Norm-Resolvent Convergence in Perforated Domains

joint work with P. Dondl and K. Cherednichenko

Abstract

For several different boundary conditions (Dirichlet, Neumann and Robin), we prove norm-resolvent convergence for the operator $-\Delta$ in the perforated domain $\Omega\setminus\bigcup_{j\in 2\varepsilon\mathbb{Z}^d} B_{r_\varepsilon}(j),\ r_\varepsilon \ll \varepsilon$, to the limit operator $-\Delta+\mu$ on $L^2(\Omega)$, where $\mu\in\mathbb{C}$ is a constant depending on the choice of boundary conditions.

This is an improvement of previous results [Cioranescu & Murat. *A Strange Term Coming From Nowhere*, Progress in Nonlinear Differential Equations and Their Applications, 31, (1997)], [S. Kaizu. *The Robin Problems on Domains with Many Tiny Holes.* Proc. Japan Acad., 61, Ser. A (1985)], which show *strong* resolvent convergence. In particular, our result implies Hausdorff convergence of the spectrum of the resolvent for the perforated domain problem.