DY 19: Finite size effects at phase transitions I (session accompanying the symposium of the same name)

Time: Tuesday 17:00–18:30 Location: H2

DY 19.1 Tue 17:00 H2

Finite-size adapted Wang-Landau/multibondic cluster simulations for second-order phase transitions — •Wolfhard Janke[1] and Bernd Berg[2] — [1]Institut für Theoretische Physik and Centre for Theoretical Sciences (NTZ), Universität Leipzig, Postfach 100900, 04009 Leipzig, Germany — [2]Department of Physics and School of Computational Science, Florida State University, Tallahassee, FL 32306, USA

For a second-order phase transition the critical energy range of interest is larger than the energy range covered by a canonical Monte Carlo simulation at the critical temperature. Such an extended energy range can be covered by performing a Wang-Landau recursion for the density of states followed by a multicanonical simulation with fixed weights. But in the conventional approach one loses the advantage due to cluster algorithms. A cluster version of the Wang-Landau recursion together with a subsequent multibondic simulation improves for 2D and 3D Ising models the efficacy of the conventional Wang-Landau/multicanonical approach by power laws in the lattice size. By suitably adapting the extended energy range to the system size, in our simulations real gains in CPU time reach two orders of magnitude.

[1] B.A. Berg and W. Janke, cond-mat/0610647, to appear in Phys. Rev. Lett.(in print).

DY 19.2 Tue 17:15 H2

Finite-size effects in anisotropic antiferromagnets — •Martin Holtschneider[1], Walter Selke[1], and Stefan Wessel[2] — [1]Institut für Theoretische Physik, RWTH Aachen — [2]Institut für Theoretische Physik, Universität Stuttgart

Square lattice Heisenberg antiferromagnets with an uniaxial anisotropy display, when applying a field parallel to the easy axis, antiferromagnetic, spin-flop, and paramagnetic phases. In particular, the transition region of the two ordered phases is studied carefully, using Monte Carlo simulations both in the classical and the spin-$\frac{1}{2}$ quantum version of the model. Finite-size analyses are found to play an essential role in investigating that region. We also present results on the closely related classical anisotropic XY antiferromagnet on a square lattice.

DY 19.3 Tue 17:30 H2

Finite-size scaling of droplets in two-dimensional ±J Ising spin glasses — •Alexander Hartmann — Institut für Theoretische Physik, Universität Göttingen, Germany

The behavior of two-dimensional Ising spin glasses is currently heavily discussed. Of particular interest is the question whether the low-temperature behavior close to the $T = 0$ phase transition depends on the type of disorder, i.e. Gaussian vs. bimodal (±J) distribution. From the finite-size scaling behavior of domain walls previously obtained via ground-state (GS) calculations, it appears that both classes behave differently, while recent Monte Carlo (MC) simulations claim universality. Here, the finite-size scaling of droplet excitations, which are dominating the low-temperature behavior, is studied numerically using a combination of suitable perturbations of the realizations together with exact GS calculations. The GS calculations are based on a matching approach, which allows to treat large system sizes up to $N = 256 \times 256$ spins. The main result is that the finite-size scaling behavior of the droplets is different from the domain-wall scaling, but similar to the scaling of droplets for the Gaussian model. Hence, this could explain the results observed in MC simulations.

DY 19.4 Tue 17:45 H2

Critical Casimir force scaling function of the mean spherical model — •Boris Kastening and Volker Dohm — Institut für Theoretische Physik, RWTH Aachen

Motivated by recent unexplained experimental data [1,2] concerning the scaling function of the critical Casimir force in Helium films below T_λ, we carry out an analysis of the finite-size scaling functions of the excess free energy and of the critical Casimir force within the mean spherical model below T_c in film geometry with $d-1$ infinitely extended dimensions and one direction of finite extent. We consider various boundary conditions.

[1] R. Garcia and M.H.W. Chan, Phys. Rev. Lett. 83, 1187 (1999).

[2] A. Ganshin, S. Scheidemantel, R. Garcia, and M.H.W. Chan, Phys. Rev. Lett. 97, 075301 (2006).

DY 19.5 Tue 18:00 H2

Scaling Theory for Logarithmic-Correction Exponents — •Ralph Kenna[1], Des Johnston[2], and Wolfhard Janke[3] — [1]Applied Mathematics Research Centre, Coventry University, Coventry, CV1 5FB, England — [2]Department of Mathematics and the Maxwell Institute for Mathematical Sciences, Heriot-Watt University, Riccarton, Edinburgh, EH144AS, Scotland — [3]Institut für Theoretische Physik and Centre for Theoretical Sciences (NTZ),, Universität Leipzig, Augustus Platz 10/11, 04109 Leipzig, Germany

Multiplicative logarithmic corrections frequently characterize critical behaviour in statistical physics. Here it is shown that the various exponents of such corrections are interrelated just as the exponents characterizing leading scaling behaviour are. A new set of scaling relations for these logarithmic-correction exponents are proposed. These relations are then confronted with results from the literature and new predictions for logarithmic corrections in certain models are made.

DY 19.6 Tue 18:15 H2

On finite-time effects in non-equilibrium critical phenomena — •Malte Henkel — Laboratoire de Physique des Materiaux, Universite Henri Poincare Nancy I, Frankreich

The long-time regime in the dynamics of non-equilibrium systems, usually described in terms of dynamical scaling, is often sensible to strong finite-time corrections which can affect the conclusions on the kind of scaling description to be used (e.g. ageing vs sub-ageing or superageing). This will be illustrated in several examples from the ageing of disordered systems.