Wigner Function Method to Bose-Einstein Condensation

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After the experimental observation of the Bose-Einstein Condensation (BEC) in dilute ultracold gases [1], BEC has been manifested in many systems. However, the theoretical investigation for these phenomena is usually done by the mean field approach: one of them is the Gross-Pitaevskii (GP) type equations.

Although the condensation behavior can be well described by these GP-like equations, the fluctuation residing in the system is not easily describable in mean field approach: it is non-Gaussian even in the thermodynamic limit[2].

To analyze the fluctuation behaviors, the master equations derived in [3] was used to characterize them quantitatively. Here, we will reconstruct the master equation with Wigner function[4] instead of the usual density operator ρ, and show its solution to describe the BEC.

References


