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Probing Transient Electron Dynamics Using Ultrafast X Rays¹

PHILIP BUCKSBAUM, PULSE Institute, Stanford University and SLAC National Accelerator Laboratory

Linear x-ray absorption in atoms or molecules creates highly excited multi-electron quantum systems, which relax rapidly by fluorescence or Auger emission. These relaxation rates are usually less than a few femtoseconds in duration, and so they can reveal transient electronic states in molecules as they undergo photo-induced transformations. I will show recent results from femtosecond x-ray experiments that display this phenomenon. There are efforts underway to push the temporal resolving power of ultrafast x-ray pulses into the attosecond regime, using stronger fields to initiate nonlinear absorption processes such as transient stimulated electronic Raman scattering. I will discuss current progress and future prospects for research in this area.

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