

# **Imaging Charge Transfer and Nuclear Dynamics in Time-Resolved X-Ray and Laser Experiments**

Daniel Rolles

*J.R. Macdonald Laboratory, Physics Dept., Kansas State University, Manhattan, KS, USA*

The combination of various electron and ion imaging schemes, such as Velocity Map Imaging and Coincident Electron and Ion Momentum Imaging, with femtosecond light sources ranging from the near-infrared to the hard X-ray regime has allowed us to systematically study ultrafast dynamics in polyatomic gas-phase molecules. I will report on a series of time-resolved experiments on halogenated hydrocarbons performed with femtosecond near-infrared lasers as well as with soft and hard X-ray free-electron lasers, where we can directly observe nuclear dynamics in bound and dissociating molecular systems and image charge transfer between the molecular constituents. For the free-electron laser experiment, I will emphasize the importance of jitter-correction schemes for pump-probe experiments combining an optical laser and with the free-electron laser, and show recent advanced in the regard that were achieved at FLASH.