Abstract Submitted
for the MAR08 Meeting of
The American Physical Society

Evidence of spontaneous vortex phase in ferromagnet-superconductor nanocomposites TATIANA RAPPOPORT, Universidade Federal do Rio de Janeiro, YUTAO XING, HANS MICKLITZ, Centro Brasileiro de Pesquisas Físicas, MILORAD MILOSEVIC, Universiteit Antwerpen, IVAN SOLORZANO-NARANJO, PUC-RJ, ELISA BAGGIO-SAITOVITCH, Centro Brasileiro de Pesquisas Físicas — The interplay between superconductivity and magnetism gives rise to many intriguing phenomena. We report a novel manifestation of this interplay: the appearance of a spontaneous vortex phase in superconducting films with embedded magnetic nanoparticles. These systems can be seen as artificial analogues of ferromagnetic superconductors. Unlike traditional vortices in superconductors, this vortex phase appears without any applied magnetic field. The vortices nucleate due exclusively to the stray field of the magnetic nanoparticles, which serve the dual role of providing the internal field while working as pinning centers. Transport measurements reveal that this vortices have a phase transition from a liquid to a disordered solid resembling a vortex glass. The transition is characterized by means of a scaling analysis.

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Date submitted: 14 Dec 2007 Electronic form version 1.4