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Pseudo-spectral solution of nonlinear Schrödinger equations. (English) Zbl 0691.65090
J. Comput. Phys. 87, No. 1, 108-125 (1990).

This paper compares four discretization methods for solving the generalized nonlinear Schrödinger equation $iu_t + u_{xx} + q_c|u|^2u + q_q|u|^4u + iq_m|u|_x^2u + iq_u|u|^2u_x = 0$ where q_c, q_q, q_m and q_u are real parameters. An initial value problem is considered so that $u(x, 0) = u_0(x)$ is specified. The solution may be represented in a Fourier series where the coefficients depend on time and the methods differ on their formalism connecting the time variable with the space function discretization at n collocation points. Numerical examples are given.

Reviewer: [B.Burrows](#)

MSC:

- [65Z05](#) Applications to the sciences
- [65N35](#) Spectral, collocation and related methods for boundary value problems involving PDEs
- [35Q99](#) Partial differential equations of mathematical physics and other areas of application
- [81Q05](#) Closed and approximate solutions to the Schrödinger, Dirac, Klein-Gordon and other equations of quantum mechanics

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Keywords:

[pseudo-spectral solution](#); [nonlinear Schrödinger equation](#); [Fourier series](#); [collocation](#); [Numerical examples](#)

Full Text: [DOI](#)

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