Abstract Submitted
for the DAMOP07 Meeting of
The American Physical Society

Effects of resonant coupling on the formation of ultracold $^{85}Rb_2$ molecules H.K. PECHKIS, D. WANG, Y. HUANG, E.E. EYLER, P.L. GOULD, W.C. STWALLEY, Physics Department, University of Connecticut, USA, CHRISTIANE P. KOCH, Freie Universität Berlin, Institut für Theoretische Physik, Germany — We have studied the effect of resonant electronic state coupling on the formation of ultracold ground-state $^{85}Rb_2$. The ultracold Rb_2 are formed by photoassociation (PA) to the 0_u^+ state converging to the $5S + 5P_{1/2}$ limit, followed by radiative decay into high vibrational levels of the ground state, $X\ ^1\Sigma_g^+$. The populations of high-v levels of the X state are monitored by resonance-enhanced two- photon ionization through the $2\ ^1\Sigma_u^+$ state. We find that the populations of vibrational levels v"=112-116 are far larger than can be accounted for by the Frank-Condon factors for $0_u^+ \leftarrow X\ ^1\Sigma_g^+$ transitions. Further, the ground-state molecule population exhibits oscillatory behavior as the PA laser is tuned through a succession of 0_u^+ state vibrational levels. Both of these effects explained by a new calculation of transition amplitudes that includes the resonant character of the spin-orbit coupling of the two 0_u^+ states converging to the $5P_{1/2}$ and $5P_{3/2}$ limits. The resulting enhancement of more deeply bound ground-state molecule formation will be useful for future experiments on ultracold molecules. We also present the progress toward forming $^{85}Rb_2$ by photoassociation in an optical dipole trap using a CO_2 laser. This work is supported by the NSF.

H. K. Pechkis
Physics Department, University of Connecticut, USA

Date submitted: 06 Feb 2007 Electronic form version 1.4