SFB/TRR 21 - Kolloquium
25. Mai 2007, Ulm

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Rotating Bose-Einstein Condensates

Trapped Bose-Einstein condensates (BECs) differ considerably from the standard textbook example of a uniform Bose gas. The trapped ground state introduces new intrinsic scales (the ground-state size d_0 and the ground-state energy E_0). At low angular velocity, the behavior of one vortex in a rotating condensate illustrates the effect of discrete quantized vorticity. For more rapid rotation, the condensate contains an array of many vortices. In this case, the centrifugal forces expand the condensate radially and shrink it axially; thus the condensate becomes effectively two-dimensional. When the external rotation speed approaches the frequency of the radial harmonic confining potential, the condensate enters the "lowest Landau level" limit, when a simple description becomes possible. Eventually, the system should make a quantum phase transition to a highly correlated state analogous to the quantum-Hall states of electrons in a strong magnetic field.

25. Mai 2007, 15:30 Uhr

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