Abstract Submitted
for the MAR12 Meeting of
The American Physical Society

Time-Resolved Near-Edge Coherent Diffractive Imaging FABIAN WEISE, DANIEL NEUMARK[1], STEPHEN R. LEONE[2], OLIVER GESSNER, Ultrafast X-ray Science Laboratory, Chemical Sciences Division, Lawrence Berkeley National Laboratory, Berkeley, California 94720, USA — Coherent diffractive imaging (CDI) with x-rays is a well-established technique that provides structural information beyond the limitations of optical microscopy. Free electron lasers provide ultrashort x-ray pulses with sufficiently high peak brightness to facilitate single-shot imaging and the extension of CDI into the time-domain. Recent progress in the generation of spatially coherent ultrashort x-ray pulses by high harmonic generation (HHG) using tabletop lasers lead to the emergence of a new field of laboratory-based CDI. While a relatively low photon flux and limited photon energies result in lower imaging resolution compared to x-ray studies at large-scale facilities, the significantly greater availability makes laboratory-based experiments well suited for developing new CDI techniques. We present a new apparatus for CDI, which provides ultrashort XUV pulses with tunable photon energies. By implementing a monochromator in a HHG-based CDI setup, the photon energy can be tuned to the inner-shell absorption edges of different elements in the sample. The wavelength-dependence of the x-ray optical constants close to the resonances facilitates to exploit the element selectivity and chemical sensitivity of x-ray transitions in time-domain CDI experiments.

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Date submitted: 17 Nov 2011 Electronic form version 1.4