Abstract Submitted
for the MAR10 Meeting of
The American Physical Society

Smearing of the superfluid-normal phase transition in layered systems by c-axis disorder DAVID PEKKER, Harvard University, GIL REFAEL, Caltech, EUGENE DEMLER, Harvard University — We study the effect of disorder on a system composed of a stack of Josephson coupled 2D superfluid layers. In the absence of disorder, this system has 3D XY type superfluid-normal transition as a function of temperature. We introduce c-axis disorder in the form of random superfluid stiffnesses and vortex fugacities in the various layers as well as random inter-layer couplings. As the lower-critical dimension of the transition matches the effective dimensionality of the c-axis disorder, the disorder is expected to have a strong effect on the properties of the phase transition. Indeed, using a functional renormalization group that we construct, we show that disorder smears the phase transition via the formation of a Griffith phase that smoothly fits in-between the usual superfluid and normal phases. Remarkably, in the Griffith phase, due to the power law distribution of the inter-layer couplings, the system becomes essentially two dimensional. This is reflected in the very strong anisotropy of experimental observables like the superfluid response.

David Pekker
Harvard University

Date submitted: 20 Nov 2009 Electronic form version 1.4