Abstract Submitted
for the MAR13 Meeting of
The American Physical Society

Self-similarity of phase-space networks of frustrated spin models and lattice gas models[1] YI PENG, FENG WANG, YILONG HAN, Department of Physics, Hong Kong University of Science and Technology, Clear Water Bay, Hong Kong, China — We studied the self-similar properties of the phase-spaces of two frustrated spin models and two lattice gas models. The frustrated spin models included (1) the anti-ferromagnetic Ising model on a two-dimensional triangular lattice (1a) at the ground states and (1b) above the ground states and (2) the six-vertex model. The two lattice gas models were (3) the one-dimensional lattice gas model and (4) the two-dimensional lattice gas model. The phase spaces were mapped to networks so that the fractal analysis of complex networks could be applied, i.e. the box-covering method and the cluster-growth method. These phase spaces, in turn, establish new classes of networks with unique self-similar properties. Models 1a, 2, and 3 with long-range power-law correlations in real space exhibit fractal phase spaces, while models 1b and 4 with short-range exponential correlations in real space exhibit nonfractal phase spaces. This behavior agrees with one of untested assumptions in Tsallis nonextensive statistics.

[1]Hong Kong GRC grants 601208 and 601911

Yi Peng
Dept of Physics, Hong Kong University of Science and Technology,
Clear Water Bay, Hong Kong, China

Date submitted: 27 Nov 2012 Electronic form version 1.4