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The impact of spatial correlation on the tunneling dynamics of few-boson mixtures in a combined triple well and harmonic trap¹
LUSHUAI CAO, IOANNIS BROUZOS, BUDHADITYA CHATTERJEE, PETER SCHMELCHER, Zentrum für Optische Quantentechnologien, Universität Hamburg, Germany — We investigate the tunneling properties of a two-species few-boson mixture in a one-dimensional triple well and harmonic trap. The mixture is prepared in an initial state with a strong spatial correlation for one species and a complete localization for the other species. We observe a correlation-induced tunneling process in the weak interspecies interaction regime. The onset of the interspecies interaction disturbs the spatial correlation of one species and induces tunneling among the correlated wells. The corresponding tunneling properties can be controlled by the spatial correlations with an underlying mechanism which is inherently different from the well known resonant tunneling process. We also observe the correlated tunneling of both species in the intermediate interspecies interaction regime and the tunneling via higher band states for strong interactions.

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Lushuai Cao
Zentrum für Optische Quantentechnologien,
Universität Hamburg, Germany

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