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Many-body Landau-Zener dynamics in coupled 1D Bose liquids
YU-AO CHEN, Max-Planck-Institut für Quantenoptik, Hans-Kopfermann-Strasse 1, 85748 Garching, Germany, STEFAN TROTZKY, UTE SCHNORRBERGER, Fakultät für Physik, Ludwig-Maximilians-Universität, Schellingstasse 4, 80799 München, Germany, SEBASTIAN HUBER, EHUD ALTMAN, Department of Condensed Matter Physics, The Weizmann Institute of Science, Rehovot, 76100, Israel, IMMANUEL BLOCH, Max-Planck-Institut für Quantenoptik, Hans-Kopfermann-Strasse 1, 85748 Garching, Germany — Non-equilibrium dynamics attracted a lot of recent interest. The departure from standard statistical mechanics is studied in a large variety of systems, at the heart of which lies the very fundamental setup of two levels undergoing an anti-crossing, knowing as the famous Landau-Zener (LZ) problem. Non-interacting atoms in a double well with tunable energy difference provide a generic two-mode system to study the dynamics of a LZ sweep. We experimentally realize a generalized LZ problem in an array of pairwise coupled tubes with interacting ultracold ^{87}Rb atoms in an optical superlattice potential. We investigate the impact of interactions and dimensionality on the sweep fidelity for sweeps in the ground state and in the excited state. The results show that interactions in the tubes improve the fidelity for sweeps in the ground state. For sweeps in the excited state we find relaxation of the system which can be explained in terms of one-dimensional low-energy excitations along the tubes, providing an intrinsic bath for thermalization.

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