DY 25 Symposium Renormalization and Scaling (SYRS) – Contributed Talks II

Zeit: Samstag 16:00–17:00 Raum: TU H3010

DY 25.1 Sa 16:00 TU H3010

The scaling of a self-avoiding walk on a percolation cluster — •Yurij Holovatch[1,2,3], Viktoria Blavats'ka[1], Christian von Ferber[4], and Reinhard Folk[2] — [1]Institute for Condensed Matter Physics, UA-79011 Lviv, Ukraine — [2]Institut für Theoretische Physik, Johannes Kepler Universität Linz, A-4040 Linz, Austria — [3]Ivan Franko National University of Lviv, UA-79005 Lviv, Ukraine — [4]Theoretische Polymerphysik, Universität Freiburg, D-79104 Freiburg, Germany

The scaling properties of a self-avoiding walk (SAW) on the d-dimensional diluted lattice at the percolation threshold are analyzed by a field-theoretical renormalization group approach. To this end we reconsider the model of Meir and Harris [1]. Although the former one-loop analysis points to a new universality class for a SAW on the percolation cluster, the numerical values found for the scaling exponents almost coincide with those for a SAW on an undiluted lattice. Our second order result for the mean square end-to-end distance exponent reads: $\nu_{\rm p} = 1/2 + \varepsilon/42 + 110\varepsilon^2/21^3$, $\varepsilon = 6 - d$ and leads to perfect agreement with known theoretical, MC and exact enumeration data [2,3]. Moreover, we argue that the observed scaling possesses multifractal properties and obtain a non-trivial spectrum of correlation exponents governing the multifractal scaling.

[1] Y. Meir and A.B. Harris, Phys. Rev. Lett. **63**, 2819 (1989).
[2] C. von Ferber, V. Blavats'ka, R. Folk, Yu. Holovatch, Phys. Rev. E **70** 035104(R) (2004).
[3] V. Blavats'ka, C. von Ferber, R. Folk, Yu. Holovatch, in: *Polymers in Random Media*, ed. by B. Chakrabarti, Elsevier, 2005 (to appear).

DY 25.2 Sa 16:15 TU H3010

Star polymer scaling - 4th order RG results and applications — •Christian von Ferber[1], Yurij Holovatch[2,3], Verena Schulte-Frohlinde[1] und Alexander Blumen[1] — [1]Theoretische Polymerphysik, Universität Freiburg — [2]Institute for Condensed Matter Physics and Ivan Franko National University of Lviv, Ukraine — [3]Johannes Kepler Universität Linz, Austria

The overall scaling properties of a branched polymeric structure in solution can be derived in terms of the scaling behavior of the star-like branching units that define its local topology. Various physical processes and situations are governed by these: the mean force between two star polymers, the correlations of the brancing units in a star burst dendrimer, the denaturation process of DNA double strands as well as trapping processes involving traps aligned on a polymer where the random walk of each trapped particle describes a branch with branching point at the trap. More complex multifractal behavior occurs in the latter example where the branches differ. In a field thoretic approach we map the problem of finding the scaling properties of the star-like branching unit to that of determinig the anomalous dimensions of an appropriate local field operator product. We present recent 4th order RG results obtained in the minimal subtraction scheme of the $\epsilon = 4 - d$ expansion. We compare our results to previous 3rd order ϵ- and fixed dimension expansions as well as to exact results in 2D and MC simulations.

[1]V. Schulte-Frohlinde, Yu. Holovatch, C. von Ferber, A. Blumen. Phys. Lett. A 328:335-340 (2004).
[2]C. von Ferber, Yu. Holovatch, ed. Condens. Matt. Phys. 5(2002).

DY 25.3 Sa 16:30 TU H3010

Limits of real space renormalization group studies of network models for the quantum Hall effect — •Achim Manze and Bodo Huckestein — Theoretische Physik III, Ruhr-Universität Bochum, Bochum, Germany

We consider a models of Integer Quantum Hall systems with two Landau levels where each node represents a 4×4 scattering matrix and the bonds correspond to propagation along directed links subject to random Landau level mixing ($U(2)$-disorder). Restriction to a fractal structure allows for the implementation of a real-space renormalization (RSR). For the single channel model this model has been employed very successfully for the calculation of , e.g., critical conductance distributions, critical exponent of the localization length, and energy level statistics.

Applying the RSR procedure to the two-channel model, we find only two stable phases corresponding to Hall conductivities of $\nu = 0$ and $\nu = 2$ (in units of e^2/h), respectively, even in the limit of weak Landau level mixing. The absence of a stable localized phase with Hall conductivity $\nu = 1$ appears to be a feature of the RSR procedure. Comparison of the results of the RSR with exact calculations for small, square systems and weak mixing shows a tendency towards localization with increasing system size for the square systems while the RSR yields delocalization at $\nu = 1$.

As the RSR can also be interpreted as a numerically exact treatment of a hierarchical lattice, this study shows that the phase diagrams of a two-channel quantum Hall system on a hierarchical and a square lattice differ in topology, in contrast to the case of the one-channel model.

DY 25.4 Sa 16:45 TU H3010

Aging in the glass phase of a 2D random periodic elastic system — •Gregory Schehr[1] and Pierre Le Doussal[2] — [1]Theoretische Phisik Universitat des Saarlandes 66041 Saarbrucken Germany — [2]CNRS-Laboratoire de Physique Theorique de l'Ecole Normale Superieure, 24 Rue Lhomond 75231 Paris, France

Using RG we investigate the non-equilibrium relaxation of the (Cardy-Ostlund) 2D random Sine-Gordon model, which describes pinned arrays of lines. Its statics exhibits a marginal ($\theta = 0$) glass phase for $T < T_g$ described by a line of fixed points. We obtain the universal scaling functions for two-time dynamical response and correlations near T_g for various initial conditions, as well as the autocorrelation exponent. The fluctuation dissipation ratio is found to be non-trivial and continuously dependent on T.