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Is quantum criticality relevant to upper critical field (H_{c2}) scaling in the heavy-fermion compound $CeRhIn_5$?[1] TUSON PARK, JOHN L. SARRAO, JOE D. THOMPSON, Los Alamos National Laboratory — We report disparate forms of upper critical field (H_{c2}) scaling below and above a critical pressure P_{c1}, where long- range antiferromagnetic order (AFM) abruptly disappears in the pressure-tuned heavy-fermion superconductor $CeRhIn_5$. For $P > P_{c1}$, $h_{c2} = H_{c2}/H_{c2}(T = 0\ \mathrm{K})$ shows normal two- fluid type scaling with $t = T/T_c$, i.e., $h_{c2} = (1 - t^2)(1 - at^2)$, where T_c is superconducting transition temperature at zero field and a is a fitting parameter. In this regime, the Maki parameter α, a measure of Pauli limiting effects, is large, suggesting that an inhomogeneous superconducting state (FFLO) may be observable. For $P < P_{c1}$, in stark contrast, h_{c2} linearly increases with decreasing t down to $t = 0.1$ and the specific heat discontinuity $\Delta C/C_N$ at T_c is much smaller than the BCS value (=1.43). These observations manifest the interplay between superconductivity and antiferromagnetic fluctuations that exist in the vicinity of P_{c1}.

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