

Abstract Submitted
for the DAMOP13 Meeting of
The American Physical Society

Nucleation of Quantized Vortices in an Ultracold Atomic Gas¹

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Amherst College — In analogy with the rotating bucket experiment of liquid helium, we create vortices in a trapped Bose-Einstein condensate by cooling the atomic sample through the phase transition in the presence of a rotating magnetic trapping potential. The thermal cloud remains in quasi-equilibrium during the cooling, ultimately producing rotating condensates in the ground state. The method presents a way to consistently create a set number of vortices ($N_V < 10$). We show that the trap rotation frequency at which a vortex first appears agrees closely with theoretical predictions, and that the number of vortices within the condensate is established by the rotation frequency at the phase transition. Once the condensate has started to form, the number of vortices in the condensate is stable against changes in the frequency. Images of the condensate taken during evaporation suggest that the vortex spatial configuration is similarly determined early on in the growth of the condensate. We use this nucleation method to explore the angular momentum of a condensate with vortices.

¹This work is funded by the National Science Foundation through grant PHY-0855475.

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Date submitted: 25 Jan 2013

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