

Abstract Submitted  
for the DAMOP16 Meeting of  
The American Physical Society

**Three-dimensional momentum imaging of delayed dissociation of metastable molecular ions**<sup>1</sup> Y. MALAKAR, BETHANY JOCHIM, REID ERDWIEN, K. D. CARNES, W. L. PEARSON, A. RUDENKO, I. BEN-ITZHAK, J. R. Macdonald Laboratory, Department of Physics, Kansas State University, Manhattan, KS 66506 USA — Coincidence three-dimensional momentum imaging has been a powerful technique in studies of molecular fragmentation following ionization by ultrashort intense laser pulses, fast ion or electron impact, etc. On occasion, the fragmentation process of the intermediate molecular ion can be delayed by a significant fraction of the flight time to the detector due to the presence of metastable states. We focus on the signatures of delayed dissociation into an ion pair observed in coincidence spectra obtained using cold target recoil ion momentum spectrometry (COLTRIMS). Moreover, we present a method for recovering the complete 3D momenta of the dissociating fragments as well as the time delay of the dissociation. Laser-induced dissociation of hydrocarbon dications, for example  $\text{C}_2\text{H}_4^{2+} \rightarrow \text{H}^+ + \text{C}_2\text{H}_3^+$ , is used to demonstrate the method.

<sup>1</sup>Supported by the Chemical Sciences, Geosciences, and Biosciences Division, Office of Basic Energy Sciences, Office of Science, U. S. Department of Energy.

Bethany Jochim  
J. R. Macdonald Laboratory, Department of Physics, Kansas State University, Manhattan, KS 66506 USA

Date submitted: 29 Jan 2016

Electronic form version 1.4