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The manipulation of atomic waves by optical elements constructed from surface-based planar structures has become an active research area, called Integrated Atom Optics. Several groups have demonstrated microscopic atom traps, waveguides and beamsplitters based on current carrying conductors. We are exploring planar optical elements that are made from permanent magnetic films with anisotropic perpendicular magnetisation (CoCr or TbGdFeCo) [1]. Two seperated thin-film magnets produce a two-dimensional quadrupole potential above a surface, similar to current carrying conductors. Applying a bias field allows the potential to be moved and its steepness changed. If the characteristic size of the potential is comparable to the de Broglie wavelength the microdevice acts as an atom waveguide. Combining the magnetic strips with current carrying loops will produce a magnetic microtrap. The magnetic field gradient can be changed by 7 orders of magnitude by varying the bias field by about 100 G.

The use of permanent magnets has some advantages over current carrying conductors for generating suitable microscopic magnetic fields. Most important, magnetic thin-film devices can produce large magnetic field gradients ($\sim 10^7$ G/cm) without the risk of excessive heating and eventual breakdown of the circuitry. Permanent magnets also avoid any potential problems due to current variations, imperfect insulation between conductors and open and short circuits.

We will discuss different configurations of microtraps, waveguides and couplers that can be set up using permanent magnetic films. The integration of atom microtraps with waveguides simplifies experimental arrangements and offers the efficient production of matter waves.

[1] T.J. Davis, "Atomic de Broglie waveguides and integrated atom-optics using permanent magnets", J.Optics B:Quantum Semiclass.Opt , 408-414 (1999).