

# **Continuations of the nonlinear Schrodinger equation beyond the singularity**

G. Fibich and M. Klein

Applied mathematics, Tel Aviv University,

The nonlinear Schrodinger equation (NLS) is one of the canonical nonlinear equations in physics. In 1965, Kelley showed that the NLS admits solutions that collapse (become singular) at a finite time (distance). Since physical quantities do not become singular, a question which has been open since 1965 is whether and how singular NLS solutions can be continued beyond the singularity.

A similar situation occurs in hyperbolic conservation laws, where in the absence of viscosity, the solution can become singular (develop shocks). In that case, there is a huge body of literature on how to continue the inviscid solution beyond the singularity. In contrast, very few studies addressed this question in the NLS.

In this talk I will present several potential continuations of the NLS beyond the singularity. These continuations share the universal feature that after the singularity, the solution is only determined up to multiplication by a constant phase term. As a result, the interaction between two post-collapse components (beams) is chaotic, as indeed has been observed recently in experiments with high-power laser beams.