Abstract Submitted
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Transient absorption lineshapes in a dense, laser-dressed Helium target probed by attosecond pulse trains[1] CHEN-TING LIAO, College of Optical Sciences, University of Arizona, HENRY TIMMERS, Department of Physics, University of Arizona, ARVINDER SANDHU, College of Optical Sciences and Department of Physics, University of Arizona — Attosecond transient absorption is an emerging time-resolved spectroscopic technique to explore electron dynamics in atoms and molecules. In this experimental study, we used extreme ultraviolet (XUV) attosecond pulse trains (APTs) in energy range of 20-25 eV to probe the transient excited-state absorption of an optically thick Helium gas sample under the influence of moderately strong (1-3 TW/cm^2), infrared (IR), femtosecond pump pulse. We found that the resonant absorption lineshapes for Helium 1s2p, 1snp, and continuum states show rich dynamics, evolving between Lorenzian and Fano profiles with phases imposed by IR laser pulse and multi-channel quantum-path interference. Both AC Stark shifts and light-induced states were studied as a function of pump-probe delay and IR intensity. By changing the Helium gas density, we observed the lineshape modification due to the macroscopic propagation effects, which is usually not included in the single-atom response model. We found that the 13th and 15th high harmonics of XUV produce two coupled polarizations, and the relative coherence between these two polarizations changes the absorption even when the IR pulse arrives after a long time (about 500 fs) after the XUV.

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