

Abstract Submitted  
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**Separating sequential from concerted three-body fragmentation of molecules**<sup>1</sup> T. SEVERT, JYOTI RAJPUT, BEN BERRY, BETHANY JOCHIM, PEYMAN FEIZOLLAH, KANAKA RAJU P., M. ZOHRABI, U. ABLIKIM, FARZANEH ZAIEE, BALRAM KADERIYA, D. ROLLES, A. RUDENKO, K. D. CARNES, B. D. ESRY, I. BEN-ITZHAK, J.R. Macdonald Laboratory, Physics Department, Kansas State University, Manhattan, KS 66506, USA — The ability to disentangle three-body sequential from concerted fragmentation events has been a long-standing endeavor when imaging molecular dynamics. Here, we study the multiphoton dissociative ionization of OCS to  $O^+ + C^+ + S^+$  via two sequential pathways involving either a metastable  $CS^{2+}$  or  $CO^{2+}$  molecule. To separate sequential events, we transform to the center-of-mass frame of the rotating intermediate dication and compute the angle  $\gamma$  between the  $C^+$  and the dication's center of mass momenta. When the lifetime of the intermediate fragment is much larger than its rotational period, the  $N(\gamma)$  distribution is expected to be uniform, which can be used to extract sequential events. Improving on previously proposed methods, we exploit the uniformity of  $N(\gamma)$  allowing events hidden by concerted breakup to be retrieved, leading to the separation of both sequential channels from the concerted events. Therefore, any spectra can be created showing either the sequential-only or concerted-only contribution to the breakup.

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Travis Severt  
Kansas State University

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