

Abstract Submitted
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Rate Saturation of Photoassociation in a Bose-Einstein Condensate¹ J. HITCHCOCK, M. JUNKER, D. DRIES, C. WELFORD, Y.P. CHEN², T.A. CORCOVILOS, R.G. HULET, Department of Physics and Astronomy and Rice Quantum Institute, Rice University, Houston TX 77005 — We present the first experimental evidence for saturation of the photoassociation (PA) rate constant, K_p , in a Bose-Einstein condensate (BEC). Atomic ${}^7\text{Li}$ in the $F = 1$, $m_F = 1$ hyperfine state is condensed in an elongated optical trap and a PA pulse coupling the atoms to the $v'' = 83$ vibrational level of the $1\ ^3\Sigma_g^+$ excited molecular state propagates along the long axis of the trap. On-resonant absorption imaging is used to measure the fraction of atoms remaining in the BEC after each PA pulse for a given duration and intensity. K_p is then extracted as a fitting parameter to the time dependent loss. The PA rate is substantially enhanced by tuning to near a magnetic Feshbach resonance at 732G. The rate constant is observed to saturate to a value of $K_p \sim 1.4 \times 10^{-7}$ cm³/s for PA pulse intensities > 5 W/cm². The saturation level is compared with the theories of quantum mechanical unitarity and rogue dissociation.

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