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**Fresnel-regime Coherent Diffractive Imaging using Tabletop Sources** MATTHEW TYSON, Los Alamos National Laboratory, KIMBERLY NGUYEN, University of New Mexico, JONATHAN GIGAX, RICHARD SANDBERG, Los Alamos National Laboratory — Coherent diffractive imaging (CDI) is a technique which aims to alleviate issues often associated with X-ray microscopy, such as inefficient light transmission, limited resolution, and lenses that are difficult to produce. CDI can be used in conjunction with an ultrafast pulsed X-ray source in order to achieve nanometer scale spatial and femtosecond scale temporal resolution. In order to resolve such fine details, CDI relies on oversampled diffraction patterns, which are then manipulated via a procedure known as iterative phase retrieval to reconstruct an image of the original sample. This technique typically requires the detector to be placed in the far-field regime in order to obtain a Fraunhofer diffraction pattern, where the wavefront can be assumed to be a plane wave. In near-field Fresnel diffraction, the wavefront on the detector has considerable phase-distortion, significantly complicating the reconstruction algorithm. The further into the Fresnel regime the detector is placed, the more substantial the phase-distortion. Here, we demonstrated Fresnel-regime CDI using a tabletop HeNe laser, analogous to a coherent X-ray source, and the effects of reconstructing a sample in the Fresnel regime were examined.

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