[QMS2020 invited talk]

Spin Freezing in Unconventional Superconductors

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Spin freezing due to Hund coupling leads to bad metal behavior in multi-orbital lattice models. Interestingly, in the crossover regime from the Fermi-liquid to the spin-frozen state, the local moment fluctuations induce spin-triplet superconductivity at low temperature [1]. This mechanism may be relevant for uranium based compounds, where superconductivity occurs in the vicinity of a ferromagnetic phase. Analogous physics, but with spin and orbital degrees of freedom interchanged, explains the unconventional singlet pairing in multi-orbital Hubbard models with negative Hund coupling, which are relevant for the description of alkali-doped fulleride compounds [2,3]. While cuprates are usually described by a single-band Hubbard model, spin-freezing phenomena also play a role there, as this model can be mapped to an auxiliary multi-orbital system with strong ferromagnetic Hund coupling [4]. This mapping allows to discuss the non-Fermi liquid behavior and unconventional superconductivity in cuprates, uranium-based superconductors, and fulleride compounds within a unified theoretical framework. A recent study of spin correlations in the two-dimensional Hubbard model confirms the predictions from the spin-freezing theory [5].

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