Abstract Submitted
for the DAMOP13 Meeting of
The American Physical Society

Ionization of Polar Atoms by Intense, Single-Cycle Fields[1] SHA LI, R.R. JONES, Department of Physics, University of Virginia, Charlottesville, VA —

We have employed intense, single-cycle THz pulses to explore the ionization of atomic Stark states as a function of the magnitude and direction of their permanent dipole moments. The presence of a permanent dipole moment can substantially influence strong field ionization dynamics in atoms and molecules and lead to directional asymmetries in electron emission. In our experiments, tunable dye lasers are used to excite Na atoms to Rydberg Stark states ($n \approx 10$) with well-defined permanent dipole moments in the presence of a static electric field. The atoms are then exposed to a single-cycle, THz pulse produced via tilted-pulse-front optical rectification of a 150fs, 780nm laser pulse in $LiNbO_3$. The ionization yield is recorded as a function of the THz field strength. The peak THz field strength required for ionization shows a pronounced variation among states with different dipole moments but with nearly identical binding energies. This orientation dependence can be attributed to diabatic population transfer between "uphill" and "downhill" oriented states and an asymmetry in the peak THz field strength in the forward and backward directions.

[1]This work was supported by the DOE Office of Science, Basic Energy Sciences, Chemical Sciences, Geosciences, and Biosciences Division.

Sha Li
Department of Physics, University of Virginia, Charlottesville, VA

Date submitted: 25 Jan 2013 Electronic form version 1.4