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Scanning Coherent X-ray Diffraction Imaging of GdFe Magnetic Multilayers[1] A. TRIPATHI, University of California San Diego, S.S. KIM, Argonne National Laboratory, J. MOHANTY, S. DIETZE, E. SHIPTON, K. CHAN, E. FULLERTON, O. SHPYRKO, University of California San Diego, I. MCNULTY, Argonne National Laboratory — Crucial to understanding fundamental physics puzzles such as colossal magnetoresistance and developing future technologies for magnetic data storage is an understanding of the nanoscale behavior of magnetism. Probes with the ability to see beyond surfaces on this length scale, ultimately on ultrafast time scales, would greatly enhance this understanding. Coherent X-ray Diffraction Imaging (CXDI) is a promising new technique with wavelength-limited resolution that can probe deeply beyond surfaces. We studied the evolution of "worm" domains in a ferrimagnetic GdFe multilayer film as a function of applied field using CXDI. Ferromagnetic domains in the multilayer produce high contrast speckle when the film is illuminated with linearly polarized coherent x-rays resonant at the Gd M5 edge. This diffraction is purely magnetic since the sample is electronically amorphous. We recorded coherent diffraction data by scanning overlapping regions on the sample. These diverse diffraction patterns are then numerically inverted using ptychographic iterative algorithms to give a high resolution map of the ferromagnetic domain configuration.

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