Building a magneto-optical trap for rubidium atoms: a practical guide for the intrepid third year

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Abstract

Our goal for this project was to develop a procedure by which third-year undergraduate students could build, test, and experiment with a magneto-optical trap (MOT). We successfully constructed a MOT and demonstrated its effectiveness, though our setup required the use of expensive and fiddly fibre optic couples. These were chosen for flexibility; an implementation of the experiment would need only minor modifications to avoid using these.

This document is intended to be both a reflection of our experiences and a guide for a prospective third year laboratory experiment. I will first outline some of the arelevant theory for the experiment, then discuss the experimental procedures required to build the MOT; I will conclude the document with a brief discussion of our results.

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Optical trapping methodologies have their origin in the 1970s, when Ashkin (1970) developed what has become known as optical tweezers using electromagnetic gradients.

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Ashkin, A. (1970). Acceleration and trapping of particles by radiation pressure. *Physical Review Letters*, 24(156).