

Driven-Dissipative Bose-Einstein Condensation

This thesis investigates Bose-Einstein condensation in a driven-dissipative system. As shown recently, the non-stationary nature of driven systems opens the possibility for fragmented condensation into multiple states. In this thesis, we examine this phenomenon for the case of non-interacting bosons in a harmonically driven quartic double well potential, weakly coupled to a heat bath of constant temperature. First, the solutions of the periodically time-dependent Schrödinger equation are obtained using Floquet theory. Then, the coupling to the heat bath is incorporated within the frame of Floquet-Born-Markov theory. Our numerical calculations show that fragmented condensation indeed occurs for certain parameter ranges of the driving amplitude and frequency. Moreover, we identify two different physical mechanisms which lead to fragmented condensation: First, we show that condensation into many states arises at avoided crossings of the quasi energies. Second, multiple selected states are also found for even small driving strengths if the driving frequency exceeds the energy difference of the first and second doublet of the double well. Finally, the analysis of the Shannon entropy of the distribution of the Floquet states' occupations indicates complex behavior for higher driving strengths to be investigated in future research.