

Abstract Submitted  
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**De novo production of polyatomic molecular movies**<sup>1</sup> MATTHEW WARE, PULSE Institute at Stanford and SLAC, JAMES M. GLOWNIA, LINAC Coherent Light Source, DAVID SANCHEZ, PHILIP H. BUCKSBAUM, PULSE Institute at Stanford and SLAC — The practical tools to reconstruct real-space movies in the molecular frame from experimental time-resolved x-ray scattering (TRXS) measurement is an active field of research. We have developed frequency-resolved x-ray scattering (FRXS) as one such tool for producing molecular movies, which leverages the current strength of free-electron lasers: fine temporal resolution (50 fs) and fast data accumulation (4 mJ pulses at 120 Hz). We have used FRXS to characterize the simultaneous dissociations and vibrations on multiple electronic states in molecular iodine. This presentation will focus on the extension of FRXS to polyatomic molecules. For example, we will show how normal modes of motion may be recovered from a TRXS measurement using FRXS, and we will discuss the application of FRXS to chemically interesting dynamics like ring-opening.

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