An Effective Collision Rate Model for Atomtronic Devices

POSTER

Abstract

We demonstrate application of a model, previously developed for the detailed study of quantum electronic systems [1], to atomtronic devices utilizing finite temperature Bose-condensed gases. The numerical approach is based on the relaxation rate approximation where collisions effectively drive the system towards a dynamical (non-thermal) equilibrium distribution. This approach allows parametric studies involving time scales that cover both the rapid population dynamics relevant to non-equilibrium state evolution, as well as the much longer time durations typical of steady-state device operation. The model is demonstrated by studying the evolution of a Bose-condensed gas in the presence of atom injection and extraction in a double-well potential. In this configuration phase-locking between condensates in each well of the potential is readily observed, and its influence on the evolution of the system is studied.\\[4pt] [1] W. W. Chow and S. W. Koch, IEEE J. Quantum Elec., \textbf{41}, 495 (2005)

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