

Fast rotating Bose-Einstein condensates in an asymmetric trap

A. Aftalion, X. Blanc, N. Lerner

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We investigate the effect of the anisotropy of a harmonic trap on the behaviour of a fast rotating Bose-Einstein condensate. Fast rotation is reached when the rotational velocity is condensate in the corresponding direction. One striking new feature is the non-existence of visible vortices for the ground state. The condensate can be described with the lowest Landau level set of states, but using distorted complex coordinates. We find that the coarse grained atomic density behaves like an inverted parabola with large radius in the deconfined direction, and like a fixed Gaussian in the other direction. It has no visible vortices, but invisible vortices which are needed to recover the mixed Thomas-Fermi Gaussian profile. There is a regime of small anisotropy and intermediate rotational velocity where the behaviour is similar to the isotropic case: a hexagonal Abrikosov lattice of vortices, with an inverted parabola profile.