Abstract Submitted
for the DAMOP14 Meeting of
The American Physical Society

Polarization-Dependent Measurements of Molecular Super Rotors with Oriented Angular Momenta MATTHEW J. MURRAY, CARLOS TORO, QINGNAN LIU, AMY S. MULLIN, Department of Chemistry and Biochemistry, University of Maryland, College Park, MD 20742 — Controlling molecular motion would enable manipulation of energy flow between molecules. Here we have used an optical centrifuge to investigate energy transfer between molecular super rotors with oriented angular momenta. The polarizable electron cloud of the molecules interacts with the electric field of linearly polarized light that angularly accelerates over the time of the optical pulse. This process drives molecules into high angular momentum states that are oriented with the optical field and have energies far from equilibrium. High resolution transient IR spectroscopy reveals the dynamics of collisional energy transfer for these super excited rotors. The results of this study leads to a more fundamental understanding of energy balance in non-equilibrium environments and the physical and chemical properties of gases in a new regime of energy states. Results will be presented for several super rotor species including carbon monoxide, carbon dioxide, and acetylene. Polarization-dependent measurements reveal the extent to which the super rotors maintain spatial orientation of high angular momentum states.

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Date submitted: 30 Jan 2014 Electronic form version 1.4