Abstract Submitted
for the DAMOP06 Meeting of
The American Physical Society

Direct Measurement of Dynamic Alignment in Strong Femtosecond Fields[1] KUN ZHAO, LEE N. ELBERSON, GETAHUN M. MENKIR, MARCUS LAICH, WENDELL T. HILL, III, Institute for Physical Science & Technology and Department of Physics, University of Maryland — Coulomb explosion imaging provides a unique window into molecular structure and dynamics on a timescale commensurate with intramolecular motion. This techniques combines the rapid removal of electrons from a molecular target, induced by intense ultrashort laser pulses, with position sensitive detection for coincidence capture of all fragments over 4π sr. We employed to measure the degree of dynamic alignment (the excess alignment beyond that due to geometric alignment) induced by linearly polarized, 100 fs pulses in the 10^{15} W/cm^2 intensity range. Exploiting circular polarization to turn off dynamic alignment a quantitative measure of the excess alignment was extracted from the relative atomic ion yields subsequent to Coulomb explosion in linearly and circularly polarized fields for several linear molecules (H_2, N_2, O_2 and CO_2). The degree of dynamic alignment was measured to be about 0.90 (H_2), 0.16 (N_2 and O_2) and 0.29 (CO_2). The anomalously large value of CO_2 implies a torque enhancement that we show is consistent with CO_2 interacting with the field longer than N_2 and O_2 prior to enhanced ionization. These results will be summarized and compared with other approaches and previous measurements.

[1]The work was supported by NSF.

Wendell T. Hill, III
Institute for Physical Science & Technology and Department of Physics, University of Maryland

Date submitted: 02 Feb 2006 Electronic form version 1.4