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Temperature dependence of the superheating field in type-II superconductors MARK TRANSTRUM, LASSP, Cornell University, GIANLUIGI CATELANI, JAMES SETHNA — The expulsion of an applied magnetic field is a hallmark characteristic of superconductivity. For a sufficiently large external field, the superconducting state transitions to a normal metal (type-I) or a flux-lattice state (type-II) at a field H_{c1}. The superconducting state is metastable and persists up to a field above H_{c1}, the so-called superheating field. We numerically solve the semi-classical equations of Eilenberger for the anomalous Green's functions, order parameter, and vector potential for a clean superconductor in an external magnetic field. We use a linear stability analysis to explore the local stability of the free energy to two-dimensional fluctuations, mapping the stability onto an eigenvalue problem of a linear operator. We systematically calculate the dependence of the superheating field on both temperature and the Ginzburg-Landau parameter κ. We compare our results with the analogous calculation for Ginzburg-Landau theory, which is valid only near the critical temperature, and to experimental measurements.

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