

Abstract Submitted
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Local Quantum Criticality in an Iron-Pnictide Tetrahedron¹

TZEN ONG, Department of Physics & Astronomy, Rutgers University, PATRICK SEMON, ANDRÉ-MARIE TREMBLAY, Department of Physics, University of Sherbrooke, PIERS COLEMAN, Center for Materials Theory Department of Physics & Astronomy, Rutgers University — The iron-based superconductors display a close experimental relationship between the T_c values and the tetrahedral bond angle of the As-Fe-As layer, with optimal T_c clustering close to the ideal tetrahedron geometry. This motivates a study of the local physics of an Fe atom within an As tetrahedron, and we find a strong interplay between spin and orbital degrees of freedom. The d-orbitals are crystal field split, and the lower eg orbitals have an $SU(2) \times SU(2)$ symmetry with both a spin and orbital Kondo interaction. The spin Kondo coupling is strongly reduced by the Hund's coupling; hence the system flows to an over-screened orbital Kondo state. A perturbative RG analysis of the strong-coupling fixed point is done using a Majorana fermion representation of the $SU(2) \times SU(2)$ symmetry. The low-temperature physics, and the possibility of a Marginal Fermi Liquid ground state, is carefully studied using the CTQMC method, taking into account the effect of Hund's coupling on the Kondo physics.

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