9.7 cm

Quantum and thermal effects in the double exchange ferromagnet

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The physics of the "double exchange" has been widely discussed in the context of the CMR manganites, where narrow Mn d–electron bands with strong Hund's first rule coupling can be modelled using a Kondo lattice model, in the limit of large ferromagnetic J. The zero temperature properties of this model have been widely studied, both numerically, and analytically using a number of different *semi–classical* approximation schemes. We present a new analytic approach to systematically evaluating quantum and thermal corrections to the magnetic and electronic excitations of *any* magnetically ordered Kondo lattice model, starting from a quantisation in the basis of local eigenstates of charge and total spin. In the case of the double exchange ferromagnet, this approach enables us to study how the semi–classical mapping onto independent spin and charge excitations breaks down once quantum and thermal fluctuation effects are taken into account. We consider in particular interaction effects missing at a semi–classical level, and emphasise the way in which spin wave and band electron states become damped once these are taken into account. The relevance of these results for the ferromagnetic phase of the Manganites is discussed.

13.4 cm

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