

Abstract Submitted
for the MAR16 Meeting of
The American Physical Society

The Upper Critical Field of Bilayer NbSe₂ BENJAMIN HUNT, Carnegie Mellon University, ADAM W. TSEN, Y. D. KIM, Columbia University, Z. J. YUAN, S. JIA, Peking University, R. J. CAVA, Princeton University, J. HONE, Columbia University, P. KIM, Harvard University, ABHAY PASUPATHY, CORY DEAN, Columbia University — We report on the fate of the superconducting state of bilayer NbSe₂ in a large parallel magnetic field. Due to strong spin-orbit coupling, the system exhibits an out-of-plane polarization of electron spins in each valley, which leads to an enhanced upper critical field H_{c2}^{\parallel} as compared to that expected from the Pauli limit H_p [1]. We explore the behavior of $H_{c2}^{\parallel}(T)$ in the low temperature limit, down to $T = 0.3\text{K}$ (approximately $0.06T_c$), and we find a maximum upper critical field of 28 T which is ≈ 3 times the Pauli limit. We find that the measured $H_{c2}^{\parallel}(T)$ deviates significantly from the standard pair-breaking theory as $T \rightarrow 0$, and we compare our results to recent observations of Ising superconductivity in NbSe₂ [1] and in ionic-liquid-gated MoS₂ [2], as well as to calculations of H_{c2} based on realistic band structure of NbSe₂. References: [1] Xi et al. arXiv:1507.08731 (2015) [2] Saito et al. arXiv:1506.04146 (2015)

Benjamin Hunt
Carnegie Mellon University

Date submitted: 06 Nov 2015

Electronic form version 1.4