Manipulation of solitons in optical fiber experiments

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Nonlinear Schrödinger equation

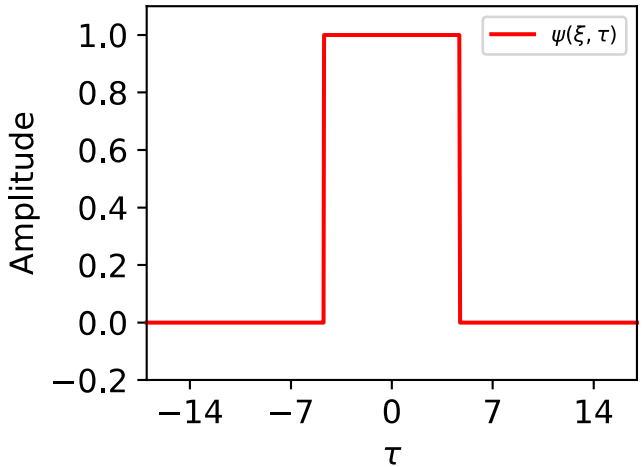
$$\psi_\xi = \frac{i}{2}\psi_{\tau\tau} + i|\psi|^2\psi$$

IST Eigenvalues

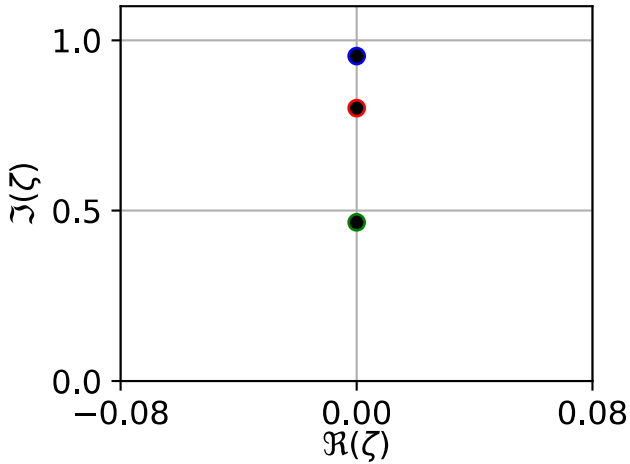
$$\zeta = \delta + i\eta$$

Number of solitons

$$N = Integer[1/2 + L/\pi]$$



"FT_{NL}"



Shabat, A., & Zakharov, V. (1972). Exact theory of two-dimensional self-focusing and one-dimensional self-modulation of waves in nonlinear media. Sov. Phys. JETP, 34(1), 62.
Gelash, A., Agafontsev, D., Suret, P., & Randoux, S. (2021). Solitonic model of the condensate. Physical Review E, 104(4), 044213.
Mullyadzhanov, R., & Gelash, A. (2021). Solitons in a Box-Shaped Wave Field with Noise: Perturbation Theory and Statistics. Physical Review Letters, 126(23), 234101.

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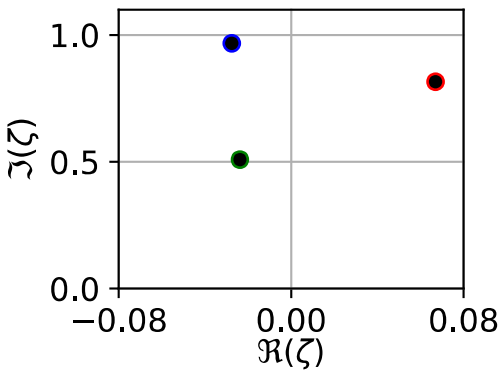
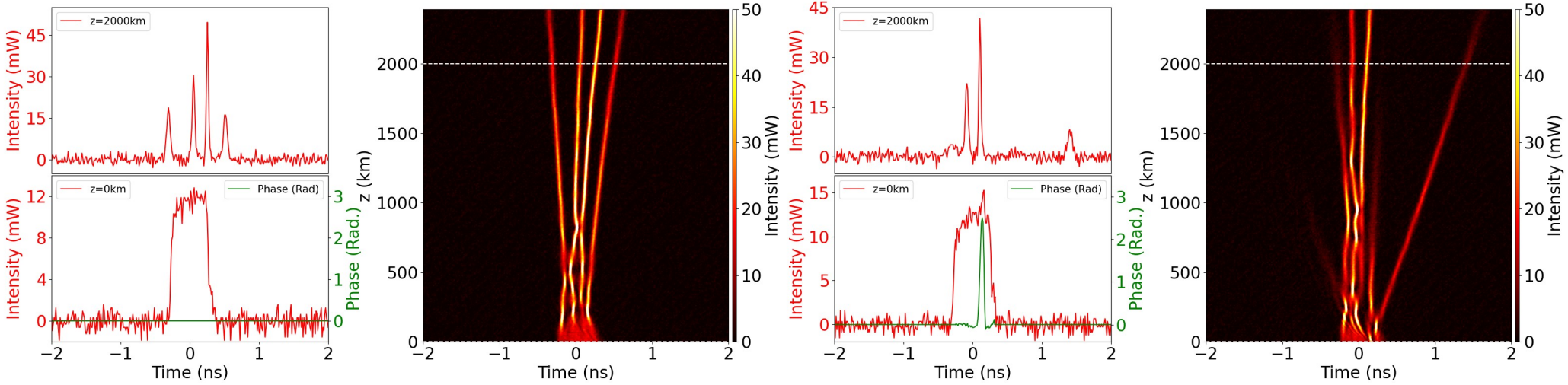
$$\psi' = \psi + \delta\psi$$

$$\zeta_n' = \zeta_n + \delta\zeta_n$$

Eigenvalues deviation

$$\delta\zeta_n^{re/im} = \int_{-\infty}^{+\infty} s_n^{re/im}(\tau)\delta\psi(\tau)d\tau$$





Satsuma, J., & Yajima, N. (1974). B. Initial value problems of one-dimensional self-modulation of nonlinear waves in dispersive media. Progress of Theoretical Physics Supplement, 55, 284-306.
Mullyadzhanov, R., & Gelash, A. (2021). Solitons in a Box-Shaped Wave Field with Noise: Perturbation Theory and Statistics. Physical Review Letters, 126(23), 234101.