

**Gutkin, Eugène**

**Conservation laws for the nonlinear Schrödinger equation.** (English) Zbl 0585.35080  
*Ann. Inst. Henri Poincaré, Anal. Non Linéaire* 2, 67-74 (1985).

The purpose of the paper is to obtain a method which allows to derive conservation laws of the quantum nonlinear Schrödinger equation  $i\psi_t = -\psi_{xx} + 2c\psi^\dagger\psi^2$  where  $\psi$  is interpreted as a two dimensional quantum field. The heart of the method is the construction of an operator  $P$  which intertwines the Laplacian with boundary conditions corresponding to the Hamiltonian  $(\partial/\partial x_{k+1} - \partial/\partial x_k)F = cF$ ,  $c > 0$  with the Laplacian with Neumann boundary conditions  $(\partial/\partial x_{k+1} - \partial/\partial x_k)F = 0$ .

Of the infinitely many conservation laws the first four are derived explicitly. The fourth one shows a difference to the analogous classical one. The three first conservation laws reproduce an earlier result by *H. B. Thacker* [*Phys. Rev. D* 17, 1031 (1978)].

Reviewer: [H.Siedentop](#)

**MSC:**

**35Q99** Partial differential equations of mathematical physics and other areas of application Cited in 4 Documents  
**81T08** Constructive quantum field theory  
**35G20** Nonlinear higher-order PDEs

**Keywords:**

conservation laws; quantum nonlinear Schrödinger equation

**Full Text:** [DOI](#) [Numdam](#) [EuDML](#)

**References:**

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