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Tomography and non-equilibrium dynamics in a continuous field quantum simulator

Monday, 28 June 2021 17:00 (30 minutes)

Atom chips allow to manipulate the low-energy effective field theory of individual or coupled one-dimensional gases. I will present recent direct observations of coherent wave-packet propagation within an effective light cone following a global quantum quench from effectively the Klein-Gordon regime to a Tomonaga-Luttinger liquid. These experimental developments are particularly appealing as they allow to gain an understanding of the physics of the system comparable to that obtained by theoretical computations and it will be my aim to show that in an illustrative way. The fact that direct experimental observations can match closely the most instructive theoretical observables hints at one possible way quantum simulation technology may come into play in future physics research. I will also tell you how we do tomography of the phononic fluctuations based on matter-wave interferometry using data from non-equilibrium quenches and mention our ongoing work towards using such reconstructions to decide whether the locally propagating correlation fronts entail bipartite entanglement. The research presented was motivated by our recent studies of the decay and revival of non-Gaussian correlations and our proposal for building quantum field machines using the digital-mirror-device control available on the atom chip.

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Session Classification: Monday Afternoon