MAR17-2016-005246

Abstract for an Invited Paper
for the MAR17 Meeting of
the American Physical Society

Spin excitations in superconducting CeCoIn5 and antiferromagnetic CeRhIn5 – From doublet spin resonance to quasiparticle breakdown

CHRIS STOCK, Univ of Edinburgh

The 115 series of compounds provides a unique opportunity to study unconventional d-wave superconductivity in the clean limit. In this talk we will compare the spin excitations in superconducting CeCoIn5 to that in antiferromagnetic and helically ordered CeRhIn5. In CeCoIn5, we will show that superconductivity is accompanied by a sharp spin resonance. High resolution neutron scattering finds that this resonance mode is a doublet and is suggestive that it is the soft mode for density wave order at high fields termed the Q-phase [1,2]. The results in CeCoIn5 are strikingly different to that observed in antiferromagnetic CeRhIn5 [3,4]. This system displays both sharp magnon excitations, however also a strong continuum of excitations originating from a coupling between itinerant and localized responses. This observation of two distinct components illustrates the dual nature of the spins in CeRhIn5 [5] and the nature of the parent phase from which unconventional superconductivity derives from. [1] C. Stock *et al.* Phys. Rev. let. **10**0, 087001 (2008) [2] C. Stock *et al.* Phys. Rev. Lett. **109**, 167207 (2012). [3] M. Kenzelmann *et. al.* Science 321, 1652 (2008); C. Stock *et al.* Phys. Rev. Lett. **114**, 247005 (2015); S. Raymond and G. Lapertot Phys. Rev. Lett. **115**, 037001 (2015). [4] P. Das *et al.* Phys. Rev. Lett. **113**, 246403 (2014). [5] T. Park *et al.* Proc. Natl. Acad. Sci. U.S.A. **105**, 6825 (2008).