ID: P1.10

Title: Identification of full order parameter and conjugate field in the dynamic phase transition in the mean-field Ginzburg-Landau model

Name: Robb, Daniel

Affiliation: Berry College

Dynamic phase transitions (DPTs) have been studied in a variety of physical systems, and can serve as a valuable aid in characterizing the behavior of non-equilibrium systems. The DPT in a driven ferromagnetic system below its critical temperature has been shown in mean-field models [1] and in kinetic Monte Carlo (KMC) simulations [2] to exhibit critical scaling with the same critical exponent β as the corresponding equilibrium transitions. In addition, recently a portion of the field conjugate to the order parameter was identified for the KMC model [3], and the field-scaling exponent δ was shown to have the same value as in the equilibrium transition. Here we present numerical evidence that for the DPT in the mean-field model, the full conjugate field is a vector consisting of the even complex Fourier components of the applied field, while the full order parameter (previously taken to be a single scalar, the period-averaged magnetization) is a vector consisting of the deviations of all complex Fourier components of the magnetization from their value in zero conjugate field. Using the full conjugate field and order parameter, the scaling exponents β and δ are found numerically to be consistent with their equilibrium mean-field values. To our knowledge, this is the first identification of a vector order parameter and conjugate field pair, raising the question of whether such quantities occur in other non-equilibrium systems. [1] H. Fujisaka, H. Tutu, and P. A. Rikvold, Phys. Rev. E 63, 036109 (2001); Phys. Rev. E 63, 059903 (2001) [erratum]. [2] S. W. Sides, P. A. Rikvold, and M. A. Novotny, Phys. Rev. E 59, 2710 (1999). [3] D.T. Robb, P.A. Rikvold, A. Berger, M.A. Novotny, Phys. Rev. E 76, 021124 (2007).