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**Estimating the Superconducting Superheating Field in Time-Dependent Ginzburg-Landau Theory using Bifurcation Analysis**[1] ALDEN PACK, MARK TRANSTRUM, Brigham Young University — The expulsion of magnetic fields is a hallmark of superconductivity known as the Meissner effect. In the presence of an applied magnetic field, the Meissner state is thermodynamically stable up to a critical magnetic field (Hc for type I superconductors and Hc1 for type II superconductors). However, the Meissner state may persist as a metastable state up to the so-called "superheating field", Hsh. Understanding the dependence of Hsh on material and geometry is an important question for improving performance of particle accelerators. We numerically study the superheating transition in time-dependent Ginzburg-Landau theory using finite-element methods. At the superheating field, the equations exhibit a saddle-node bifurcation. We use techniques from numerical analysis of dynamical systems to estimate Hsh. We estimate the time for the system to equilibrate at small values of the applied field and extrapolate to where the equilibration time diverges. We explore the dependence on Hsh on material and geometric properties of interest in accelerator physics.

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