Hall Effect Evolution Across a Field-Induced Quantum Critical Point in $\text{U(}\text{Ru}_{0.96}\text{Rh}_{0.04})_2\text{Si}_2$ 

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 $\text{U(}\text{Ru}_{0.96}\text{Rh}_{0.04})_2\text{Si}_2$ 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 $\text{U(}\text{Ru}_{0.96}\text{Rh}_{0.04})_2\text{Si}_2$ 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 $B_{\text{QCP}} \sim 34T$, evidencing formation of a gap in the Fermi surface. Furthermore, low temperature $R_H$ at $B > 38T$ is much smaller than that at $B < 28T$, 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 $B_{\text{QCP}}$, 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 $B_{\text{QCP}}$. [1] K. H. Kim et al., Phys. Rev. Lett. 93, 206402 (2004)

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