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Quantum phase transitions in the underscreened pseudogap Kondo model[1] JAIMIE STEPHENS, Department of Physical and Environmental Sciences, Colorado Mesa University, KEVIN INGERSENT, Department of Physics, University of Florida — The Kondo effect is the collective screening of the spin of a magnetic impurity atom by the electrons in a nonmagnetic host metal, a fundamental problem in many-body physics. This work addresses a variant in which an impurity spin-1 can only be partially screened by the spin-1/2 conduction electrons of the host. In particular, we study the pseudogap version of this underscreened Kondo model, where the conduction-electron density of states vanishes like $|E - E_F|^r$ at the Fermi energy $E = E_F$. This problem, of current interest in connection with the behavior of impurities in graphene, features a continuous quantum (zero-absolute-temperature) phase transition between underscreened-Kondo and non-Kondo ground states that occurs at a critical value of the impurity-band exchange coupling. We have used the numerical renormalization- group method to study the critical properties in the vicinity of the transition. Various critical exponents, which have a nontrivial dependence on the density of states exponent r, obey the hyperscaling relations expected at an interacting quantum critical point that cannot be described by any simple (mean-field) theory.

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