Light-cone dynamics escaping generalised hydrodynamics

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The nonequilibrium dynamics of 1D integrable and quasi-integrable systems with inhomogeneities are nowadays investigated in the framework of "generalised hydrodynamics"[1,2]. Under some assumptions (always satisfied in free systems), the expectation values of local observables can be computed exactly by solving a system of nonlinear equations representing the infinitely many conservation laws underlying integrability. In this talk I present various situations in which nonequilibrium time evolution produces lightcone dynamics that seem to escape generalised-hydrodynamic descriptions. Our ideal setting is time evolution under a translationally invariant Hamiltonian after that a localised perturbation has broken translational invariance in the initial state. I describe the following scenarios :

1. The Hamiltonian has jammed excited states, i.e., states that can be interpreted as a collection of particles stuck together ; before the perturbation, the initial state is jammed [3,4].
2. There are semi-local conservation laws, which are integrals of motion that allow the system to retain memory of string order [5].
3. The state before the perturbation is a quantum scar [6].

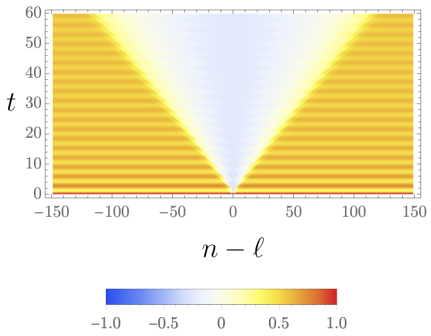

Figure 1. Example of an unexpected ballistic profile of a local observable emerging from a product state with all but one (at site ℓ) spins aligned in the same direction [5].

Références

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