Degenerate free discontinuity problems and quantitative spectral inequalities

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We study a semilinear eigenvalue problem involving the Laplace operator with Robin boundary conditions among sets of fixed measure in $\mathbb{R}^n$. In particular, consider a solid D with a constant volumetric heat source and a thin layer of insulator on its surface, and let $T(D)$ be the mean temperature of D at equilibrium. We will present a proof of $T(D) \leq T(D^*) - C.d(D, D^*)^2$, where d is the L^1 distance between sets up to translation and D^* is the ball with same measure as D. This will be obtained through a shape optimisation problem involving both free discontinuity and free boundary phenomena.