

# Dimensional crossover for the Bose-Einstein condensation

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We study Bose-Einstein condensation (BEC) for a non-interacting gas in a very anisotropic trap. Therefore, at enough small temperatures some degrees of freedom "freeze", thus reducing the "effective" dimensionality of the system. We mainly focus in quasi-bidimensional traps characterized by a surface  $S$  in the  $(x, y)$  plane. We consider two confining mechanisms in the  $z$  direction: harmonic and rigid wall potentials. There are not forces parallel to  $S$ , excepting the rigid wall at the edges. The most relevant results are: (a) The condensate smoothly sets at  $T \sim O(\text{sign}(T_c / \log N))$ , where  $T_c$  is the tridimensional condensation temperature. (b) When BEC is present, also the low-lying excited states have a macroscopic occupation; this effect is also present in a quasi-onedimensional harmonic "cigar-shape" trap. (c) The condensation process is sensitive to the shape of  $S$ .