

## EINLADUNG ZUM MATHEMATISCHEN KOLLOQUIUM

Es spricht

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zum Thema:

### „SCHRÖDINGER OPERATORS WITH $\delta'$ -LIKE POTENTIALS“

#### Abstract:

We address the problem on the right definition of the one-dimensional Schrödinger operator with potential  $\delta'$ , where  $\delta$  is the Dirac delta-function. While Schrödinger operators with  $\delta'$ -interactions have become a standard solvable model in quantum mechanics and have been used in both physical and mathematical literature since the 1980-ies to describe e.g. various types of particle interactions, it is not clear how a  $\delta'$ -potential should be defined.

For an arbitrary real-valued function  $V$  from the Faddeev–Marchenko class  $L^1(\mathbb{R}; (1+x)dx)$  and  $\varepsilon > 0$ , we study the operator family

$$S_\varepsilon := \frac{d^2}{dx^2} + \frac{1}{\varepsilon^2} V\left(\frac{x}{\varepsilon}\right)$$

of Schrödinger operators as  $\varepsilon \rightarrow 0$ . If the potential  $V$  satisfies the conditions

$$\int_{\mathbb{R}} V(x)dx = 0, \quad \int_{\mathbb{R}} xV(x)dx = -1,$$

then the functions  $\varepsilon^{-2}V(x/\varepsilon)$  converge to  $\delta'$  in the sense of distributions, so the limit  $S_0$  of  $S_\varepsilon$  as  $\varepsilon \rightarrow 0$  if exists might be taken as a mathematically motivated realization of the Schrödinger operator with potential  $\delta'$ .

In the talk we will justify existence of the limit of  $S_\varepsilon$  as  $\varepsilon \rightarrow 0$ , identify the limiting operator  $S_0$  and discuss whether this limit is the operator we are looking for. We shall also explain how the stationary scattering theory for  $S_\varepsilon$  gives physical justification of our conclusions.

The talk is based on a joint project with Yu. Golovaty (Lviv, Ukraine).

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**Mittwoch, 5. September 2018, 17:00 Uhr, Raum C 113 im Curiebau  
(Kaffee 16:30 Uhr im Raum C 325)**

Alle Interessierten sind herzlich eingeladen.

Ilmenau, 29.08.2018

Die Hochschullehrer des Institutes