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Transient Absorption of Attosecond Pulses by He Atoms in Presence of Near-Infrared Laser Fields: A TDDFT Analysis of Sub-Cycle Temporal Structures[1] JOHN HESLAR, National Taiwan University, Taiwan, DMITRY A. TELNOV, St. Petersburg State University, Russia, SHIH-I CHU, University of Kansas — We study transient absorption of extreme ultraviolet (XUV) attosecond pulses in presence of near-infrared (NIR) laser fields by analyzing the population and photon emission of excited atomic energy levels. We consider He atoms and apply a self-interaction-free fully *ab initio* time-dependent density functional theory (TDDFT). Our method is based on the Krieger-Li-Iafrate (KLI) treatment of the optimized effective potential and incorporates explicitly the self-interaction correction. We focus on the sub-cycle (with respect to NIR field) temporal behavior of the population of the excited energy levels and related dynamics of photon emission. We observe and identify sub-cycle shifts in the photon emission spectrum as a function of the time delay between the XUV and NIR pulses. In the region where the two pulses overlap, the photon emission peaks have an oscillatory structure with a period of 1.3 fs, which is half of the NIR laser optical cycle. Such a structure was also observed in recent experiments on transient absorption.

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