Abstract Submitted
for the MAR07 Meeting of
The American Physical Society

Measurement Noise Maximum as a Signature of a Phase Transition[1] ZHI CHEN, CLARE YU, University of California, Irvine — Noise is ubiquitous and is being increasingly used as an experimental tool to probe condensed matter systems, but unfortunately, when studying phase transitions, the usefulness of the experimental results is diminished by the fact that little is known about what to expect in the noise spectra. We propose that an increase in the measurement noise can be used to signal the onset of a phase transition since noise arises from the fluctuations of microscopic entities which, in turn, play a key role in phase transitions. As an example, we study the noise in the 2D Ising model which undergoes a second order phase transition, and in the 5-state Potts model which undergoes a first order phase transition by using Monte Carlo simulations. We monitor these systems as the temperature drops below the critical temperature. At each temperature, after equilibration is established, we obtain the time series of quantities characterizing the properties of the system, i.e., the energy and magnetization per site for different size of systems. We apply different methods, such as the noise power spectrum and the second spectrum of the noise, to analyze the fluctuations in these quantities. We show that fluctuations produce an increase in the low frequency noise and the total noise power as first and second order phase transitions are approached.

[1]Work supported by DOE grant DE-FG02-04ER46107

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Date submitted: 14 Nov 2006 Electronic form version 1.4