Abstract Submitted
for the MAR10 Meeting of
The American Physical Society

Anisotropic Superconductivity and Vortex Dynamics in Magnetically Coupled F/S and F/S/F Hybrids[1] G. KARAPETROV, A. BELKIN, MSD, Argonne, M. IAVARONE, MSD, Argonne and Temple Univ., J. FEDOR, V. NOVOSAD, MSD, Argonne, M. V. MILOSEVIC, F. M. PEETERS, Univ. of Antwerpen, Belgium — Magnetically coupled superconductor-ferromagnet hybrids offer advanced routes for nanoscale control of superconductivity. Magnetotransport characteristics and STM images of vortex structures in superconductor-ferromagnet hybrids reveal rich vortex phase diagram. We use a combination of STM and Ginzburg-Landau simulations to reveal that the magnetic stripe domain structure induces periodic local magnetic induction in the superconductor, creating a series of pinning-antipinning channels for externally added superconducting flux quanta. Such laterally confined Abrikosov vortices form quasi-1D arrays (chains). The transitions between multichain states occur through propagation of kinks at the intermediate fields. In F/S/F hybrids we demonstrate the evolution of the anisotropic conductivity in the superconductor that is coupled with two adjacent ferromagnetic layers. The anisotropic conductivity of up to three orders of magnitude can be achieved.

[1]This work was supported by UChicago Argonne, LLC, Operator of Argonne National Laboratory. Argonne, a U.S. DOE Office of Science Laboratory, is operated under Contract No. DE-AC02-06CH11357

Goran Karapetrov
Materials Science Division, Argonne National Laboratory

Date submitted: 20 Nov 2009 Electronic form version 1.4