





# PROBLEM

Numerous studies has been devoted to the scattering problem on the real line  $-\infty < x < +\infty$  for the one dimensional Schrödinger equation because of its applications in many physical problems, for example, in electrical engineering or in quantum mechanics (see Chadan K. and Sabatier P. C. [1], Jaulent M. and Jean C. [2], Kamimura Y. [3], Faddeev L. D. and Takhtajan A. [4]).

Consider the differential equation

$$-y'' + q(x)y = \lambda^2 \rho(x)y, \quad -\infty < x < +\infty, \quad (1)$$

where

$$\rho(x) = \begin{cases} 1, & x \geq 0, \\ \alpha^2, & x < 0, \end{cases} \quad (\alpha \neq 1, \alpha > 0), \quad (2)$$

$q(x)$  is a real-valued function defined on the real line and the condition

$$\int_{-\infty}^{+\infty} (1 + |x|) |q(x)| dx < +\infty \quad (3)$$

is satisfied.





Marchenko V A 1986 *Sturm-Liouville Operators and Their Applications* (Basel: Birkhauser).

Pashaev A A and Guseinov I M 2006 On the Jost solutions of the Schrödinger-type equations with a polynomial energy-dependent potential *Inverse Problems* 22(1) 55-67.

Asymov M G 1977 The direct and inverse problem of spectral analysis for a class of equations with a discontinuous coefficient *Classical Methods in Geophysics* ed M. M. Lavrent'ev (Novosibirsk) pp. 37-44 (in Russian).

Darwish A A 1993 The inverse problem for a singular Sturm-Liouville problem *New Zealand Journal of Mathematics* 22 37-66.

Guseinov I M and Pashaev R T 2002 On an inverse problem for a second-order differential equation *Uspekhi Math Nauk.* 57



$y'' - 5y' + 6 = 0$   
 $\lambda^2 - 5\lambda + 6 = 0$

$y_1, y_2, y_n, y$

$y' = 0$

$3x$

$2$

$3$





On a given boundary value in the domain bounded by a smooth surface and continuous function

- [15] Marchenko V A 1966 *S Sturm-Liouville Operators and Their Applications* (Basel: Birkhäuser)
- [16] Nabiev A A and Guseinov I M 2006 On the Jost solutions of the Schrödinger-type equations with a polynomial energy-dependent potential *Inverse Problems* 22(1) 55-67
- [17] Guseinov M G 1977 The direct and inverse problem of spectral analysis of a class of equations with a discontinuous coefficient (*Methods of Methods in Geophysics*) ed M. M. Lavrent'ev (Novosibirsk: Nauka) 7-44 (in Russian)
- [18] Guseinov M G 1992 The inverse problem of singular boundary value problems of Sturm-Liouville type *Journal of Inverse and Ill-Posed Problems* 1(1) 7-16
- [19] Guseinov M G 2002 The inverse problem of Sturm-Liouville type *Journal of Inverse and Ill-Posed Problems* 11(1) 57-147

