Abstract Submitted
for the MAR07 Meeting of
The American Physical Society

Spinless Fermions on a Checkerboard Lattice KIRILL SHTENGEL, UC Riverside, FRANK POLLMANN, Max Planck Institute for the Physics of Complex Systems, JOSEPH BETOURAS, SUPA, University of St. Andrews, PETER FULDE, Max Planck Institute for the Physics of Complex Systems — We present a study of the low-energy physics of a spinless fermionic model on a checkerboard lattice at half-filling. The bosonic version of this model has been recently studied and found to have several unusual features. Fermionic models tend to be more interesting: the inherent sign problem resulting from the fermionic statistics makes them notoriously difficult to handle. The low-energy physics of the model can be described by a fermionic quantum loop model on the square lattice. We found a non-local transformation that can, in certain cases, cure the sign problem. We also identified a large class of fluctuationless states specific to the fermionic models – a result hinting at a possible explanation of the extended ground-state entropy recently found in a few other fermionic models. Finally, we looked at the so-called Rokhsar-Kivelson quantum critical point, where we found the exact ground state(s) as well as studied the low-lying excitations. This allowed us to make several educated guesses about the phase diagram for the model in question. [1] F. Pollmann, J. J. Betouras, K. Shtengel, and P. Fulde, Phys. Rev. Lett. **97**, 170407 (2006)

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Date submitted: 20 Nov 2006 Electronic form version 1.4