

Dynamics of Vortices in Weakly Interacting Bose-Einstein Condensates¹

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Abstract

We study the dynamics of vortices in ideal and weakly interacting Bose-Einstein condensates using a Ritz minimization method to solve the two-dimensional Gross-Pitaevskii equation. For different initial vortex configurations we calculate the trajectories of the vortices. We find conditions under which a vortex-antivortex pair annihilates and is created again. For the case of three vortices we show that at certain times two additional vortices may be created, which move through the condensate and annihilate each other again. For a noninteracting condensate this process is periodic, whereas for small interactions the essential features persist, but the periodicity is lost. The results are compared to exact numerical solutions of the Gross-Pitaevskii equation confirming our analytical findings.

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