Correlations and Implosions: Experiments with a Bose-Einstein Condensate with an Adjustable Scattering Length

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The presence of a Feshbach resonance in ^{85}Rb at 155 Gauss makes it a very attractive candidate species for experiments in which the scattering length is varied in real time. In particular, the scattering length, which is normally negative, is positive for ambient fields between 155 and 166 Gauss. We have created stable condensates, with positive scattering lengths, of approximately 5000 ^{85}Rb atoms. By suddenly changing the scattering length to a negative value, we have been able to follow the time-evolution of a condensate implosion. By suddenly changing the scattering length to a very large and positive value, we have been able to study the behavior of a condensate for which the mean-field approximation no longer holds.