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Strong magnetic fluctuations in superconducting state of $CeCoIn_5$[1] T. HU, H. XIAO[2], M. DZERO, C.C. ALMASAN, Kent State University, Kent, OH, T.A. SAYLES, M.B. MAPLE, University of California at San Diego, CA — We probe the magnetism inside the superconducting state of $CeCoIn_5$ by locally suppressing superconductivity and investigating the underlying normal state through current-voltage measurements under applied pressure and external magnetic field in the mixed state. We observe that the vortex core resistivity increases sharply with decreasing temperature (T) for $T < T_c$ and magnetic field. We attribute this result to the presence of critical spin fluctuations near the Neel temperature inside the vortex core. This behavior is greatly suppressed with increasing pressure, due to the suppressed antiferromagnetic order inside the vortex core. Using our experimental results we construct a three-dimensional phase diagram which provides a direct evidence for a quantum critical line inside the superconducting phase. An experimentally obtained explicit equation for the antiferromagnetic boundary inside the superconducting dome shows the close relationship between quantum criticality, antiferromagnetism, and superconductivity.

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