Abstract Submitted
for the MAR13 Meeting of
The American Physical Society

Vortex confinement by magnetic domains in superconductor-ferromagnet bilayers[1] MARTA Z. CIEPLAK, Z. ADAMUS, Institute of Physics, Polish Acad. Sciences, Warsaw, Poland, M. KONCZYKOWSKI, Ecole Polytechnique, Palaiseau, France, L.Y. ZHU, C.L. CHIEN, Johns Hopkins University, X.M. CHENG, Bryn Mawr College — We use a line of miniature Hall sensors to study the effect of magnetic-domain-induced vortex confinement on the flux dynamics in a superconductor/ferromagnet bilayer. A single tunable bilayer is built of a ferromagnetic Co/Pt multilayer with perpendicular magnetic anisotropy and a superconducting Nb layer, with the insulating layer in between to avoid proximity effect. The magnetic domain patterns of various geometries are reversibly predefined in the Co/Pt multilayer using the appropriate magnetization procedure. The magnetic domain geometry strongly affects vortex dynamics, leading to geometry-dependent trapping of vortices at the sample edge, nonuniform flux penetration, and strongly nonuniform critical current density. With the decreasing temperature the magnetic pinning increases but this increase is substantially weaker than that of the intrinsic pinning. The analysis of the initial flux penetration suggests that vortices may form various vortex structures, including disordered Abrikosov lattice or single and double vortex chains, in which minimal vortex-vortex distance is comparable to the magnetic penetration depth.

[1]Supported by Polish NCS grant 2011/01/B/ST3/00462, by the French-Polish Program PICS 2012, by EU grant POIG.01.01.02-00-108/09, and by NSF grants DMR05-20491 and DMR-1053854.

Marta Z. Cieplak
Institute of Physics, Polish Acad. Sciences, Warsaw, Poland

Date submitted: 13 Nov 2012 Electronic form version 1.4