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Quantum distillation of bosons[1]

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The non-equilibrium dynamics of many-body quantum systems present a series of challenges for theory and opportunities for cold atom experiments. I will describe an experiment in which a bundle of initially trapped superfluid 1D Bose lattice gases is quenched to an untrapped, flat lattice potential. This simple experimental situation in the intermediate coupling regime (U/J between 4 and 9.6) leads to interesting dynamics. These include the progressive dissolution of a fraction of the doublons, as well as the quantum distillation and long term confinement of singlons out of and within the central, doublon-dominated region. We measure these processes by combining absorption imaging, photoassociation and 3-body loss to separately reconstruct the spatial distributions of the expectation values of singlons, doublons and triplons. The qualitative dynamics is reproduced by a Gutzwiller mean field model and the essence of the experiment can be understood by considering simple spatial pictures of site occupancies.

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