

DAMOP10-2010-000714

Abstract for an Invited Paper
for the DAMOP10 Meeting of
the American Physical Society

Exploration and Control of Molecular Dissociation in Strong Asymmetric Laser Fields¹

ROBERT JONES, Department of Physics, University of Virginia

Intense lasers can be effective tools for manipulating and probing coherent dynamics within atoms and molecules. Asymmetric laser fields, in which there is a pronounced, controllable difference in the peak amplitude in one direction over another, are particularly interesting in this regard. Such fields can be produced through carrier-envelope-phase stabilization of few-cycle laser pulses or by coherently combining even and odd harmonics of a laser pulse (e.g. with frequencies ω and 2ω). We have used such fields to explore asymmetric dissociation of multiply-charged homo- and hetero-nuclear diatomic and triatomic molecules. Robust high-contrast control over the emission direction of specific ion fragments is observed for target species with a variety of different molecular structures, suggesting a common dynamical mechanism. The phase, intensity, and pulse-duration dependence of the directional emission could provide new insight into the combined nuclear and electronic evolution, from the initial ionization step through expansion and subsequent ionization.

¹This work has been supported by the Chemical Sciences, Geosciences and Biosciences Division, Office of Basic Energy Sciences, Office of Science, U.S. Department of Energy.