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*Singular Limits for Thin Film Superconductors in Strong Magnetic Fields*

We consider singular limits of the three-dimensional Ginzburg-Landau functional for a superconductor with thin-film geometry, in a constant external magnetic field. The superconducting domain has characteristic thickness on the scale $\epsilon > 0$, and we consider the simultaneous limit as the thickness $\epsilon \to 0$ and the Ginzburg-Landau parameter $\kappa \to \infty$. We assume that the applied field is strong (on the order of $\epsilon^{-1}$ in magnitude) in its components tangential to the film domain, and of order $\log \kappa$ in its dependence on $\kappa$. We prove that the Ginzburg-Landau energy $\Gamma$-converges to an energy associated with a two-obstacle problem, posed on the planar domain which supports the thin film. The same limit is obtained regardless of the relationship between $\epsilon$ and $\kappa$ in the limit. Two illustrative examples are presented, each of which demonstrating how the curvature of the film can induce the presence of both (positively oriented) vortices and (negatively oriented) antivortices coexisting in a global minimizer of the energy. This is joint work with Stan Alama and Bernardo Galvão-Sousa.