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Stable Trap for Neutral Atoms with a Superconducting Disc TETSUYA MUKAI, NTT Basic Research Laboratories — A stable magnetic quadrupole trap for neutral atoms on a superconducting Nb thin-film disc is demonstrated. The quadrupole field is composed of the magnetic field that is generated by vortices on the disc introduced by field cooling of the disc, and a uniform external field perpendicular to the disc surface. The dynamics and stability of the trap are studied. The trap is stable when all trapping processes are performed above the dendritic instability temperature T_a. When the field intensity is changed below this temperature, the quadrupole field collapses, and the trap disappears. The initial vortex density decreases even when the external field is changed at a temperature $T > T_a$. However, the vortex density is stabilized at an equilibrium density, whereas at $T < T_a$, it almost completely disappears. A stable trap can be formed, even when the initial vortices are introduced through a dendritic avalanche. [1] Fujio Shimizu, Christoph Hufnagel, and Tetsuya Mukai, Phys. Rev. Lett. **103**, 253002 (2009).

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