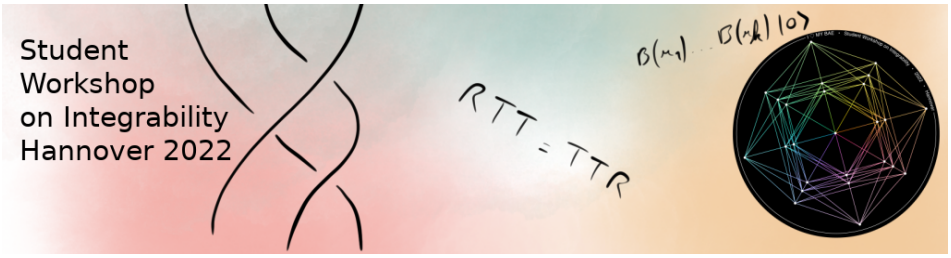

Contribution ID: **24** Type: **40 Min Talk**

Bound state production in the 1d Bose gas

Monday, 28 March 2022 10:00 (1 hour)

Out-of-equilibrium phases of matter have triggered a lot of attention in the last decade, since new and interesting physical phenomena with no equilibrium counter parts can arise. The 1d interacting Bose-gas for example possesses bound states for attractive interactions but is experimentally highly unstable at equilibrium. However, these bound states become stable out-of-equilibrium since the 1d Bose-gas is integrable and thus, thermalization is absent.
Strongly interacting systems are notoriously hard to tackle, but due to integrability we can analytically investigate slow interaction changes from the repulsive to the attractive regime using the framework of Generalized Hydrodynamics (GHD). We obtain exact predictions for the bound state production and completely characterize the non-equilibrium state.
While in the quantum realm numerical checks are often absent, we can translate this protocol to the semi-classical analogue of the 1d Bose-gas – the non-Linear-Schroedinger equation (NLS) – and exploit Monte Carlo methods for numerical benchmarks. By taking the semi-classical limit new technical challenges arise, but they are accompanied with new insight into the thermodynamical description of the NLS model.
Finally, as the 1d interacting Bose-gas is realized in state-of-the art experiments with cold atoms, our analytic results can already be applied to describe signatures of bound-states.

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