Abstract Submitted
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Observations of Electronic Excited States using Ultrafast Gas-phase X-ray Scattering[1] HAIWANG YONG, Brown University, NIKOLA ZOTEV, University of Edinburgh, JENNIFER RUDDOCK, BRIAN STANKUS, Brown University, DARREN BELLSHAW, ANDRES MORENO CARRASCOSA, University of Edinburgh, SEBASTIN BOUTET, THOMAS LANE, MENGNING LIANG, SERGIO CARBAJO, JOSEPH ROBINSON, JASON KOGLIN, SLAC National Accelerator Laboratory, WENPENG DU, NATHAN GOFF, YU CHANG, Brown University, MICHAEL MINITTI, SLAC National Accelerator Laboratory, ADAM KIRRANDER, University of Edinburgh, PETER WEBER, Brown University — Implemented in a pump-probe scheme, the scattering patterns provide a direct view of the structural evolution of the molecules on a femtosecond timescale. Our early study of 1,3-cyclohexadiene used excitation at 267 nm to record time-resolved scattering patterns that show the structural evolution during the electrocyclic ring opening reaction on a sub-100 fs time scale. We now explore the photo-induced dynamics of medium-sized organic molecules upon excitation at 200 nm by ultrafast x-ray scattering using the Linac Coherent Light Source. We show that the scattering patterns inherently reflect the nature of the initially excited state. The nature of the excited electronic state is identified and in good agreement with theoretical predictions. The optical excitation to excited electronic states changes the charge density distribution of the molecule. This leads to a measurable change in the total scattering signal, which needs to be considered in the analysis.

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