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From local energy bounds to dimensional estimates in a reduced model for type-I superconductors

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In the limit of vanishing but moderate external magnetic field, we derived a few years ago together with S. Conti, F. Otto and S. Serfaty a branched transport problem from the full Ginzburg–Landau model. In this regime, the irrigated measure is the Lebesgue measure and, at least in a simplified 2d setting, it is possible to prove that the minimizer is a self-similar branching tree. In the regime of even smaller magnetic fields, a similar limit problem is expected but this time the irrigation of the Lebesgue measure is not imposed as a hard constraint but rather as a penalization. While an explicit computation of the minimizers seems here out of reach, I will present some ongoing project with G. De Philippis and B. Ruffini relating local energy bounds to dimensional estimates for the irrigated measure.

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