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【515】 Optimal preparation of vibrational state superpositions in a 1D Bose-Einstein condensate

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On our atomchip setup a one-dimensional Bose gas of ^{87}Rb is cooled down to the transverse groundstate of the trapping potential. The wave function of the condensate is manipulated by displacing the potential following a trajectory defined by optimal control. Thus superpositions of transverse vibrational states are prepared.

Their dynamics is probed by measuring the transverse momentum distribution, imaged after time of flight. Although well

described by mean-field theory initially, the system evolves towards a steady state, which is not expected from the mean-field description. Several effects and their influence on the relaxation process have been studied such as the emission of correlated atom pairs from the first excited state.

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