Abstract Submitted
for the MAR08 Meeting of
The American Physical Society

Effects of Quenched Random Gap Inhomogeneities on the Specific Heat of a Model High-T_c Superconductor[1] DAVID STROUD, Department of Physics, Ohio State University, Columbus, OH 43210, DANIEL VALDEZ-BALDERAS, Department of Physics and Astronomy, University of Rochester, Rochester, NY 14627 — In many cuprate superconductors, scanning tunneling microscopy experiments show that the energy gap has substantial quenched random spatial variations. We have calculated how such gap variations affect the specific heat C_V in a model for the most anisotropic of these materials. The model is based on a Ginzburg-Landau free energy functional in which position- dependent coefficients are used to model quenched inhomogeneity. Using Monte Carlo simulations, we evaluate C_V for different disorder strengths. Near optimal doping, we find that quenched gap disorder substantially broadens the specific heat anomaly near the phase ordering transition T_c, compared to that due to thermal fluctuations alone. But for strongly underdoped samples, in which T_c is greatly separated from the pseudogap temperature T_{c0}, disorder only slightly increases the broadening beyond the already substantial amount due to thermal fluctuations. We compare these results to recent experiments.

[1]Supported by NSF and DOE

David Stroud
Department of Physics, Ohio State University, Columbus, OH 43210

Date submitted: 26 Nov 2007 Electronic form version 1.4