

## Vortex Pump for Dilute Bose-Einstein Condensates

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The formation of vortices by topological phase engineering has been realized experimentally to create the first two- and four-quantum vortices in dilute atomic Bose-Einstein condensates. We consider a similar system, but in addition to the Ioffe-Pritchard magnetic trap we employ an additional hexapole field. By controlling cyclically the strengths of these magnetic fields, we show that a fixed amount of vorticity can be added to the condensate in each cycle. In an adiabatic operation of this vortex pump, the appearance of vortices into the condensate is interpreted as the accumulation of a local Berry phase. Our design can be used as an experimentally realizable vortex source for possible vortex-based applications of dilute Bose-Einstein condensates. [Möttönen et al., Phys. Rev. Lett. 99, 250406 (2007)]