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Unconventional Superconductivity in the Vicinity of the Local Quantum Critical Point QIMIAO SI, Rice University, JEDEDIAH PIXLEY, Condensed Matter Theory Center, University of Maryland, LILI DENG, KEVIN INGERSENT, University of Florida — Unconventional superconductivity and its relationship with quantum criticality remains a central question in strongly correlated electron systems. In the case of heavy fermion metals, the existence of antiferromagnetic quantum critical points (QCPs) is well established. Theoretical work has identified the existence of a local QCP where the Kondo effect is driven critical concomitant with the vanishing of the magnetic order parameter. Experiments on the heavy fermion compound $CeRhIn_5$ and other materials have provided strong evidence that such a QCP drives unconventional superconductivity. With this in mind we solve the periodic Anderson model using a cluster extended dynamical mean field theory. We show that the Kondo energy scale is continuously suppressed at the antiferromagnetic QCP, and we determine the scaling form of the order parameter susceptibility and find remarkable agreement with well-established experiments in the related heavy fermion system $CeCu_{6-x}Au_x$. Most importantly, we find that the singlet pairing susceptibility is strongly enhanced at the QCP, which points towards a new pairing mechanism associated with both magnetic and local critical fluctuations.

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