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Superconducting Vortices in $CeCoIn_5$: Beyond the Abrikosov-Ginzburg-Landau Paradigm A. D. BIANCHI, Dép. de physique, U. de Montréal, Montréal, QC, Canada, M. KENZELMANN, J. MESOT, M. ZOLLIKER, J. KOHLBRECHER, LNS, ETHZ & PSI, PSI, Switzerland, L. DEBEER-SCHMITT, M. R. ESKILDSEN, Dept. of Physics, U.of Notre Dame, Notre Dame, IL, USA, J. S. WHITE, E. M. FORGAN, School of Phys. and Astro., U. of Birmingham, Birmingham, UK, Z. FISK, Dept. Phys. & Astro., UC Irvine, Irvine, CA, USA, R. MOVSHOVICH, E. D. BAUER, J. L. SARRAO, MPA-10, LANL, Los Alamos, NM, USA, C. PETROVIC, Cond. Matt. Phys., BNL, Upton, NY 11973, USA — We report on the magnetic field (H) dependence of the form factor $|F|^2$ of the vortex lattice (VL) in $CeCoIn_5$ obtained by small angle neutron scattering for H applied along the crystallographic c-axis. Superconductivity (SC) in $CeCoIn_5$ has several unconventional aspects to it: The d-wave SC is in competition with antiferromagnetic order, as suggested by the presence of an magnetic QCP located at the upper critical field H_{c2} determined by the Pauli effect. At both 50 and 500 mK we observe an H-independent $|F|^2$ up to 2 T. With further increasing H, $|F|^2$ continues to increase all the way up to H_{c2}. This finding is in contrast to that normally observed in type-II SC's, where $|F|^2$ decreases with increasing H. It suggests a departure from the Abrikosov-Ginzburg-Landau paradigm, where the properties of the vortex state can be described by the coherence length ξ and the penetration depth λ.

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