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Ginzburg–Landau Vortices Concentrating on Curves

We study a two-dimensional Ginzburg–Landau functional, which describes superconductors in an externally applied magnetic field. We are interested in describing the energy minimizers at the critical value of the magnetic field for which vortices first appear in the superconductor (the "lower critical field".) The vortices are quantized singularities, and we are interested in their number and their distribution in the sample for applied fields close to the lower critical field. I will describe recent results with L. Bronsard and V. Millot in which we study the number and distribution of these vortices which concentrate along a curve. We prove that, suitably normalized, the energy functional Γ-converges to a classical variational problem from potential theory.