Abstract Submitted
for the MAR09 Meeting of
The American Physical Society

Insulating Vortex Core near QCP in $CeCoIn_5$[1] H. XIAO, T. HU, C. C. ALMASAN, Department of Physics, Kent State University, Kent, OH, 44242, USA, T. A. SAYLES, M. B. MAPLE, Department of Physics, University of California at San Diego, La Jalla, California, 92903, USA — We have investigated the vortex core of the superclean unconventional heavy fermion superconductor $CeCoIn_5$ by studying the flux flow dissipation in the mixed state for two magnetic field orientations, i.e., $H \parallel c$ axis and $H \parallel ab$ plane, at temperatures down to 1.8 K. The vortex core in the mixed state of $CeCoIn_5$ is insulator-like, in contrast to the metallic behavior of $CeCoIn_5$ in its normal state, at temperatures T larger than the supercondcting transition temperature T_c. Moreover, the abnormal insulating behavior of the vortex core is strongly suppressed when $CeCoIn_5$ is tuned away from the quantum critical point (QCP) by applying pressure. This latter result gives firm evidence that quantum criticality plays an important role in the interaction between superconductivity and magnetism, hence is responsible for the emergence of unconventional superconductivity. A scaling law of the flux flow resistivity has also been found and will be discussed.

[1]This resear ch was supported by the National Science Foundation under Grant No. DMR-0705959 at KSU and the US Department of Energy under Grant No. DE-FG02-04ER46105 at UCSD

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Date submitted: 19 Nov 2008 Electronic form version 1.4