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Imaging Coherent Electronic Motion in Atoms by Ultrafast Electron Diffraction[1] HUA-CHIEH SHAO, ANTHONY F. STARACE, University of Nebraska-Lincoln — Ultrafast electron diffraction from time-varying coherent electronic states of the H atom is investigated.[2] Electron diffraction from coherent electronic states exhibiting breathing and wiggling modes of electronic motion are simulated in order to demonstrate the capability of attosecond electron pulses to image electron dynamics. A theoretical analysis identifies the conditions necessary to obtain time-resolved measurements. The scattering patterns and their temporal behaviors are shown to differentiate the two kinds of target electronic motion. Moreover, our simulations show that inelastic processes contribute significantly to the diffraction patterns. Thus although the diffraction patterns clearly distinguish different modes of target electronic motion, they cannot be easily related to the time-dependent target charge density. Finally, we note that detection of the scattered electron energy can provide more information on time-dependent target electronic motion.

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[2]H.-C. Shao and A.F. Starace, Phys. Rev. A **88**, 062711 (2013).

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