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Probing the Sub-cycle AC Stark Shift by means of Attosecond Pulses: An *ab initio* Study of Transient Absorption DI ZHAO, Xi'an Jiaotong University, Xi'an, China, University of Kansas, DMITRY A. TELNOV, St.Petersburg State University, Russia, SHIH-I. CHU, University of Kansas — We report a first fully *ab initio* theoretical exploration of the sub-cycle dynamical AC Stark shift and broadening of He atoms driven by an attosecond pulse and IR pulse. Since the duration of the UV pulse is much shorter than that of the optical cycle of the IR dressing laser field, the sub-cycle dynamics of the dressed atoms can be unfolded by applying the attosecond pulse at different time delay. A nonperturbative method is developed to calculate the transient absorption spectrum without weak-field limitation. By solving the time-dependent Schrödinger equation accurately by means of the time-dependent generalized pseudospectral method, we predict novel sub-cycle laser-induced time-dependent AC Stark shift and power broadening of He atoms whose dynamical features are in good agreement with the latest ongoing experiments at UCF. Detailed results will be presented. This work is partially supported by DOE and NSF.

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