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Probing Vibrational and Dissociative Wavepacket Dynamics in H_2 and D_2 Molecules with Ultra Short Laser Pulses[1] ALI ALNASER, B. ULRICH, X.-M. TONG, C.M. MAHARJAN, P. RANITOVIC, T. OSIPOV, R. ALI, B. SHAN, Z. CHANG, C.D. LIN, I.V. LITVINYUK, C.L. COCKE, J. R. MACDONALD LABORATORY, PHYSICS DEPARTMENT, KANSAS STATE UNIV., MANHATTAN, KS, 66506 TEAM — We have used ultra short laser pulses of 8fs duration in pump- probe arrangement to probe fast wavepacket dynamics in H_2 (D_2) molecules. A vibrational wave packet is launched onto the $1s\sigma_g$ potential curve of the singly charged molecule by the (tunneling) removal of one electron from the neutral molecule. By choosing the proper laser intensities for the pump and the probe pulses, we were able to monitor the simultaneous propagation of this wave packet on the (coupled) $1s\sigma_g$ (bound) and $2p\sigma_u$(dissociative) potential curves of H_2^+ and D_2^+ over a time delay of 0-100 fs between the two pulses. We used the COLTRIMS technique to measure the kinetic energy release (KER) of the proton (deuteron) pairs produced in the Coulomb explosion of these molecules as function of time. A quantitative model has been constructed which accounts for the major features observed in the experiment.

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