Abstract Submitted
for the MAR07 Meeting of
The American Physical Society

Replacing energy by von Neumann entropy in quantum phase transitions[1] XUN JIA, ANGELA KOPP, SUDIP CHAKRAVARTY, UCLA — In the thermodynamic limit two distinct states of matter cannot be analytic continuations of each other. Classical phase transitions are characterized by non-analyticities of the free energy. For quantum phase transitions the ground state energy often assumes the role of the free energy. But in a number of important cases this criterion fails, such as the three- dimensional metal-insulator transition of non-interacting electrons in a random potential. It is therefore essential that we find alternative criteria that can track fundamental changes in the internal correlations of the ground state wavefunction. Here we propose that QPTs are generally accompanied by non-analyticities of the von Neumann (entanglement) entropy. In particular, the entropy is non-analytic at the Anderson transition, where it exhibits unusual fractal scaling. We also examine integer quantum Hall effect from this perspective.

[1]Supported by NSF-DMR.

Sudip Chakravarty
UCLA

Date submitted: 02 Dec 2006 Electronic form version 1.4