

Neumann problem for nonlinear Schrödinger equation with the Riesz fractional derivative operator

L. Esquivel*, E. Kaikina

Centro de Ciencias Matemáticas, UNAM Campus Morelia.
liliane.esquivel@gmail.com

Resumo/Abstract:

Consider the initial-boundary value problem for the modified Schrödinger equation, posed on positive half-line $x > 0$:

$$\begin{cases} u_t + iu_{xx} + i|u|^2u + |\partial_x|^{\frac{1}{2}}u = 0, & t > 0, x > 0; \\ u(x, 0) = u_0(x), & x > 0 \\ u_x(0, t) = h(t), & t > 0. \end{cases}$$

where $|\partial_x|^{\frac{1}{2}}$ is the module-fractional derivative operator defined by the modified Riesz Potential

$$|\partial_x|^{\frac{1}{2}} = \frac{1}{\sqrt{2\pi}} \int_0^{\infty} \frac{\text{sign}(x-y)}{\sqrt{|x-y|}} u(y) dy.$$

We prove the existence and the uniqueness of the solution. We propose a new method to construct solutions to the initial-boundary value problem. These results could be applied to the study of a wide class of nonlinear nonlocal equations on half-line by using the techniques of nonlinear analysis.

*Corresponding author.

E-mail addresses: liliane.esquivel@gmail.com (L. Esquivel), ekaikina@matmor.unam.mx (E. Kaikina).