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Penetration Depth of Superconductors with Random Superfluid Density THOMAS LIPPMAN, KATHRYN MOLER, Stanford Institute for Materials and Energy Sciences, SLAC National Accelerator Laboratory, 2575 Sand Hill Road, Menlo Park, CA 94025, USA. — Electronic inhomogeneity is inevitable in doped superconductors, due simply to the random nature of the doping process. We argue that when the superconducting coherence length is not much larger than the lattice scale, this creates spatial randomness in the superconducting properties. In particular, we expect the superfluid density to be stochastic, which modifies the measured diamagnetic response. We approximate the London equation with random superfluid density as a modified equation for the disorder averaged field response, and speculate on implications for the interpretation of measurements of the penetration depth.

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