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Spectral function of two-dimensional disordered Hubbard model[1]

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We show that moderate disorder introduces extended states in the Mott gap which upon further increase of disorder strength become localized states [1]. We propose that the inverse of the Lorentzian broadening of the spectral function A($\mathbf{k}$, ω=0) as a function of $\mathbf{k}$ can be used as an order parameter for describing the both the transition from a Mott insulator to an unusual metallic state and the transition from the metal to a localized insulator of spin singlets. We further track the evolution of A($\mathbf{k}$,ω) as a function of disorder and interaction strength. We also obtain the screening length of an external Coulomb potential from the density-density correlation function and find that the screening length is shortest at intermediate disorder in the metallic region. Our calculations are performed within an exact eigenstate formalism that treats the disorder exactly. The single particle Green's function is calculated within self-consistent mean field theory. In real space the bubble diagrams for this on-site interaction are an exact representation of density-density correlation function.

[1] D. Heidarian and N. Trivedi, Phys. Rev. Lett. **93**, 126401 (2004)

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