseudospectral method to solve the time-dependent Schrödinger equation, we have performed calculations on H, He^+, H_2^+, and HHe^{2+}, for the laser fields with several intensities and wavelengths in the near-infrared range (750 nm to 1064 nm). The sub-cycle structures appear a universal feature of multiphoton ionization and become well pronounced for sufficiently strong laser fields depending on the target atom or molecule. Analysis of the electron density distributions on the sub-femtosecond time scale shows several time moments per optical cycle (not necessarily corresponding to the peak values of the laser field) when significant portions of the electron density move away from the nucleus giving rise to the bursts in the ionization rate. The nature of the phenomenon can be related to ionization through different pathways, including direct ionization as well as population of the excited states by the laser field with subsequent ionization at later times.

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