Bose-Einstein condensation of ^{85}Rb

P. A. Altin, N. P. Robins, D. Döring, J. E. Debs, R. Poldy, C. Figl and J. D. Close
Research School of Physics and Engineering, ACQAO, ANU

Recently, we have achieved Bose-Einstein condensation of ^{85}Rb [1], only the second group to do so worldwide [2]. ^{85}Rb has a wide Feshbach resonance at an accessible magnetic field which can be used to change the interaction strength of ^{85}Rb. We are particularly interested in the ability to tune the s-wave scattering length to facilitate the production of a non-interacting or a squeezed atom laser. In our system, a beam of ^{85}Rb and ^{87}Rb atoms is produced in a 2D MOT and is directed through the vacuum system to a 3D MOT in the main chamber. The atoms are pumped into their lower ground states before being loaded into a quadrupole Ioffe-Pritchard type (QUIC) magnetic trap. Here, the ^{87}Rb is selectively evaporated by an rf sweep, sympathetically cooling the ^{85}Rb through thermal contact. Once the temperature of the combined sample has fallen to 20 K, the atoms are transferred to a crossed optical dipole trap and a large magnetic bias field is applied to suppress inelastic collisions in ^{85}Rb. Finally, the depth of the dipole trap is reduced, resulting in further evaporation of both species. With the appropriate magnetic field strength, the ^{85}Rb scattering length can be made positive and a stable condensate of 4×10^4 atoms is created.

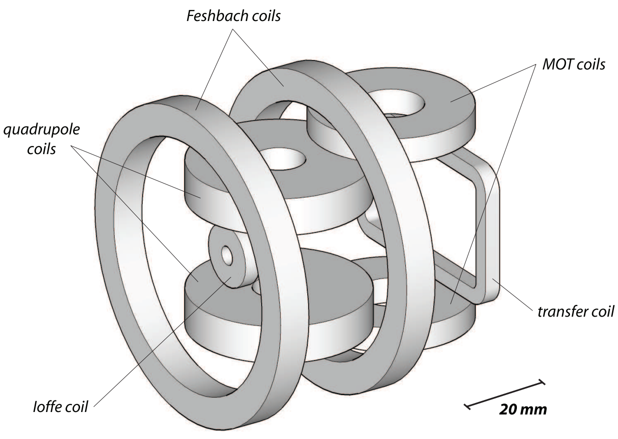

Fig. 1: Magnetic trap coils mounted around the UHV cell.

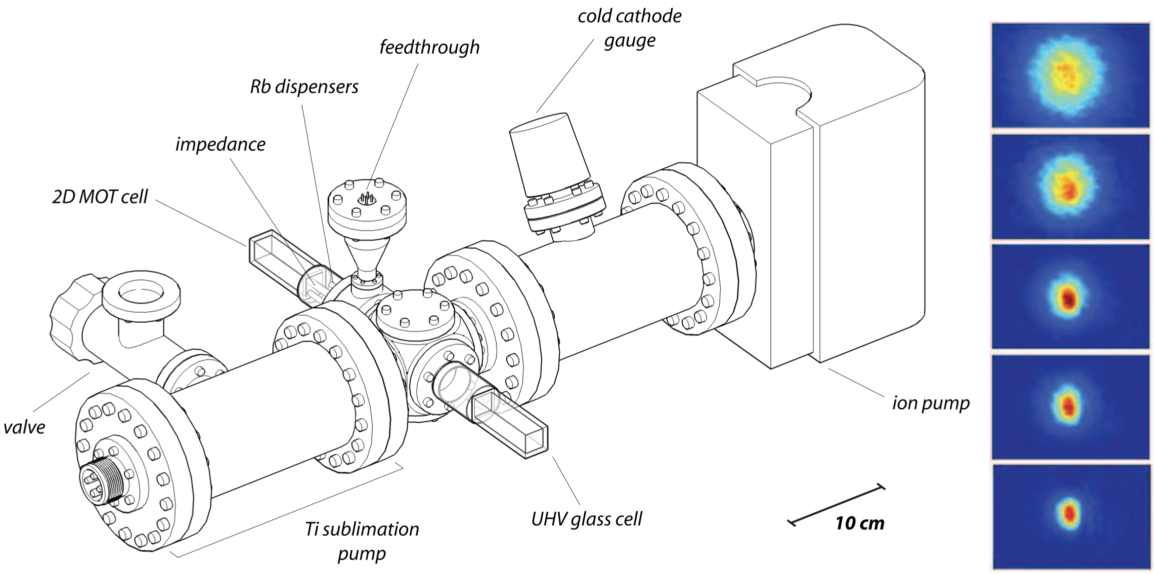

Fig. 2: Vacuum system schematic (left) and absorption images after 20 ms expansion, showing the formation of a ^{85}Rb BEC as the depth of the dipole trap is reduced (right).

References

[1] P. A. Altin, N. P. Robins, R. Poldy, J. E. Debs, D. Doering, C. Figl, and J. D.Close, PRA, accepted for publication (2009).

[2] S. Cornish, N. Claussen, J. Roberts, E. Cornell, and C. Wieman, Phys. Rev. Lett. **85**, 1795 (2000).