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Dissociation and ionization of HD^+ in intense few-cycle laser pulses[1] P. Q. WANG, A. M. SAYLER, V. ROUDNEV, B. GAIRE, NORA G. JOHNSON, M. LEONARD, E. PARKE, K.D. CARNES, B. D. ESRY, I. BEN-ITZHAK, J. R. Macdonald Laboratory, Physics Department, Kansas State University, Manhattan KS 66506 — All the dissociation and ionization channels of an HD^+ molecular ion beam exposed to intense laser fields, namely H^++D, D^++H and H^++D^+, have been studied simultaneously using a 3D coincidence momentum imaging method. These breakup channels are experimentally separated from each other. The laser pulse durations are from about 8 fs up to those comparable to the dissociation time scale of the molecule, with a wavelength of 790 nm and an intensity range of 10^{13}-10^{15} W/cm^2. The focus of this study is on the phenomena in few-cycle laser pulses. The 3D momentum of each fragment is retrieved from its position and time signals, which provides angular and kinetic energy release spectra for each breakup channel. The dissociation of HD^+ is found to be governed by bond-softening and above threshold dissociation, depending on the laser intensity. The ionization of HD^+ is strongly aligned along the laser polarization and has a broad kinetic energy distribution which shifts to higher values at higher intensity.

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