Public Abstract

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Graduation Term:FS 2011
Department:Physics
Degree:PhD

Title:Percolative Effects in Quantum Critical Systems How Magnetic Clusters Shape the Response at Low Temperatures

We have investigated the link between cluster morphology and non-Fermi liquid behavior in the bulk properties of Ce(Ru1-xFex)2Ge2, a prototypical quantum critical system that has been driven to criticality through chemical doping. The compound Ce(Ru1-xFex)2Ge2 is on the verge of magnetic ordering as the temperature is decreased to zero Kelvin, at which point quantum fluctuations keep the system in the disordered phase. This region is marked by quantum critical phenomena such as dynamical E/T-scaling, as well as by the formation of magnetic clusters which are an inescapable by-product of chemical doping. Since cluster formation in classical systems such as insulating LiY[Mn2-XLiX]O4 has been shown by us to mimic dynamical scaling laws, we have studied the link between cluster morphology and the specific heat in Ce(Ru1-xFex)2Ge2. Using a set of reasonable assumptions, we show that the characteristic low-temperature dependence of the specific heat in this quantum critical system is strongly influenced by the formation of magnetic clusters, to the point that cluster formation might well account for some of the more prominent discrepancies that have emerged between the experimental systems being investigated and the idealized systems on which theoretical scenarios are based.