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Interplay of Superconducting with Magnetic Vortices[1] A. HOFFMANN, J.E. PEARSON, G. MIHAJLOVIĆ, MSD and CNM, Argonne National Laboratory, V. METLUSHKO, L. FUMAGALLI, J.C. SAUTNER, N. JAHEDI, ECE, University of Illinois at Chicago — Periodic arrays of magnetic structures are well known to give rise to commensurate pinning of superconducting vortices in adjacent superconducting films. We compared the pinning effects due to magnetic dots with either single domain or vortex magnetization configuration. There is a clear correlation between the magnetoresistance in the superconductor and the magnetization configuration of the magnetic dots, indicating that the pinning of the superconducting vortices is strongly enhanced for the magnetic vortex state. The origin of this enhanced pinning is due to the locally larger magnetic stray fields produced by the magnetic vortex cores. The absence of an asymmetry for parallel and anti-parallel orientation between the superconducting vortex flux and the magnetic vortex cores suggests that the enhanced pinning is not due to magnetostatic interactions but is rather due to the local suppression of superconductivity by highly localized, large perpendicular stray magnetic fields generated by the magnetic vortex cores.

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