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Dissipation effects to the disintegration of a multiply-charged quantum vortex YUCONG CAI, IKAIKA MCKEAGUE-MCFADDEN, E. CARLO SAMSON, Miami University — Using 2D numerical simulations based on the Gross-Pitaevskii equation (GPE), we study the quantum vortices created by a blue-detuned optical beam that is dragged across a highly oblate Bose-Einstein condensate (BEC) in a spiral trajectory. The dependence of the generated vorticity to the beams optical power and to the trajectory parameters was analyzed. Dissipation was introduced to the simulations by adding a phenomenological damping term to the GPE. We explored how dissipation affects the vortex dynamics after ramping off the optical beam, wherein we observed spatial clustering of vortices, co-rotating vortices, and regular arrangement of vortices prior to break up. The break up dynamics of the giant vortex exhibited a transition from a symmetric configuration of single vortices to a disordered arrangement. The observed dissipation effects may help understand the role of thermal/background atoms to the onset of turbulence in BECs.

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