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Interplay between Electronic and Nuclear Motion in the Photodouble Ionization of H_2 T.J. REDDISH, University of Windsor, J. COLGAN, Los Alamos National Laboratory, P. BOLOGNESI, L. AVALDI, CNR-IMIP (Rome), M. GISSELBRECHT, M. LAVOLLÉE, LIXAM, CNRS-Université Paris Sud, M.S. PINDZOLA, Auburn University, A. HUETZ, LIXAM, CNRS-Université Paris Sud — Photodouble ionization of molecular hydrogen results in a "Coulomb explosion," as the two protons rapidly separate in opposite directions. The internuclear distance, R, between the two nuclei at the instant of photodouble ionization can be accessed through the kinetic energies of the emitted protons. A systematic analysis of the variation with R of the fully differential cross section (FDCS) for this process is presented for a geometry where the 4-body interaction is completely probed. Dramatic variations in the FDCS with different R are observed for geometries where the molecule is at approximately 20° to the polarization axis. Excellent agreement is found between experiment and Time-Dependent Close-Coupling theory after convolution of the latter over the relevant solid angles. We show that the observed variations are purely due to the ε_Σ component of the polarization vector ε along the molecular axis and a physical interpretation is proposed by analogy with single ionization of H_2^+, where similar variations in the angular distributions of the outgoing electron are found as a function of R.

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