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Stable Vortex States in Superconductivity

We present the construction of local minimizers to the Ginzburg-Landau functional of superconductivity in the presence of an external magnetic field. We investigate the existence of stable states where the number of vortices N is far from optimal(as dictated by the energy formulation), is prescribed and blows up as the parameter epsilon, inverse of the Ginzburg-Landau parameter kappa, tends to zero. We treat the case of N as large as $\log \varepsilon$, and a wide range of intensity of external magnetic field. This is joint work with Sylvia Serfaty.