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A Renormalisation Group Approach to Fermi liquid Theory and Beyond.

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We review the some results of applying the numerical renormalisation group (NRG) approach within the framework of dynamical mean field theory to some systems with strong electron-electron and strong electron-phonon interaction as described the Hubbard-Holstein model [1, 2]. In particular, we present recent results in the model away from half-filling showing the existence of a narrow band of polaron excitations in the region of the Fermi level in the strong coupling regime [4].

We also describe how the renormalised parameters can be deduced from the NRG calculations [3] and then used in a renormalised perturbation theory [5]. Some recent results for spin and charge dynamics calculated from this combined approach will be presented for an impurity Anderson model in a magnetic field [6, 7]. Finally, we consider how this approach can be applied to models of heavy fermion systems, and to the problem of quantum critical behaviour.

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