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Strongly interacting Bose Gases

We describe recent experiments on a Bose gas in the strongly interacting regime. First, using in situ imaging of Lithium 7 atoms near a Feshbach resonance, we measure thermodynamic properties of the Bose gas as a function of the scattering length. The equation of state of a low temperature homogeneous Bose-Einstein condensate reveals beyond mean-field effects as first predicted by Lee, Huang, and Yang in 1957 [1]. The universality of this LHY quantum correction is further shown by the analysis of a molecular Bose-Einstein condensate made by strong fermion pairing in Lithium 6. Finally we measure the temperature dependence of the three-body decay rate of the unitary Bose gas $L_3(T)$ and compare it to an exact calculation. We show that $L_3(T) \propto 1/T^2$. Theory and experiment quantitatively agree within the 40

[1] N. Navon, S. Piatecki, K. Günter, B. Rem, T. C Nguyen, F. Chevy, W. Krauth, C. Salomon, Phys. Rev. Lett., 107, 135301 (2011). [2] B. Rem, A. Grier, I. Ferrier-Barbut, U. Eismann, T. Langen, N. Navon, L. Khaykovich, F. Werner, D. Petrov, F. Chevy, C. Salomon, Phys. Rev. Lett., 110, 163202, (2013)

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