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Electron spin resonance in Kondo systems

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Well-defined electron spin resonance (ESR) lines have been detected recently in several heavy fermion compounds, in which ferromagnetic correlations appear to be present [1]. We first discuss [2] the theory of ESR for the Kondo impurity system at temperatures $T<<T_K$ (Kondo temperature), where the local spin ESR line has a width of order T_K and is therefore unobservably broad. By contrast, in the Anderson lattice system in the Kondo regime the ESR linewidth is narrow, and gets broadened by spin lattice relaxation and quasiparticle interaction processes. We show [2] that the spin lattice induced ESR linewidth is greatly reduced by an effective mass factor. The quasiparticle induced linewidth is small in the Fermi liquid regime, proportional to $\max(T^2,B^2)$ (T=temperature, B=Zeeman energy). The total ESR linewidth is reduced by exchange narrowing induced by a ferromagnetic exchange interaction. This explains the available ESR data.

[1] C. Krellner et al., Phys. Rev. Lett. **100**, 066401 (2008)
[2] E. Abrahams and P. Woelfle, Phys. Rev. B**78**, 104423 (2008)