Albeverio, Sergio; **Gesztesy, Friedrich**; **Høegh-Krohn, Raphael**; **Holden, Helge**
Solvable models in quantum mechanics. (English) Zbl 0679.46057
Texts and Monographs in Physics. New York etc.: Springer-Verlag. xiv, 452 p. DM 158.00 (1988).

This monograph presents a detailed and systematic study of models of a particle with δ-function interaction described by the Schrödinger operator with potential supported on a discrete (finite or infinite) set of points. The dimensions d of the space are $d = 1, 2, 3$.

These models have been discussed extensively, particularly in solid state physics (e.g. the Kronig-Penney model of a crystal), atomic and nuclear physics (describing short-range nuclear forces or low-energy phenomena) and electromagnetism (propagation in dielectric media).

The main purpose of this monograph is to present the mathematical approaches developed in recent years and to systematize results obtained earlier by different and often heuristic methods in disparate contexts.

Exposition is divided into 3 parts, namely point interactions with one center (Part I), finitely many centers (Part II) and infinitely many centers (Part III). Chapter III.5 of Part III, stochastic potentials are discussed.

The spectrum, the eigenfunctions, resonances, and scattering quantities are explicitly discussed. Convergences of their approximations are also treated.

Reviewer: H.Araki

MSC:

46N50	Applications of functional analysis in quantum physics
81-02	Research exposition (monographs, survey articles) pertaining to quantum theory
81Q05	Closed and approximate solutions to the Schrödinger, Dirac, Klein-Gordon and other equations of quantum mechanics
47A70	(Generalized) eigenfunction expansions of linear operators; rigged Hilbert spaces
35P25	Scattering theory for PDEs
81U05	2-body potential quantum scattering theory
81Q10	Selfadjoint operator theory in quantum theory, including spectral analysis
81V70	Many-body theory; quantum Hall effect
03H10	Other applications of nonstandard models (economics, physics, etc.)

Keywords:

models of a particle with δ-function interaction; point interactions with one center; finitely many centers; infinitely many centers; stochastic potentials; spectrum; eigenfunctions; resonances; scattering quantities