Abstract Submitted
for the DAMOP10 Meeting of
The American Physical Society

Quantum control of the spin-orbit coupling interaction using the AC Stark effect[1] ERGIN AHMED, SONIA INGRAM, TEODORA KIROVA, OMER SALIHOGLU, YAFEI GUAN, Temple University, JOHN HUENNEKENS, Lehigh University, MARJATTA LYYRA, Temple University — The spin-orbit coupling plays an important role in the dynamics of excited states. It can cause natural mixing of potentials of different multiplicity leading to possible population exchange between them. Thus the ability to manipulate the degree of mixing of the multiplicity character opens up the possibility of exerting control on processes such as photodissociation and the rate of energy relaxation. It can be also applied to the preparation of spin switches, with potential application in quantum information storage or quantum information processing devices. Using a three laser excitation scheme in $^7Li_2$, we have demonstrated that AC Stark effect (Autler-Townes splitting) can be used to modify the mixing coefficients and thus the amount of singlet or triplet character of a pair of rovibrational G $^1\Pi_g$(v=12,J=21f)and $1^3\Sigma_g$(v=1,N=21f) states perturbed by the spin-orbit interaction. The singlet triplet pair of levels is naturally separated by an energy gap of 750 MHz. The AC Stark splitting is due to a strong laser that couples the singlet G $^1\Pi_g$(v=12,J=21f) state to rovibrational level in the $A^1\Sigma_u^+$ state.

[1]Supported by NSF grants PHY 0555608 and PHY 0855502

Marjatta Lyyra
Temple University

Date submitted: 22 Jan 2010 Electronic form version 1.4