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Coherent-state Hall effect in the heavy fermions $CeCu_6$ and U_2PtC_2 (abstract)

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The Hall effect is found to set the scale for coherence in the normal state of $CeCu_6$ and U_2PtC_2. $CeCu_6$ is a nonmagnetic, nonsuperconducting heavy fermion system.[1-4] Its resistivity at high temperature is like that of a collection of incoherent Kondo scatterers. At low temperature the resistivity smoothly decreases to a very small value, indicating that scattering has become coherent. The Hall effect has two strong extrema in its temperature dependence which define a high-temperature incoherent scattering region, a transition region, and a low temperature coherent region. Although U_2PtC_2 is superconducting below 1.5 K,[5] the Hall results in the normal state show two extrema similar to those of $CeCu_6$. However, these features are scaled to higher temperatures, consistent with the smaller low-temperature electronic specific heat and higher Fermi temperature.

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[1]H. R. Ott *et al.*, Solid State Commun. **53**, 235 (1985).
[2]Y. Onuki *et al.*, J. Phys. Soc. Jpn. **54**, 2804 (1985).
[3]J. Flouquet *et al.*, J. Magn. Magn. Mater. **52**, 85 (1985).
[4]T. Penney *et al.*, J. Magn. Magn. Mater. **54-57**, 370 (1986); Phys. Rev. B **34**, 5959 (1986).
[5]G. P. Meisner *et al.*, Phys. Rev. Lett. **53**, 1829 (1984).

Hall effect in heavy fermion compounds (abstract)

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As a result of a recent analysis of data on the Hall effect in heavy fermion compounds[1] we evaluated the higher-order resonant scattering contributions to the skew scattering of conduction electrons. In the single-site approximation we have calculated the t matrix elements for skew scattering correct to fourth order in the Anderson mixing interaction, i.e., we have neglected pair correlation effects. By including this fourth-order correction in our calculation of the Hall resistivity we find it is positive at high temperatures which is in agreement with data on heavy fermion compounds. Prior calculations of this scattering in these compounds were limited to second order in the mixing interaction above T_K, and predicted a negative Hall constant at high temperatures.[2] By using a phase shift analysis of the skew scattering we have extended our calculation to the incoherent (single-site) strong coupling regime. In the temperature ranges we considered the Hall resistivity is proportional to the product of the resistivity and magnetic susceptibility. This is in agreement with data on heavy fermion compounds.

[1]M. Hadžić-Leroux, A. Hamzić, A. Fert, P. Haen, F. Lapierre, and O. Laborde, Europhys. Lett. **1**, 579 (1986).
[2]P. Coleman, P. W. Anderson, and T. V. Ramakrishnan, Phys. Rev. Lett. **55**, 414 (1985).

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