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Renormalisation group approach to strong correlation behaviour

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We review results of the renormalised perturbation approach as applied to infinite dimensional Hubbard [1, 2] and Hubbard-Holstein model [3, 4] in the strong correlation regime. From the low lying excitations of a numerical renormalisation group calculation (NRG), using dynamical mean field theory, renormalised parameters for the band width, chemical potential and local quasiparticle interations can be calculated (see 1 (a)). The quasiparticle spectra deduced describe well the low energy one-particle spectral densities when compared with the direct NRG calculations. The renormalised parameters when used to calculate the repeated quasiparticle scattering also in excellent agreement with the low energy spin dynamics from a direct NRG calculation (see 1(b)). The approach has been generalised to include an arbitrary magnetic field, and antiferromangetic order in the case of the Hubbard model. We assess the potential of this approach to describe the to give relevant information physics for the calculation of transport properties for models with strong correlation behaviour.

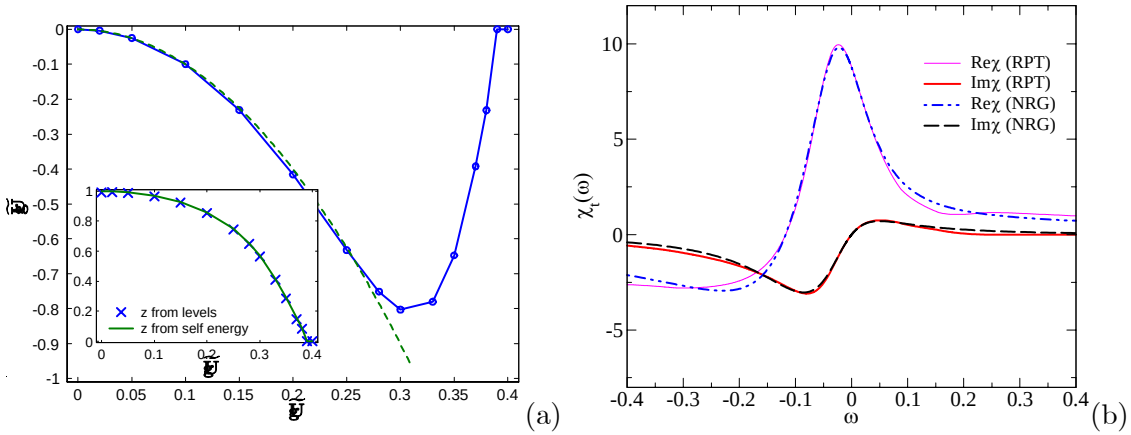

Figure 1: (a) The local quasiparticle interaction $\tilde{U}$ and z-factor (inset) for the Holstein model as a function of the electron-phonon coupling g at half-filling and (b) the imaginary part of the longitudinal and transverse dynamic spin susceptibities for the infinite dimensional Hubbard model as calculated from the RPT and NRG for $U = 6$ at 5% doping in a magnetic field $h = 0.15$.

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