

Collective & Quasiparticle Excitations close to a Metal-Insulator Transition

The transition from a metal to an insulator due to strong electron-electron interaction constitutes a very intriguing and complicated issue. It is relevant to many inorganic compounds with narrow bands, e.g. transition metal compounds. The early concepts are reconciled by means of the dynamical mean-field approach. This approach maps the lattice problem to an effective single impurity problem plus a self-consistency.

For the solution of the single impurity problem we propose to use dynamic density-matrix renormalization. Several important aspects of this numerical tool will be discussed. The high accuracy of this approach at all energy scales allows us to obtain thermodynamically consistent data at zero temperature. The photoemission spectra display sharp features at the inner edges of the Hubbard bands. We discuss the origin of these sharp features and link them to the collective modes of the system. To this end, the spin and the charge susceptibilities are analysed.