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STM Spectroscopy Probe of Field Depairing and Vortex Lattice Transition in a Multiband Superconductor[1] I. FRIDMAN, University of Toronto, V. LUKIC, Stevens Institute of Technology, C. KLOC, Nanyang Technological University, C. PETROVIC, Brookhaven National Laboratory, J.Y.T. WEI, University of Toronto and Canadian Institute for Advanced Research — The Cooper pairing in a variety of superconductors involves carriers from multiple bands, which can optimize the pairing phase space and provide novel pairing interactions. We have developed a novel technique to probe multiband pairing, using a directional diamagnetic supercurrent to perturb the quasiparticle density-of-states spectrum, and measuring the spectral evolution due to pair breaking by finite superfluid momentum. This technique is demonstrated on the layered superconductor 2H-NbSe2, using a scanning tunneling microscope (STM) at 300 mK with an in-plane magnetic field up to 9 T [1]. The STM spectroscopy measurements revealed unambiguous evidence for multiband pairing [2], as well as a novel reorientation transition of the in-plane vortex lattice [3]. We will discuss the first-order and quantum-critical characteristics of this transition, in terms of the geometric frustration of a distorted hexagonal vortex lattice, and show that this transition is intimately related to the multiband pairing.

[1] I. Fridman et al., Applied Physics Letters 99, 192505 (2011).
[2] I. Fridman et al., arXiv:1110.6490.
[3] I. Fridman et al., arXiv:1303.3559.

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