Physics > Atomic Physics

Reconfigurable self-sufficient traps for ultracold atoms based on a superconducting square

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We report on the trapping of ultracold atoms in the magnetic field formed entirely by persistent supercurrents induced in a thin film type-II superconducting square. The supercurrents are carried by vortices induced in the 2D structure by applying two magnetic field pulses of varying amplitude perpendicular to its surface. This results in a self-sufficient quadrupole trap that does not require any externally applied fields. We investigate the trapping parameters for different supercurrent distributions. Furthermore, to demonstrate possible applications of these types of supercurrent traps we show how a central quadrupole trap can be split into four traps by the use of a bias field.

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