Abstract Submitted
for the DAMOP14 Meeting of
The American Physical Society

Angle-resolved studies of strong-field ionization and hydrogen elimination from ethylene and ethane[1] A. VOZNYUK, D. SCHMITZ, J. MAHOWALD, E. WELLS, Department of Physics, Augustana College, Sioux Falls, SD 57197 USA, M. ZOHRABI, B. JOCHIM, K.J. BETSCH, N.G. KLING, U. ABLIKIM, T. SEVERT, B. BERRY, K.D. CARNES, I. BEN-ITZHAK, J.R. Macdonald Laboratory, Kansas State University, Manhattan, KS 66506 USA, R. SIEMERING, M.F. KLING, R. DE VIVIE-RIEDLE, Ludwig Maximillian University, Munich, Germany — Intense few-cycle laser pulses are used to ionize C_2D_4 and C_2D_6 and stimulate dissociation into $C_2D_3^+$ + D and $C_2D_5^+$ + D, respectively. Velocity map imaging of the ionized fragment ions allows examination of the angular dependence of these processes. In the ethylene example, calculations show that the HOMO, LUMO, and HOMO-1 orbitals are strongly distorted along the C-D bond direction, leading to the creation of a Rydberg orbital near the deuterium atom. The tunneling ionization probability from the Rydberg orbital is high, explaining the experimental observation of enhanced fragmentation along the C-D bond direction. Similar calculations for ethane show qualitative agreement with the measured angular distributions of $C_2D_5^+$ fragments. This link between molecular structure, tunneling ionization, and imaging detection can be useful for image-based adaptive control experiments.

[1]Augustana College personnel are supported by NSF grants PHY-0969687 and EPS-0903804 while JRML is supported by the Chemical Sciences, Geosciences, and Biosciences Division, Office of Basic Energy Science, Office of Science, US Department of Energy

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Date submitted: 31 Jan 2014 Electronic form version 1.4