Abstract Submitted
for the MAR12 Meeting of
The American Physical Society

Influence of the cluster-shape on the d-wave-transition temperature T_c in the dynamical cluster approximation: A case study for the 2D repulsive Hubbard model PETER STAAR, ETH Zurich, THOMAS MAIER, Oak Ridge National Laboratory (ORNL), THOMAS SCHULTHESS, ETH Zurich, ITP ETH ZURICH - ORNL TEAM — The dynamical cluster approximation (DCA) is a systematic extension beyond the single site approximation of dynamical mean field theory to include non-local correlations. The method maps the infinite lattice self-consistently on a cluster with N_c sites, which is embedded into a mean field. Since the correlations within the cluster are treated exactly, it is ideal to investigate phase-transitions such as d-wave superconductivity. Since a Quantum Monte Carlo integration is used to obtain the DCA self-consistency, the sign-problem prevents us to solve large cluster problems ($N_c > 32$). Meanwhile, the transition temperatures T_c from smaller clusters fluctuate due to a large dependency on the cluster-shape. Here, we investigate whether this cluster-dependency originates from the quantum impurity problem, or from the mesh on which we solve the Bethe-Salpeter (BS) equation. By exploiting the localized nature of the self-energy Σ and the vertex function Γ in real space, we can reconstruct these functions on arbitrary fine meshes in momentum-space and investigate its impact on the solutions of the BS equation. We will show that the 8-site cluster has a finite T_c for small doping-levels and that the 16-site clusters have converged transition temperatures.

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Date submitted: 17 Nov 2011 Electronic form version 1.4