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Non-equilibrium dynamics around integrability in a one-dimensional two-component Bose gas[1] NICOLAAS VAN DRUTEN, PHILIPP WICKE, SHANNON WHITLOCK, Van der Waals-Zeeman Institute, University of Amsterdam — We investigate a one-dimensional two-component Bose gas near the point of state-independent interactions. At this specific point the system is integrable, in the sense that exact (thermodynamic) Bethe Ansatz solutions can be applied locally. In the experiments, we employ an atom chip and the magnetically trappable clock states in ^{87}Rb. State-dependent potentials are generated by using the polarization dependence of radio-frequency dressing. We show that this allows us to continuously and dynamically tune both the local interactions and the global trapping potential. The experimentally accessible range in interactions includes the region around the integrability point. We study the spin motion that follows upon a sudden change in the system, a quantum quench. When starting from a low-temperature, quantum-degenerate gas in the weakly interacting regime, good agreement with a Gross-Pitaevskii description is found. The experiment allows exploring regimes that go beyond such a description and opens up a novel route to the study of the relation between non-equilibrium dynamics, thermalization and the making and breaking of integrability in quantum many-body physics.

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