New insights into quantum many-body nonequilibrium dynamics

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Abstract:

In this talk I will present two of our recent results on nonequilibrium quantum dynamics in many-body systems.

The first one concerns new insights into what is called the "eigenstate thermalization hypothesis", according to which a many-body energy eigenstate generically already contains all the properties of a thermal state. Based on exact diagonalization calculations, we show for a specific model system how that behaviour is approached when going towards the thermodynamic limit. Specifically, we show how delocalization in the many-body Fock space leads to the suppression of fluctuations away from thermal values.

The second part will deal with a quench in a tunnel-coupled system of two 1d clouds of cold bosonic atoms. There, we find that tiny initial quantum fluctuations in the relative phase between the two condensates can grow into localized nonlinear structures. These "quasi-breathers" then form and decay stochastically, and their properties can be understood based on exact solutions of the classical sine-Gordon equation.