Abstract Submitted
for the MAR17 Meeting of
The American Physical Society

Magnetic Interactions of Nanodisk Arrays[1] SVEN VELTEN, U Hamburg/Germany, ROBERT STREUBEL, ALAN FARHAN, NOAH KENT, MI-YOUNG IM, ANDREAS SCHOLL, SCOTT DHUEY, Lawrence Berkeley Natl Lab, PETER YOUNG, UC Santa Cruz, ULRICH MERKT, CAROLIN BEHNCKE, U Hamburg/Germany, GUIDO MEIER, MPI Hamburg/Germany, PETER FISCHER, Lawrence Berkeley Natl Lab — We have investigated the collective behavior of interacting magnetic nanostructures in two dimensional arrays, such as emerging circularity patterns of magnetic vortices in hexagonal and honeycomb lattices. In particular we address the impact of varying disorder. By applying magnetic fields the magnetostatic interactions in the disk arrays lead to a coupling of the individual magnetic structures. Imaging those arrays with high resolution magnetic transmission soft x-ray microscopy we observe an alternating ordering of the magnetic curling direction, the circularity, of the vortices in the honeycomb lattice. In contrast, in the hexagonal lattice, small regions of alternating lines are formed. Micromagnetic simulations reveal that the patterns arise due to flux closure states during the stabilizing process of the magnetic vortices after the magnetic field is turned off. The effect of disorder on the collective behavior is studied by X-ray Photoemission Electron Microscopy using randomly distributed soft magnetic nanoislands, forming a single domain state pointing in either of two directions. We discuss these observations in the context of spin glass behavior.

[1]Supported by U.S. DOE BES Contract No. DE-AC02-05-CH11231 and by DFG SFB668 and the Cluster of Excellence 'The Hamburg Center for Ultrafast Imaging (CUI).

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Date submitted: 08 Nov 2016 Electronic form version 1.4