Abstract Submitted
for the MAR09 Meeting of
The American Physical Society

Abrikosov flux-lines in a two-band superconductor with mixed dimensionality[1] K. TANAKA, University of Saskatchewan, M. ESCHRIG, Universitaet Karlsruhe — We study electronic and thermodynamic properties of a two-band superconductor in the vortex state, in which one band is ballistic and quasi-two-dimensional (2D), and the other is diffusive and three-dimensional (3D). A circular cell approximation of the vortex lattice within the quasiclassical theory of superconductivity is applied to a recently developed model appropriate for such a two-band system [1,2]. Motivated by MgB_2, superconductivity in the 3D diffusive band is assumed to be "weak", i.e., mostly induced. We examine the intriguing effects of induced superconductivity, impurities, and Coulomb interactions in the 3D band on electronic structure in the 2D band. In particular, the Coulomb repulsion and the diffusivity in the "weak" band enhance suppression of the order parameter and enlargement of the vortex core by magnetic field in the "strong" band, resulting in reduced critical temperature and field. A particularly interesting feature found in our model is the appearance of additional bound states at the gap edge in the "strong" band. Furthermore, coupling with the "weak" band leads to reduced band gaps and van Hove singularities of energy bands of the vortex lattice in the "strong" band. [1] K. Tanaka, D. F. Agterberg, J. Kopu, and M. Eschrig, Phys. Rev. B **73** 220501(R) (2006). [2] K. Tanaka, M. Eschrig, and D. F. Agterberg, Phys. Rev. B **75** 214512 (2007).

[1]NSERC of Canada, Canada Foundation for Innovation, Deutsche Forschungsgemeinschaft within CFN

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Date submitted: 21 Nov 2008 Electronic form version 1.4