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Absence of permanent dipole transitions in HD^+ strong-field dissociation[1] B. GAIRE, J. MCKENNA, A.M. SAYLER, NORA G. JOHNSON, M. ZOHRABI, K.D. CARNES, B.D. ESRY, I. BEN-ITZHAK, J.R. Macdonald Laboratory, Department of Physics, Kansas State University — One of the important questions in strong-field molecular physics is: *what is the role of the permanent electric dipole moment of heteronuclear molecules in dissociation?* Recently Kiess *et al.* [Phys. Rev. A **77**, 053401 (2008)] reported the first exciting evidence for direct two-photon dissociation of an HD^+ beam involving its permanent dipole moment, using 790 nm, 100 fs laser pulses. However, the measurement was hampered by the fact that the H^+(H) and D^+(D) fragments could not be well resolved. Using coincidence 3D-momentum imaging we clearly separate and distinguish all fragments in our measurement. Thus, it allows us to determine that the small peak observed and assigned to two-photon dissociation by Kiess *et al.* is instead due to strong bond-softening in the one-photon dissociation. We find no evidence to support the elusive direct two-photon dissociation at 790 nm in the intensity range 5×10^{12} – 2×10^{15} W/cm^2.

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Bishwanath Gaire
J.R. Macdonald Laboratory, Dept of Physics, Kansas State University

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