Metal-Insulator Transition and Coulomb Gap: A Real-Space Dynamical Mean-Field Study of the Anderson-Hubbard Model

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The interplay between disorder and electron interactions in the two-dimensional paramagnetic Anderson-Hubbard model is studied by real-space dynamical mean-field theory (DMFT) with a Hubbard-I solver. At half-filling, the Mott gap evolves into a Coulomb-like gap with power law energy dependence $|E - E_F|$, suggesting a Mott insulator to Anderson insulator transition as a function of disorder. Away from half-filling for strong interactions and disorder, we find a negative density of states (DOS) anomaly at the Fermi level that is distinct from the Mott gap. Far from half-filling, we obtain a positive DOS anomaly at the Fermi level. While this positive anomaly is consistent with paramagnetic mean-field calculations, the negative anomaly near half-filling is a feature unique to strong correlation physics.

1NSERC and Trent University.