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Coherent Diffractive Imaging in the Near Field at Large Angles BENJAMIN A. P, JOHN L. BARBER, KIMBERLY NGUYEN, MATTHEW C. TYSON, RICHARD L. SANDBERG, Los Alamos National Laboratory — Coherent diffraction imaging (CDI) is a rapidly developing form of lensless imaging where the intensity of the diffraction pattern is directly imaged on a CCD and iterative phase retrieval (IPR) algorithms are used to reconstruct a high resolution image of the sample. This is especially useful at x-ray wavelengths, where lenses are inefficient and difficult to manufacture. However, one challenge with CDI is that the exact relationship between light emerging from the sample and arriving at the detector is nearly impossible to determine, even numerically, but becomes tractable with various assumptions. The standard far-field assumptions require the detector to be placed hundreds or thousands of meters from the sample at hard x-ray energies, which is not practical. A different set of assumptions called the "distorted object" approach allows imaging at any distance, but has the strict requirement that a value called the small angle number, An, needs to be much smaller than one. Here we examine where the distorted object approach fails, specifically in regards to An. We have found that we can obtain good quality images with very large An values at visible wavelengths.

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