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Demonstration of a Microtrap Array and manipulation of Array Elements

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A novel magnetic microtrap has been demonstrated for ultracold neutral atoms [1]. It consists of two concentric currents loops having radii r1 and r2. A magnetic field minimum is generated along the axis of the loops if oppositely oriented currents flow through the loops. Selecting r2/r1 = 2.2 maximizes the restoring force to the trap center. The strength and position of the microtrap relative to the atom chip surface can be precisely adjusted by applying an external bias magnetic field. A microtrap array can be formed by linking individual microtraps in series. A linear array of 11 microtraps having r1= 60 microns, was loaded with more than 105 87Rb atoms using three different methods: 1) from a transported quadrupole magnetic trap, 2) directly from a mirror MOT and 3) from an optical dipole trap. A proposal to manipulate atoms in adjacent microtraps will also be presented.

1. B. Jian & W. A. van Wijngaarden, Appl. Physics B: Lasers & Optics. (2014).

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