

Abstract Submitted  
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**Pump-probe studies of fragmentation of a fast HD<sup>+</sup> beam** M. ZOHRABI, BEN BERRY, T. SEVERT, BETHANY JOCHIM, PEYMAN FEIZOLLAH, KANAKA RAJU P., JYOTI RAJPUT, K. D. CARNES, B. D. ESRY, I. BEN-ITZHAK, J. R. Macdonald Laboratory, Physics Department, Kansas State University — Studies of fast molecular ion beams in strong-field ultrafast lasers are of particular interest for benchmark molecules, like H<sub>2</sub><sup>+</sup>, H<sub>3</sub><sup>+</sup> and HeH<sup>+</sup>. However, the low target density of a typical ion beam puts severe limits on studies of the time evolution through the implementation of the pump-probe technique. We have recently conducted a first-of-its-kind NIR-pump – NIR-probe measurement on a few-keV HD<sup>+</sup> beam target. Specifically, the first pulse initiates the dissociation of the HD<sup>+</sup>, while the second ionizes the molecule during its dissociation. We have observed enhancement in the ionization yield of the dissociating wave packet at about 24 and 200 fs, corresponding to internuclear distances estimated classically to be about 15 and 85 a.u., respectively. The unexpected enhancement at very large internuclear separation has not been previously observed in pump-probe studies of neutral hydrogen molecules.

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Itzhak Ben-Itzhak  
Kansas State Univ

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