

# Long-time asymptotics for the 1D nonlocal nonlinear Schrödinger equation

Dmitry Shepelsky (Institute for Low Temperature Physics,  
Kharkiv, Ukraine)

**Abstract.** We study the initial value problem for the integrable nonlocal nonlinear Schrödinger (NNLS) equation

$$iq_t(x, t) + q_{xx}(x, t) + 2\sigma q^2(x, t)\bar{q}(-x, t) = 0$$

with (i) decaying (as  $x \rightarrow \pm\infty$ ) initial conditions; (ii) step-like initial conditions. The main aim is to describe the long-time behavior of the solution of this problem. To do this, we adapt the nonlinear steepest-descent method to the study of the Riemann-Hilbert problems associated with the NNLS equation in these two settings.

We show that, in contrast to the local NLS equation, (i) the power decay rate of decaying asymptotic terms depends, in general, on  $x/t$ ; (ii) in the case of step-like initial conditions, the picture of the asymptotic sectors does not include a dispersive shock wave (genus-1) sector.

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