Abstract Submitted
for the MAR06 Meeting of
The American Physical Society

Hall Effect Evolution Across a Field-Induced Quantum Critical Point in U($\mathbf{Ru_{0.96}Rh_{0.04}}$)$_2$$\mathbf{Si_2}$ YOON SEOK OH, KEE HOON KIM, School of Physics and CSCMR, Seoul National University, N. HARRISON, P. A. SHARMA, NHMFL-LANL, H. AMITSUKA, Hokkaido University, J. A. MYDOSH, Leiden University — The heavy fermion compound $U(Ru_{0.96}Rh_{0.04})_2Si_2$ has been recently identified as a unique system in which a magnetic field-induced quantum critical point (QCP) is avoided by the creation of a single magnetic phase [1]. To further understand the nature of phase formation across the putative QCP, we have measured the Hall effect of $U(Ru_{0.96}Rh_{0.04})_2Si_2$ between 0.6 and 30K using a 50T mid-pulse magnet. We find that the Hall coefficient R_{H} abruptly increases inside the new phase formed between 28 and 38T, around $B_{\mathrm{QCP}} \sim 34$T, evidencing formation of a gap in the Fermi surface. Furthermore, low temperature R_{H} at $B > 38$T is much smaller than that at $B < 28$T, indicating the different Fermi surface area in each Fermi liquid states. While the field-induced phase disappeared above 9.5K, R_{H} still exhibits a broad maximum near B_{QCP}, signaling a finite temperature crossover of the Fermi surface change. All of above findings are consistent with an electronic structure evolution from a heavy fermion to spin-polarized Fermi liquids across B_{QCP}. [1] K. H. Kim *et al.*, Phys. Rev. Lett. **93**, 206402 (2004)

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Date submitted: 29 Nov 2005 Electronic form version 1.4