PHYSICAL REVIEW A
covering atomic, molecular, and optical physics and quantum information
INSTYTUT FIZYKI POLSKIEJ AKADEMII NAUK

# Continuum of classical-field ensembles in Bose gases from canonical to grand canonical and the onset of their equivalence

J. Pietraszewicz, E. Witkowska, and P. Deuar
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PSGPE WITH ADDITIONAL TERM

$$\hbar \frac{\partial \psi(x,t)}{\partial t} = -i(1-i\gamma)\left(-\frac{\hbar^2}{2m}\frac{\partial^2}{\partial x^2} + V(x) - \mu + g_0|\psi(x,t)|^2\right)\psi(x,t) + \sqrt{2k_B T\,\gamma}\,\eta(x,t) + \left(-\frac{k_B T\,\gamma}{\sigma^2}\right)\left(N(\psi) - \bar{N}\right)\psi(x,t)$$

$$P_\sigma(\psi) \propto exp\left(-\frac{E(\psi) - \mu\, N(\psi)}{k_B T} - \frac{[N(\psi) - \bar{N}]^2}{2\,\sigma^2}\right)$$

PROBABILITY DISTRIBUTION

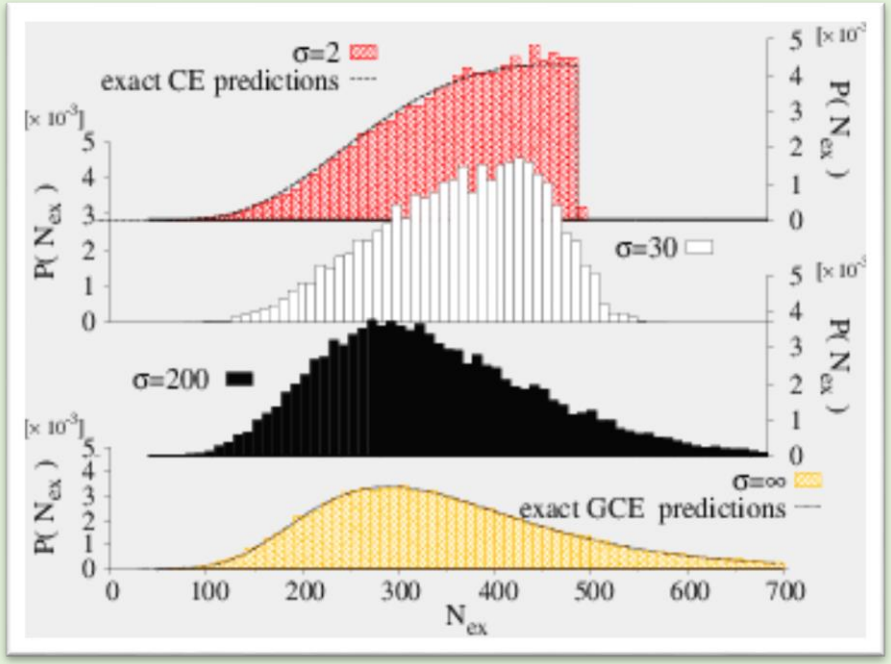
1. ***Motivation***: Each measurement has own precision – how to describe better the real experimental situation with empicirale level of fluctuations ?

2. ***Aim***: **Generation of ensemble with intermediate, controlled statistics (neither GCE nor CE)!**

3. ***The tool*:** Classical fields ensemble and Projected Stochastic Gross-Pitaevskii Equation (PSGPE) with additional term

4. ***Studies***: the behaviour of 1D bose gas statistics when fluctuations are controlled (in an ideal and an interacting system)

5. ***Results***: Development of a simple method to generate ensembles with determined fluctuations of any observable that commute with Hamiltonian.

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