Abstract Submitted
for the MAR05 Meeting of
The American Physical Society

Finite Temperature Properties of Quantum Lifshitz Transitions between valence bond phases: An Example of 'Local' Quantum Criticality POUYAN GHAEMI, MIT, ASHVIN VISHWANATH, UC Berkeley, TODADRI SENTHIL, MIT — We study finite temperature properties near quantum 'Lifshitz' transitions between different valence bond solid states of two dimensional quantum magnets. They are the generic versions of phase transitions associated with the solvable Rokshar Kivelson points in quantum dimer models on bipartite lattices. This quantum critical point is described by a free theory that nevertheless has operators with non-trivial scaling dimension. We show that while correlators of such operators exhibit the expected scaling as a function of time, they do NOT show analogous scaling in space. In particular, in the scaling limit, all such correlators are purely LOCAL. In contrast, the zero temperature properties are conventional, and the correlators decay as a power law in both space and time. This provides a valuable microscopic example of how some kind of 'local' criticality may arise at finite temperatures (in the scaling limit), although the underlying zero temperature critical point is itself not 'local' in any sense. We examine the underlying reasons for this unusual behaviour, present the exact local dynamical correlation functions at finite T for these operators, and the effect of irrelevant operators on the scaling limit results described above.

Ashvin Vishwanath
MIT

Date submitted: 03 Dec 2004 Electronic form version 1.4