ANDREAS DEUCHERT, Institute of Science and Technology Austria

Bose-Einstein Condensation in a Dilute, Trapped Gas at Positive Temperature

We consider an interacting, dilute Bose gas trapped in a harmonic potential at a positive temperature. The system is analyzed in a combination of a thermodynamic and a Gross-Pitaevskii (GP) limit where the trap frequency ω, the temperature T and the particle number N are related by $N \sim (T/\omega)^3 \to \infty$ while the scattering length is so small that the interaction energy per particle around the center of the trap is of the same order of magnitude as the spectral gap in the trap.

We prove that the difference between the canonical free energy of the interacting gas and the one of the noninteracting system can be obtained by minimizing the GP energy functional. We also prove Bose-Einstein condensation in the following sense: The one-particle density matrix of any approximate minimizer of the canonical free energy functional is to leading order given by the one of the noninteracting gas but with the free condensate wavefunction replaced by the GP minimizer.

This is joint work with Robert Seiringer and Jakob Yngvason