

MATHEMATICS DEPARTMENT
North Carolina State University

DIFFERENTIAL EQUATIONS SEMINAR

Wednesday, February 11, 2004
2:35 p.m. 330 Harrelson Hall

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“The semiclassical focusing nonlinear Schroedinger equation”

The NLS equation describes solitonic transmission in fiber optic communication and is generically encountered in propagation through nonlinear media. One of its most important aspects is its modulational instability: Regular wavetrains are unstable to modulation and break up to more complicated structures.

The IVP for the NLS equation is solvable by the method of inverse scattering. The initial spectral data of the Zakharov Shabat (ZS) operator, a particular linear operator having the solution to NLS as the potential, are calculated from the initial data of the NLS; they evolve in a simple way as a result of the integrability of the problem, and produce the solution to NLS through the inverse spectral transformation.

In collaboration with A. Tovbis, we have developed a one-parameter family of initial data for which the derivation of the spectral data is explicit. Then, in collaboration with A. Tovbis and X. Zhou, we have obtained the following results:

1. We prove the existence and basic properties of the first-breaking curve (curve in space-time above which the character of the solution changes by the emergence of a new oscillatory phase), and show that for pure radiation no further breaks occur.
2. We construct the solution beyond the first break-time.
3. We derive a rigorous estimate of the error.
4. We derive rigorous asymptotics for the large-time behavior of the system in the pure radiation case.

Graduate students are invited to attend.

For questions, comments, and offers to talk, contact Steve Schechter, schechter@math.ncsu.edu. Please visit the DE Seminar web page at www.math.ncsu.edu/seminars.html.