Measurement of inelastic losses in a sample of ultracold ^{85}Rb

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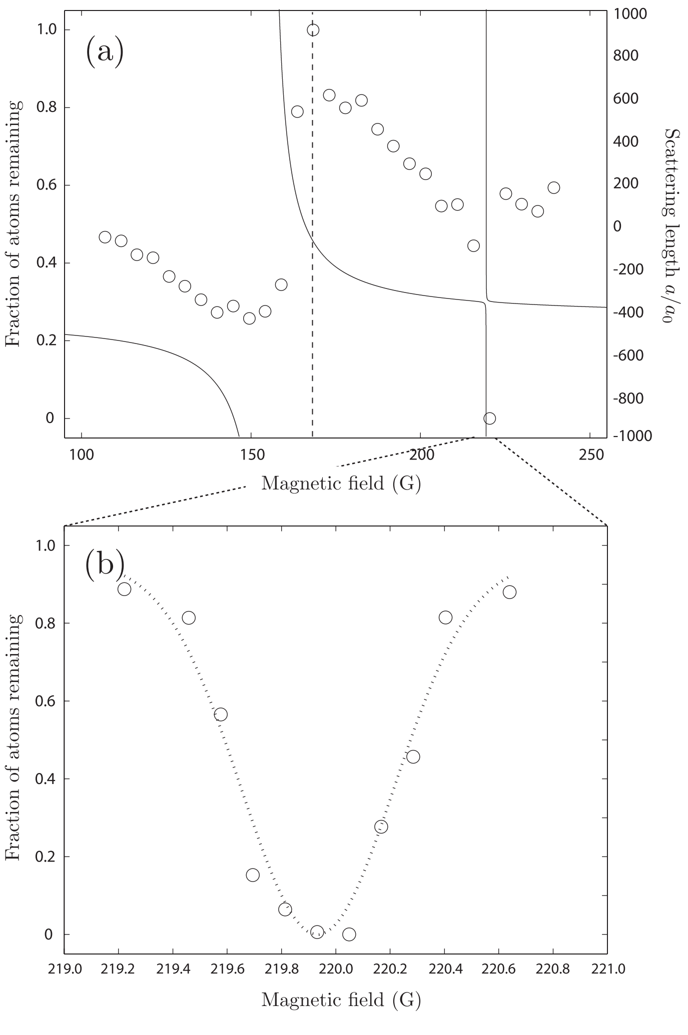
The ability to tune the interparticle interactions in an atomic Bose-Einstein condensate (BEC) has opened up a wide range of new experiments in the field of ultracold atoms. Many experiments have used a Feshbach resonance, a magnetically-tunable molecular bound state, to modify the s-wave scattering properties of ultra-cold atoms. The most notable of these include the Bose-Einstein condensation of cesium [1], the formation of a molecular BEC from a Fermi gas [2], and the demonstration of atom interferometry with a weakly-interacting condensate [3].



We have observed and characterised inelastic loss features in collisions between ultracold ^{85}Rb $|F = 2; m_F = 2\rangle$ atoms [4]. Our apparatus is described elsewhere in this annual report. The graphs on the left show the fraction of ^{85} atoms remaining in the dipole trap after 10 s as a function of the applied bias field. Loss from the dipole trap is enhanced on the low field side of the Feshbach resonance and peaks as the elastic scattering length diverges at 155 G. The inelastic loss is minimised at around 168 G, where the scattering length vanishes. The loss at 219.9(1) G with a width of 0.28(6) G, which we associate with a narrow Feshbach resonance predicted by theory [5], was previously unobserved. The lower figure on the right shows a more detailed measurement of the feature. The loss at this field is significantly greater than at the broader Feshbach resonance, even though the two-body loss coefficient is predicted to be two orders of magnitude lower here than at 155G [6], implying a particularly high three-body loss rate.

References

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