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Time-resolved imaging of laser-induced vibrational wave packets in neutral and ionic states of iodomethane[1] Y. MALAKAR, B. KADERIYA, M. ZOHRABI, W.L. PEARSON, F. ZIAEE, KANANKA RAJU P., I. BEN-ITZHAK, D. ROLLES, A. RUDENKO, J.R.Macdonald Laboratory, Kansas State University — Light-driven vibrational wave packets play an important role in molecular imaging and coherent control applications. Here we present the results of a pump-probe experiment characterizing laser-induced vibrational wave packets in both, neutral and ionic states of CH_3I (iodomethane), one of the prototypical polyatomic systems. Measuring yields and kinetic energies of all ionic fragments as a function of the time delay between two 25 fs, 800 nm pump and probe pulses, we map vibrational motion of the molecule, and identify the states involved by channel-resolved Fourier spectroscopy. In the Coulomb explosion channels we observe features with ˜130 fs periodicity resulting from C-I symmetric stretch (ν_3 mode) of the electronically excited cationic state. However the Fourier transform of the low-energy I^+ ion yield produced by the dissociative ionization of CH_3I reveals the signatures of the same vibrational mode in the ground electronic states of both, neutral and cation, reflected in 65-70 fs oscillations. We observe the degeneration of the oscillatory structures from the cationic states within ˜2 ps and discuss most likely reasons for this behavior.

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