Karlsruhe Institute of Technology

Seminar of the Work Group
Nonlinear Partial Differential Equations
SS 2021

Speaker: Dr. Andrii Khrabustovskyi
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Operator estimates for homogenization in perforated domains

Abstract

Let $\varepsilon > 0$ be a small parameter. We consider the perforated domain $\Omega_\varepsilon = \Omega \setminus D_\varepsilon$, where Ω is an open domain in $\mathbb{R}^n$,and D_ε is a family of small identical balls of the radius $d_\varepsilon = o(\varepsilon)$ distributed periodically with period ε. Let Δ_ε be the Laplace operator in Ω_ε subject to the Robin condition $\frac{\partial u}{\partial n} + \gamma_\varepsilon u = 0$ with $\gamma_\varepsilon \geq 0$ on the boundary of the holes and the Dirichlet condition on the exterior boundary. Kaizu (1985, 1989) and Brillard (1988) have shown that, under appropriate assumptions on d_ε and γ_ε, the operator Δ_ε converges in strong resolvent sense to the sum of the Dirichlet Laplacian in Ω and a constant potential. In the talk we discuss recent improvements of this result concerning the estimates on the rate of convergence in terms of $L^2 \to L^2$ and $L^2 \to H^1$ operator norms. As a byproduct we establish the estimate on the distance between the spectra of the associated operators.