Energy spectrum of pseudospin-electron model in the dynamical mean field approach

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Pseudospin-electron model (PEM) has been initially proposed for description of strongly correlated electrons interacting with the locally anharmonic mode of lattice vibrations. The model can be also used for investigation (in the hard-core boson limit) of fermion spectrum of SF-phase of the boson-fermion mixture in optical lattice.

We consider the electron energy spectrum of the PEM. For this purpose the dynamical mean field approach is applied. The effective single-site problem is solved within original scheme based on the generalization of the Wick's theorem for Fermi operators; the alloy analogy approximation is used.

The obtained results show that the metal-insulator transition, determined by the short-range electron correlation, is influenced by anharmonic subsystem described by pseudospins. Changing the parameters of local anharmonicity (e.g. the shape of potential well), we can influence the conditions of appearing a gap. In the case of optical lattice, that corresponds to the splitting of the fermion energy bands at the change of the boson chemical potential or the BE-condensate order parameter.