

Abstract Submitted  
for the DAMOP17 Meeting of  
The American Physical Society

**Mechanisms and time-resolved dynamics for trihydrogen cation ( $\text{H}_3^+$ ) formation from organic molecules in strong laser fields** N. EKANAYAKE, M. NAIRAT, Department of Chemistry, Michigan State University, Michigan, USA, B. KADERIYA, P. FEIZOLLAH, B. JOCHIM, T. SEVERT, B. BERRY, KANAKA RAJU P., K. D. CARNES, S. PATHAK, D. ROLLES, A. RUDENKO, I. BEN-ITZHAK, J. R. Macdonald Laboratory, Department of Physics, Kansas State University, Kansas, USA, J. E. JACKSON, B. G. LEVINE, M. DANTUS, Department of Chemistry, Michigan State University, Michigan, USA — Strong-field laser-matter interactions often lead to exotic chemical reactions.  $\text{H}_3^+$  formation from organic molecules is one such case which requires multiple bonds to break and form. Here, we present the first experimental evidence for the existence of two different reaction mechanisms for  $\text{H}_3^+$  formation from organic molecules irradiated by a strong-field laser. The assignment of the two different mechanisms was accomplished through the strong-field ionization of methanol isotopomers, ethylene glycol, and acetone. Our findings are supported by femtosecond time-resolved measurements, coincidence measurements, and *ab initio* calculations with the most plausible transition states involved in the two mechanisms. This exotic chemical reaction is important as it shows that a strong laser field can not only selectively break multiple bonds but also can lead to the formation of multiple new bonds within an extremely short timescale, on the order of 100 femtoseconds. This work is supported by the U.S. Department of Energy under Grants DOE SISGR (DE-SC0002325) and DE-FG02-86ER13491.

N. Ekanayake  
Department of Chemistry, Michigan State University, Michigan, USA

Date submitted: 25 Jan 2017

Electronic form version 1.4