

Nonlinear Partial Differential Equations

Boundary value problems and equations arising in fluid mechanics

Stable solitons of the cubic-quintic NLS with a delta-function potential

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This talk is about the one-dimensional nonlinear Schrödinger equation with a combination of cubic focusing and quintic defocusing nonlinearities, and an attractive delta-function potential. Physically, the model comes from nonlinear optics, and the delta-function potential models the interaction of a narrow defect with a relatively broad laser beam. I will show that all standing waves with a positive soliton profile can be determined explicitly in terms of elementary functions. I will then prove by bifurcation and spectral analysis that all these solutions are orbitally stable. A remarkable feature of the model is a regime of bistability, where two stable solitons with same wavenumber coexist.

This is joint work with Boris Malomed (Tel Aviv) and Rada Weishäupl (Vienna).