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Keyhole reflection-mode coherent diffraction imaging of nano-patterned surfaces using a tabletop EUV source[1] ELISABETH SHANBLATT, MATTHEW SEABERG, BOSHENG ZHANG, DENNIS GARDNER, MARGARET MURNANE, HENRY KAPYETN, DANIEL ADAMS, University of Colorado at Boulder — We demonstrate the first reflection-mode keyhole coherent diffraction imaging (CDI) of non-isolated samples from a single diffraction pattern. A tabletop high harmonic generation (HHG) beam at 30 nm with a curved wavefront is used to illuminate Ti nano-patterns on a Si substrate at 45 degree angle of incidence. The 30 nm illumination beam profile is first characterized using ptychograhic CDI. Keyhole CDI is then used to image the nano-sample. In contrast to ptychography CDI, keyhole CDI needs only one diffraction pattern, and therefore requires no scanning of the sample. This is a significant advantage for ultrafast pump-probe imaging of thermal or spin transport, allowing a sequence of time-delayed images of the same region to be easily acquired. Our technique opens the door for imaging dynamics in nanostructures with sub-10 nm spatial resolution and fs temporal resolution.

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