Abstract Submitted
for the MAR07 Meeting of
The American Physical Society

Quantum Field Theoretical Description of Dynamical Instability of Trapped Bose-Einstein Condensates MAKOTO MINE, Department of Physics, Waseda University, MASAHIKO OKUMURA, Department of Applied Physics, Waseda University, TOMOKA SUNAGA, Department of Physics, Waseda University, YOSHIYA YAMANAKA, Department of Materials Science and Engineering, Waseda Universtiy — The Bogoiubov-de Gennes equations are used for a number of theoretical works on the trapped Bose-Einsetein condensates. Particularly, it is important that if all of the eigenvalues of the equations are real, the solutions of the equations diagonalize the unperturbed Hamiltonian, and the quasiparticle picture, which describes the quantum fluctuation around the condensates, is obtained. We consider the quantum fluctuation in the case that these equations have complex eigenvalues. First, to expand quantum field which represents the quantum fluctuation, we give the complete set including pairs of complex modes whose eigenvalues are complex conjugate to each other. The expansion of the quantum field brings the operators associated with the complex modes, which are simply neither bosonic nor fermionic ones. Next, to evaluate physical quantities, we construct the eigenstate of the complex mode sector of the unperturbed Hamiltonian. Finally, we discuss the instability of the condensates caused by the quantum fluctuation associated with the complex mode in the context of Kubo's linear response theory.

Makoto Mine
Department of Physics, Waseda University

Date submitted: 18 Nov 2006 Electronic form version 1.4