Abstract Submitted
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Ultrafast nuclear dynamics in halomethanes studied with time-resolved Coulomb explosion imaging and channel-selective Fourier spectroscopy[1] Y. MALAKAR, B. KADERIYA, W.L. PEARSON, F. ZIAEE, KANAKA RAJU P., M. ZOHRABI, K. JENSEN, J. RAJPUT, I. BEN-ITZHAK, D. ROLLES, A. RUDENKO, J.R.Macdonald Laboratory, Kansas State University — Halomethanes have recently attracted considerable attention since they often serve as prototype systems for laser-controlled chemistry (e.g., selective bond breaking or concerted elimination reactions), and are important molecules in atmospheric chemistry. Here we combine a femtosecond laser pump-probe setup with coincident 3D ion momentum imaging apparatus to study strong-field induced nuclear dynamics in methane and several of its halogenated derivatives (CH_3I, CH_2I_2, CH_2ICl). We apply a time-resolved Coulomb explosion imaging technique to map the nuclear motion on both, bound and continuum potential surfaces, disentangle different fragmentation pathways and, for halogenated molecules, observe clear signatures of vibrational wave packets in neutral or ionized states. Channel-selective and kinetic-energy resolved Fourier analysis of these data allows for unique identification of different electronic states and vibrational modes responsible for a particular structure.

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