Abstract Submitted
for the DAMOP16 Meeting of
The American Physical Society

Photodetachment dynamics in a strong single-cycle terahertz pulse[1] BAOCHUN YANG, FRANCIS ROBICHEAUX, Purdue Univ — We present theory and calculations for the photodetachment dynamics of negative ions driven by a single-cycle terahertz pulse. The photoelectron can follow two or more classical trajectories to arrive at a detector simultaneously, allowing the electron waves to interfere quantum mechanically. For negative hydrogen and fluorine ions, both the in-phase and antiphase interference oscillations are observed in the temporal electron flux recorded at a large distance (0.5m). As the terahertz pulse gets strong enough, an oscillatory photodetachment rate can be observed, which arises from the quantum interferences near the source region caused by the returning electron waves following three types of closed classical orbits. Our semiclassical formulas are proved to be quantitatively accurate by comparing with exact quantum simulations. The presented theory could also be generalized for other similar systems where the electron experiences an interaction with an applied electric-field driving pulse.

[1]This work was supported by the U.S. Department of Energy, Office of Science, Basic Energy Sciences, under Award No. DE-SC0012193.

Baochun Yang
Purdue Univ

Date submitted: 27 Jan 2016 Electronic form version 1.4