

Abstract Submitted
for the MAR06 Meeting of
The American Physical Society

Phase Diagrams of Hubbard Models with Small Unit Cells WEI-FENG TSAI, Department of Physics and Astronomy, UCLA, STEVEN A. KIVELSON, Department of Physics and Astronomy, UCLA, and Department of Physics, Stanford University — We present a controlled approach to the low temperature phase diagram of highly inhomogeneous Hubbard models in the limit of small coupling, t' , between clusters. We apply this to the dimerized and checkerboard models with any strength of U . The dimerized model is found to behave like a doped semiconductor, with a Fermi-liquid groundstate with parameters (*e.g.* the effective mass) which are smooth, and unspectacular functions of U . By contrast, the checkerboard model has a Fermi liquid phase at large $U > U_c = 4.67$, a d-wave superconducting state with a full gap for $U_c > U > 0$, and a narrow strip of an intermediate d-wave superconducting phase with gapless “nodal” quasiparticles for $|U - U_c| < \mathcal{O}(t')$.

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Date submitted: 30 Nov 2005

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