

Persistent currents in an oblate, finite-temperature Bose-Einstein condensate

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Abstract:

We report new experimental observations of multiply charged persistent currents in a Bose-Einstein condensate (BEC). Our BECs are formed in an axi-symmetric highly oblate trapping potential. The trap is pierced with a blue-detuned laser beam propagating along the trap axis to create a toroidal potential well. At finite temperatures, with many unpinned vortices initially in the BEC, thermal damping establishes and stabilizes a persistent current about the trap axis. We have observed multiply charged persistent superfluid currents lasting for up to 50 seconds in this configuration. Our experimental methods will be compared with finite-temperature and zero-temperature numerical simulations probing the formation and stability of BEC persistent currents.