Identifying isotopic effects in intense ultrafast laser-driven $D_2H^+$ fragmentation\(^1\) K.D. CARNES, A.M. SAYLER, J. MCKENNA, B. GAIRE, NORA G. KLING, B.D. ESRY, I. BEN-ITZHAK, J.R. Macdonald Laboratory, Physics Department, Kansas State University, Manhattan, Kansas 66506 — The tri-atomic hydrogen molecular ion is instrumental as a benchmark toward understanding the strong-field dynamics of polyatomic molecules. Using a crossed-beams coincidence three-dimensional momentum imaging method, we demonstrate clear isotopic effects in the fragmentation of $D_2H^+$ induced by 7 fs (40 fs), 790 nm laser pulses at an intensity of $10^{16}$ W/cm\(^2\) ($5 \times 10^{15}$ W/cm\(^2\)). Our experiment uniquely separates all fragmentation channels and provides kinematically complete information for the nuclear fragments. We show that for dissociative ionization of $D_2H^+$ there is a large difference in branching ratios of the two-body channels, where $H^++D_2^+$ dominates $D^++HD^+$, and the three-body channels, where $H^++D^++D$ dominates $D^++D^++H$. In contrast, the dissociation channels display minimal differences.

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