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Tuning atomic interactions near a Feshbach resonance in 87Rb ROBERT COMPTON, YU-JU LIN, KARINA JIMINEZ-GARCIA, IAN SPIELMAN, JQI, NIST and U. of Maryland — The ability to tune the scattering length for collisons in ultracold gases is currently enabling the investigation of many- body Hamiltonians, such as the Bose-Hubbard model. For ^{87}Rb, the strongest resonance is at 1007.4 G and is only $\approx$ 200 mG in width. Precise control of scattering length therefore requires field resolution of 10 ppm. Here we demonstrate field resolution approaching 10 ppm with negligible drift on a timescale of 10 s, despite the dissipation of 12 kW of Joule heating in the field coils. We measure the three body loss rate constant K3 as a function of field in close proximity to the resonance, along with the the scattering length. In addition, using rf association, we map the binding energy for Feshbach molecules on the low field side of the resonance. Finally, we use rf to mix molecular levels near the resonance, and investigate how this changes the character of the resonance, potentially easing contraints on field response for tunability of the scattering length.

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