



“Elliptic Polarization Dynamics of Soliton-Soliton Collisions in CNSE”



Thursday, April 2, 2:30 pm
Pickard Hall, Room 487

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Abstract:

For the Coupled Nonlinear Schrodinger Equations (CNLSE) we construct a conservative fully implicit scheme (in the vein of the scheme with internal iterations) proposed in [1] in complex arithmetic which allows us to reduce the computational time fourfold [2].

We investigate collisions of solitary waves (quasi-particles) with elliptic polarization in the initial configuration deriving by numerical solution of bifurcational conjugated system of second-order ODEs. The initial conditions are with high accuracy compatible with the equations.

We elucidate numerically the role of both the initial polarization combined with the nonlinear coupling on the quasi-particle dynamics. We find that the initial elliptic polarizations of the quasi-particles change after the collision to another elliptic polarization and the solitary waves after collision bear “polarization” shock. Depending on the initial phase shift and the nonlinear coupling magnitude various effects like polarization conservation laws are observed. In the particular case of 45 degree circularly polarized two-soliton superposition the polarization survives the collision even for the non-Manakov states. The overall energy, momenta and masses of the system after the collision are conserved within the round-off error of the numerical scheme.

The effects found in the present work seem to be novel and shed light the phenomenology of the quasi-particles interaction with general initial conditions.

[1] C. I. Christov, S. Dost, and G. A. Maugen, Inelasticity of Soliton Collisions in System of CNLSE, *Physica Scripta*, 50 (1994), 449-454.

[2] M. D. Todorov and C. I. Christov, Conservative scheme in complex arithmetic for CNLSE, in B. Belinskiy et al (Eds) “Dynamical Systems, Differential Equations and Applications,” *AIMS, Supplementary Volume of journal “Discrete and Continuous Dynamical Systems”*, (2007), 982-992.

The Math Department will provide refreshments 30 min. prior to the presentation.