Fluctuation Diagnostics in the 2D Hubbard model from the dual- fermion method

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ABSTRACT: We use the Dual Fermion approximation (DF) to study the Hubbard model on the 2D square lattice, by using two-particle quantities, such as susceptibilities and full vertex functions.

The numerical methods that we used for our study are the dynamical mean-field theory (DMFT), the continuous-time auxiliary field (CTAUX) as self consistent impurity sover, Fluctuation diagnostics and Dual Fermion approximation (DF). The DF method provides high-resolution results for single-particle quantities such as the Density Of States (DOS) and Self Energy as well two particles spin susceptibility and vertex functions. With these results, we can present, for the first time, high-resolution results of the fluctuation diagnostics method with the minimal computational expense. We examine the full Q-vector dependence of the extended self-energy at the Nodal and Antinodal k-points and provide interpretation for the claim that spin fluctuations are responsible for the metal-to-insulator behaviour.

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