Abstract Submitted
for the TS4CF08 Meeting of
The American Physical Society

Mesoscopic effects in Bose-Einstein condensate fluctuations of a weakly interacting gas in a box KONSTANTIN DORFMAN, Department of Physics, Texas A&M University — I study the quantum and thermal fluctuations of the Bose-Einstein condensate (BEC) in a box with the periodic boundary conditions under a particle-number constraint. I start with the particle-number conserving operator formalism of Girardeau and Arnowitt. I employ an expansion of the distribution function in terms of the multinomial coefficients. I present analytical formulas and numerical calculations for the central moments of the ground state occupation fluctuations in an weakly interacting Bose gas in a box with a mesoscopic number of particles in the framework of the Bogoliubov approximation. I discuss the mesoscopic effects in statistics of a weakly interacting gas versus statistics in the thermodynamic limit and statistics of an ideal gas. I emphasize the non-Gaussian nature of the BEC fluctuations. The crossover relations between the fluctuations of weakly interacting Bose gas and ideal Bose gas are obtained. In particular, high and low temperature asymptotics are presented. Suppression of the condensate fluctuations at the moderate temperatures and their enhancement at very low temperatures are described.

Konstantin Dorfman
Department of Physics, Texas A&M University

Date submitted: 12 Sep 2008 Electronic form version 1.4