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Sub-IR-cycle time-resolved AC Stark shifts in helium[1] UWE THUMM, Kansas State University, FENG HE, Department of Physics, Shanghai, CAMILO RUIZ, Universidad de Salamanca, ANDREAS BECKER, JILA and University of Colorado, Boulder — The exposure of atoms to strong infrared (IR) laser fields periodically shifts their energy levels. We discuss a strategy for observing the instantaneous atomic level shifts in helium by analyzing measured delay-dependent XUV pump - IR probe ionization spectra based on numerical solutions of the time-dependent Schrödinger equation (SE). For IR pulse intensities that are weak enough to not excite or ionize helium, our scheme exploits that a single spectrally broad attosecond pulses will populate a distribution of excited states out of which the atom can be ionized by the weak IR pulse. Since the ionization probability depends on the magnitude of the IR electric field at the time of XUV excitation, detection of the ionization probability as a function of the center frequency of the XUV pulse and the time delay between the XUV and IR pulses, allows us to deduce instantaneous Stark shift with sub-IR-cycle resolution. We verify that this strategy works after taking into account electron correlation by solving the SE equation for two electrons.

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