Abstract Submitted
for the MAR05 Meeting of
The American Physical Society

Effects of short-ranged interactions in random hopping models on 2D bipartite lattices MATTHEW S. FOSTER, ANDREAS W.W. LUDWIG, University of California, Santa Barbara — Understanding the combined effects of disorder and interactions in electronic systems has been an important problem for many years. These questions have attracted renewed attention in the context of a possible metal-insulator transition in the disordered and interacting 2D electron gas. Here we study the effects of generic short-ranged interactions on a special class of systems: these are tight-binding models of spinless fermions subject to random hopping disorder on 2D bipartite lattices. It is known that in the absence of interactions, these disordered systems are special in that they do not localize in 2D, but possess extended states and a finite conductivity at zero energy, as well as a strongly divergent low energy density of states.[1] Using a perturbative 1-loop renormalization group analysis we show that the same mechanism responsible for the divergence of the density of states leads to an instability in which the interactions are driven strongly relevant by the disorder. [1] R. Gade and F. Wegner, Nucl. Phys. B 360, 213 (1991); R. Gade, Nucl. Phys. B 398, 499 (1993); see also e.g. O. Motrunich et al., Phys. Rev. B65, 064206 (2002).

Matthew S. Foster
University of California, Santa Barbara

Date submitted: 04 Dec 2004 Electronic form version 1.4