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Strong-Field Molecular Ionization: Suppression Induced by Dimensionality[1] YOULIANG YU, BRETT ESRY, J. R. Macdonald Laboratory, Kansas State University, Manhattan, Kansas, 66506 — For highly non-perturbative strong-field dynamics such as tunneling ionization induced by a long-wavelength laser field, reduced-dimensional models are tempting when it comes to numerically solving the time-dependent Schrödinger equation (TDSE). Although such models can often be useful for qualitative predictions, their validity should always be examined. We study the impact of dimensionality for strong-field molecular ionization by solving the TDSE for H_2^+ with both a one-dimensional model and a full-dimensional Hamiltonian. We observe in both cases that the fixed-R ionization yield is suppressed relative to the atomic yield to fairly large internuclear distances for a range of laser wavelengths. Similar observations of suppression at 800 nm have been explained as frustrated tunneling ionization. Surprisingly, we find that the suppression is much stronger in one dimension than in three with the result that the one-dimensional ionization yield asymptotes to within 1% of the atomic yield only when R approaches about 250 a.u. for 800 nm. In three dimensions, this agreement is reached already at R=90 a.u. We will explore these and other dependencies on dimensionality for this problem.

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