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**Strong-field control of $H_3^+$ formation pathways in methanol: Local versus extended $H_2$ roaming**[1] NAOKI IWAMOTO, CHARLES J. SCHWARTZ, J.L. NAPIERALA, S.N. TEGEGN, A. SOLOMON, S. ZHAO, E. WELLS, Department of Physics, Augustana University, Sioux Falls, SD 57197 USA, BETHANY JOCHIM, KANAKA RAJU P., T. SEVERT, PEYMAN FEIZOLLAH, H. LAM, TOMTHIN NGANBA WANGJAM, V. KUMARAPPAN, K.D. CARNES, I. BEN-ITZHAK, J.R. Macdonald Laboratory, Department of Physics, Kansas State University, Manhattan, KS 66506 USA — Using the $CD_3OH$ isotopologue of methanol, the ratio of $D_2H^+$ to $D_3^+$ formation is manipulated by changing the characteristics of the intense laser pulse. Formation of $D_2H^+$ indicates a process involving two hydrogen atoms from the methyl side of the target and a proton from the hydroxyl side, while detection of $D_3^+$ indicates direct formation involving only the methyl group. An adaptive control strategy that employs image-based feedback to guide the learning algorithm results in an enhancement of the $D_2H^+/D_3^+$ ratio by a factor of approximately two. The optimized pulses have time structures on the order of 100 fs. Systematic changes to the linear chirp and higher order dispersion terms of the laser pulse are compared to the results obtained with the optimized pulse shapes.

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Eric Wells
Augustana University

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