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Time-dependent Ginzburg–Landau model with an applied current

We study formally and rigorously the bifurcation to steady and time-periodic states in a model for a thin superconducting wire in the presence of an imposed current. Exploiting the PT-symmetry of the equations at both the linearized and nonlinear levels, and taking advantage of the collision of real eigenvalues leading to complex spectrum, we obtain explicit asymptotic formulas for the stationary solutions, for the amplitude and period of the bifurcating periodic solutions and for the location of their zeros or "phase slip centers" as they are known in the physics literature. In so doing, we construct a center manifold for the flow and give a complete description of the associated finite-dimensional dynamics.

This is joint work with Qingfeng Ma, Jacob Rubinstein and Kevin Zumbrun.