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Imaging point-like defects in two dimensional superconductors: theory and experiment HILARY NOAD, JULIE BERT, KATJA NOWACK, BEENA KALISKY, ILYA SOCHNIKOV, THOMAS LIPPMAN, Stanford Institute for Materials and Energy Science, Stanford University, Stanford CA 94305, JOHN KIRTLEY, Department of Applied Physics, Stanford University, Stanford CA 94305, KATHRYN MOLER, Stanford Institute for Materials and Energy Science, Stanford University, Stanford CA 94305 — Point defects in two-dimensional superconductors produce significant local variations in the superconducting properties. A model [1] of point defects in a weak, two-dimensional superconductor, based on London's equations, shows that defects appear as haloes of decreased diamagnetic susceptibility as seen by the imaging kernel of a scanning SQUID susceptometer. We report theoretical limits on the defect strength and superconducting Pearl length Λ required for defects to be visible. We compare these models to our experimental data showing similar haloes in the superconducting state of several types of superconducting films as a function of magnetic field, gate voltage, temperature, and height. Our ability to image these defects offers new possibilities for studying the interplay between materials properties and superconducting phenomena in thin film systems.

[1] V.G. Kogan and J.R. Kirtley, Phys. Rev. B **83**, 214521 (2011).

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