

Hidden Order Pseudogap and Hybridization Modulation in URu₂Si₂

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URu₂Si₂ proved to be a compound that has exhibited similarities with other correlated materials like HighT_c oxides in that it has strong correlations, competing phases and intense nanoscale inhomogeneity in Kondo lattice. We point out that Hidden order transition is not a mean field transition, in contrast to prevailing discussion to date. It has significant precursor effects, so called pseudogap. Through an analysis and modeling of data from various experimental techniques, we present evidence for the presence of a hidden order pseudogap in URu₂Si₂ in the temperature range between 25 K and 17.5 K. We evaluate the effects that gap fluctuations would produce on observables like tunneling conductance, neutron scattering and nuclear resonance, and relate them to the experimental findings. We show that the transition into hidden order phase is preceded by the onset of non-coherent hidden order fluctuations. We also discuss nanoscale inhomogeneity seen in URu₂Si₂ with STM as an evidence for hybridization modulation due to local defects and discuss the role of hybridization modulations in Hidden Order.

Hidden order pseudogap in URu₂Si₂, J. Haraldsen, 10.1103/PhysRevB.84.214410 (2011) Electronic inhomogeneity in a Kondo lattice, E. Bauer et al, PNAS 108, 6857 (2011) How Kondo Holes Create Intense Nanoscale Heavy-Fermion Hybridization Disorder, PNAS 2011 108 (45) 18233-18237; published ahead of print October 17, 2011, doi:10.1073/pnas.1115027108 Anomalous femtosecond quasiparticle dynamics of hidden order state in URu₂Si₂ Georgi L. Dakovski et al, Phys. Rev. B 84, 161103 (2011) Hybridization Wave as the "Hidden Order" in URu₂Si₂, Y. Dubi et al, Phys. Rev. Lett. 106, 086401 (2011) Incommensurate spin resonance in URu₂Si₂, A. V. Balatsky, et al, Phys. Rev. B 79, 214413

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