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Novel Double MOT System for a BEC Experiment

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Abstract content
 (Max 300 words)

The first demonstration of three-dimensional laser cooling and trapping of neutral atoms in the form of a magneto-optical trapping (MOT) was a major breakthrough in the advancement of experimental physics. These experimental techniques facilitated the routine production of a cold atomic sample, of various different atom species, in many laboratories around the world. This has also enabled further advancements in the creation of a Bose-Einstein Condensate (BEC). In order to create a large BEC, it is highly advantageous to create a double-MOT system. In such a configuration, the first MOT (usually a 2-D MOT) pre-cools atoms in a vacuum system where there is an adequate atomic background pressure (10-8 mbar). The atoms are then transported via differential pumping, to the second MOT (a 3-D MOT) where the atoms are recaptured in a vacuum system whose pressure is much lower (10-11 mbar). This allows a large number of cooled atoms as a starting point for a creation of the BEC.

Here we describe a novel magnetic coils design which generates a magnetic field suitable for a 2-D MOT. This coil design has the unprecedented advantage of being both compact and robust in a sytem that is typically much larger, while also outperforming the standard techniques. The process of transferring precooled atoms from the 2-D MOT to the 3-D MOT will also be described in detail. In addition to this, the vacuum chamber, laser system, magnetic field production, necessary for such an experiment will also be described.

Apply to be
 consider for a student
 award (Yes / No)?

Yes

Level for award
 (Hons, MSc,
 PhD)?

PhD

Main supervisor (name and email)
and his / her institution

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Would you like to
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 Proceedings (Yes / No)?

Yes

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