

On the Third Critical Speed for Rotating Bose-Einstein Condensates

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Abstract: We study a two-dimensional rotating Bose-Einstein condensate confined by an anharmonic trap in the framework of the Gross-Pitaevskii theory. We consider a rapid rotation regime close to the transition to a giant vortex state. We identify a precise value of the angular velocity such that above it the condensate is in the giant vortex phase. We also prove a refined energy asymptotics and an estimate of the winding number of any Gross-Pitaevskii minimizer.