QUANTUM DYNAMICS, COHERENT STATES AND BOGOLIUBOV TRANSFORMATIONS

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Systems of interest in physics are usually composed by a very large number of interacting particles. At equilibrium, these systems are described by stationary states of the many-body Hamiltonian (at zero temperature, by the ground state). The reaction to perturbations, for example to a change of the external fields, is governed by the time-dependent many-body Schrödinger equation. Since it is typically very difficult to extract useful information from the Schrödinger equation, one of the main goals of non-equilibrium statistical mechanics is the derivation of effective equations which can be used to predict the macroscopic behavior of the system.

In this talk I am going to discuss a couple of situations where effective equations can be rigorously derived. In particular, I am going to consider systems of interacting bosons in the so called Gross-Pitaevskii regime and I am going to show how coherent states and Bogoliubov transformations can be used to approximate the many body dynamics.