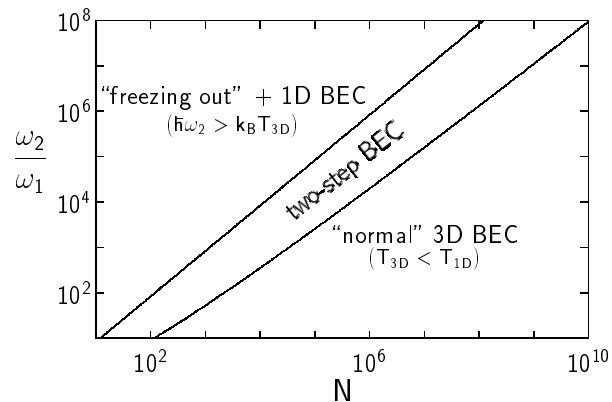


Two-step condensation of the ideal Bose gas in highly anisotropic traps

The ideal Bose gas in a highly anisotropic harmonic potential was studied theoretically [1]. It was found that Bose-Einstein condensation occurs in two distinct steps as the temperature is lowered. In the first step the specific heat shows a sharp feature, but the system still occupies many one-dimensional quantum states. In the second step, at significantly lower temperature, the ground state becomes macroscopically occupied. It should be possible to verify these predictions using present-day atom traps. The two-step behavior can occur in a rather general class of anisotropic traps, including the box potential.



Overview of the three different regimes of BEC in an anisotropic harmonic oscillator potential with $\omega_1 \ll \omega_2 = \omega_3$ as a function of particle number N , and trap anisotropy ω_2/ω_1 . The two-step BEC regime separates the regime of "normal" three-dimensional BEC and the regime of extreme anisotropy where the system first becomes one-dimensional and then undergoes 1D BEC as a second step.

1. N.J. van Druten and W. Ketterle, Phys. Rev. Lett. **79**, 549 (1997).