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Higher band dynamics of few-body bosonic ensembles in multi-well potentials LUSHUAI CAO, SIMOS MISTAKIDIS, PETER SCHMELCHER, Zentrum fuer Optische Quantentechnologien, Hamberg University, Germany — The higher band dynamics of few-body bosonic ensembles is numerically investigated, via the numerically exact Multi-Layer Multi-Configuration Time-Dependent Hartree method for Bosons (ML-MCTDHB). Initially the bosons are prepared in a superfluid-like state, with spatial correlations between different site, and then a quench of the contact interaction strength is applied to trigger the system out of equilibrium. The quench induced dynamics show rich phenomena, and various dynamical modes are identified, including the inter-well density-wave-like tunneling, the intrawell breathing, the intrawell dipolar oscillation, and the delocalized transport. The higher-band dipolar oscillation can also couple to other dynamical modes, and such coupling gives rise to a new type of avoided crossing in the spectrum of the dipolar oscillation. The higher band dynamics obtained by ML-MCTDHB is beyond the single-band Bose-Hubbard model, and illustrates the rich new physics in the strong interaction regime.

Lushuai Cao
Zentrum fuer Optische Quantentechnologien, Hamberg University, Germany

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