

# The weakly interacting Bose gas at positive temperature

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We discuss a homogeneous system of interacting bosons in the mean-field regime where the temperature is comparable to the critical temperature for the Bose-Einstein condensation (BEC). By a rigorous implementation of Bogoliubov's approximation, we derive asymptotic formulas for the free energy and the reduced density matrices of the corresponding Gibbs state. In particular, our method allows to analyze explicitly the  $U(1)$  symmetry breaking for BEC and superfluidity. This is joint work with Andreas Deuchert and Marcin Napiórkowski.

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