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Schrödinger operators with $(\alpha\delta' + \beta\delta)$ -like potentials: norm resolvent convergence and solvable models. (English) [Zbl 1265.34320](#)

Methods Funct. Anal. Topol. 18, No. 3, 243-255 (2012).

Let Φ, Ψ be integrable compactly supported real functions on \mathbb{R} . The author proves the norm resolvent convergence, as $\varepsilon \rightarrow 0$, of a family S_ε of one-dimensional Schrödinger operators on \mathbb{R} , of the form

$$S_\varepsilon = -\frac{d^2}{dx^2} + \alpha\varepsilon^{-2}\Phi(\varepsilon^{-1}x) + \beta\varepsilon^{-1}\Psi(\varepsilon^{-1}x).$$

If the equation $-u'' + \alpha\Phi(x)u = 0$ possesses a bounded solution on \mathbb{R} , then the limit of S_ε can be interpreted as a realization of the formal Hamiltonian

$$-\frac{d^2}{dx^2} + \alpha\delta'(x) + \beta\delta(x).$$

Otherwise S_ε tends to the direct sum $S_- \oplus S_+$ of the Dirichlet half-line Schrödinger operators S_\pm .

Reviewer: [Anatoly N. Kochubei \(Kyïv\)](#)

MSC:

[34L40](#) Particular ordinary differential operators (Dirac, one-dimensional Schrödinger, etc.)

Cited in **6** Documents

[81Q10](#) Selfadjoint operator theory in quantum theory, including spectral analysis

Keywords:

one-dimensional Schrödinger operators; point interaction; δ -potential; δ' -potential

Full Text: [arXiv](#)