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Asymmetric momentum distribution of d+H and p+D in the dissociation of HD^+ by ultrashort laser pulses[1] FATIMA ANIS, B.D. ESRY, J. R. Macdonald Laboratory, Dept. of Physics, Kansas State University — Many observables depend on the carrier-envelope phase (CEP) of an ultrashort laser pulse in the interaction of atoms and molecules with these pulses. One important observable is the asymmetry of the fragments in molecular dissociation, e.g. H_2^+, HD^+ and D_2^+. Unlike H_2^+ and D_2^+, where the CEP gives an asymmetry in the momentum distribution of the p+H fragments, in HD^+ the CEP controls not only the asymmetry in the momentum distribution for each channel, p+D and d+H, but also the branching ratios to these channels. To calculate the momentum distribution, we solved the time-dependent Schrödinger equation for HD^+ in the Born-Oppenheimer representation including all nuclear and electronic degrees of freedom for the molecular dissociation. To ensure the correct dissociation limit and dynamics, non-Born-Oppenheimer terms are essential for HD^+. Advancements in experimental techniques have made differential measurement of the momentum distribution for both channels of HD+ possible. Thus, our theoretical results can, in principle, be directly compared to experiment.

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