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Revisiting the RKKY interaction with a polarized electron gas

CHRISTOPHER PORTER, The Ohio State University — The RKKY interaction is a well-known itinerant interaction that can account for long-range magnetic interaction, and does not require overall polarization of the electron gas through which the interaction occurs. In fact, very few authors have considered the effects of the polarization of the electron gas. We revisit the general form of the pairwise RKKY interaction, including the possibility of a polarized electron gas. A few special cases in bulk materials are considered, in which the effect of electron gas polarization on magnetic interactions is analytically calculable. We also present preliminary results of classical Monte Carlo calculations. Such calculations are appropriate for disordered distributions of large-spin ions in a nonmagnetic lattice such as the heavy doping of Mn in GaAs diluted magnetic semiconductors.

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