Thermodynamic and transport properties of interacting electrons in two dimensions with diagonal and off-diagonal disorder

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We present numerical results on transport and thermodynamic properties of a two-dimensional electron system in the presence of both Coulomb repulsion and disorder potential, none of which can be considered weak. The numerical method used is quantum Monte Carlo simulations on a $d = 2$ square lattice. We investigate disorder potential with different symmetries like diagonal (site) disorder and off-diagonal (bond) disorder. The common features and salient differences in the physics of interacting electrons in low dimensions when the disorder symmetries are different will be stressed in this talk. In particular, evidence of universality in the value of the critical conductivity at the quantum critical point between a metallic and a localized state for the site disordered system will be highlighted, and comparisons will be made to the corresponding case of bond disorder. Interesting magnetic properties of the system at different regimes of interaction and disorder strength will also be discussed.

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