Spin-split van Hove singularities and Kondo physics

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Despite vast experimental progress in Heavy-Fermion research over last decades, a number of major puzzles remain unsolved. In particular, in some materials (*e.g.* strontium ruthenates) the nature of magnetic-field-driven quantum criticality has not been determined. It may be caused mainly by quantum fluctuations, or rather the van Hove singularity present near the Fermi level may play the major role [1].

To better understand the tension between these two mechanisms, an analysis of a simple impurity model, which can clarify the fate of the Kondo effect in the host exhibiting a spin-split van Hove singularity is proposed. The model is solved with numerical renormalization group. The novel aspect of this study is to include spin-splitting of the band, whose influence on the phase diagram is expected to be as prominent as this of potential scattering braking particle-hole symmetry, which in some cases causes a quantum phase transition between the Kondo and the asymmetric local moment phases [2]. Such splitting is seen experimentally in surface spectroscopy of $Sr_3Ru_2O_7$, even in the absence of external magnetic field [1].

In my presentation I will show the results concerning local spin susceptibility, χ_{loc}, impurity contribution to global susceptibility, χ_{imp}, and impurity contribution to entropy, S_{imp}, as functions of the type and location of singularity (note that $\chi_{\mathrm{imp}} = \chi_{\mathrm{loc}}$ only in the flat-band limit [3]), identifying all the relevant phases.

References:

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