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Approximations of spectra of Schrödinger operators with complex potentials on $\mathbb{R}^d$

Abstract

We study spectral approximations of Schrödinger operators $T = -\Delta + Q$ with complex potentials on $\Omega = \mathbb{R}^d$, or exterior domains $\Omega \subset \mathbb{R}^d$, by domain truncation. Our weak assumptions cover wide classes of potentials Q for which T has discrete spectrum, of approximating domains Ω_n, and of boundary conditions on $\partial\Omega_n$ such as mixed Dirichlet/Robin type. In particular, $\Re Q$ need not be bounded from below and Q may be singular. We prove generalized norm resolvent convergence and spectral exactness, i.e. approximation of all eigenvalues of T by those of the truncated operators T_n without spectral pollution. Moreover, we estimate the eigenvalue convergence rate and prove convergence of pseudospectra. Our results are illustrated by numerical computations for several examples, such as complex harmonic and cubic oscillators for $d = 1, 2, 3$.

The talk is based on a joint work with S. Bögli and C. Tretter.

Talk time: 2016-07-19 05:00 PM— 2016-07-19 05:20 PM
Talk location: Cupples I Room 218