# Stony Brook University
# The Graduate School

Doctoral Defense Announcement

## Abstract

Molecular Strong Field Ionization

viewed with Photoelectron Velocity Map Imaging

By

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We present work on Molecular Strong Field Ionization, during which an electron is removed from polyatomic molecules in the presence of strong electric fields. This is a process which is the basis of a number of experimental techniques to uncover electronic dynamics in atoms and molecules on the femtosecond and attosecond timescale.
Above, 'strong' is used to refer to electric field strengths on the order of 10^11 V/m. These fields can be easily produced in the focus of femtosecond laser radiation, as is done in this work.
With the use of Velocity Map Imaging of the photoelectron in coincidence with the fragment ion, we are able to distinguish between multiple ionization-dissociation pathways. It is shown that as opposed to early attempts to model the process, multiple low-lying states are populated in the ion, revealing the significance of multielectron dynamics. Using a broadband ultrafast light source we also demonstrate control over which quantum states of the ion are populated by changing the laser pulse duration. We show that for pulses <10 fs, ionization pathways that involve motion of the nuclei are almost completely shut off.

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