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(I) Signatures of light-induced potential energy surfaces in H2+ - beyond conical intersections

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H2 continues to provide fundamental insights into the mechanisms of intense light-matter interactions [1]. Recently, there has been significant interest in so-called light-induced conical intersections (LICI) that arise from the angle dependence of the single-photon coupling of electronic states. Analogously to regular conical intersections, electronic and nuclear motions are strongly coupled in the vicinity of LICIs. As a signature of such rovibronic dynamics, weak modulations in the angular distribution of protons emitted from H2+ have been reported [2]. More generally speaking, infrared (IR) laser pulses couple the 1sσg and 2pσu electronic states of H2+ typically through several pathways involving an odd number of photons [1], which can produce complex light-induced potential energy landscapes, and consequently even richer dynamics.
In this talk we will present theory and experiment to show that the full complexity of such light-induced potential energy surfaces can be uncovered using a two-step scheme [3]. In this scheme a few cycle optical pulse projects a coherent wavepacket onto the ionic state of H2 and a weak, non-ionizing, mid-infrared, and perpendicularly polarized pulse creates the light-induced potential energy landscapes upon which the H2+ wavepacket can propagate. We observe a strongly modulated angular distribution of protons which has escaped prior observation. These modulations result directly from ultrafast dynamics on the light-induced molecular potentials and can be modified by varying the amplitude, duration and phase of the mid-infrared dressing field.

[1] H. Ibrahim, C. Lefebvre, A.D. Bandrauk, A. Staudte and F. Légaré. J. Phys. B 51, 042002 (2018).
[2] A. Natan, M.R. Ware, V.S. Prabhudesai, U. Lev, B.D. Bruner, O. Heber, and P.H. Bucksbaum, Phys. Rev. Lett. 116, 143004 (2016).
[3] M. Kübel, M. Spanner, Z. Dube, A.Yu. Naumov, S. Chelkowski, A.D. Bandrauk, M.J.J. Vrakking, P.B. Corkum, D.M. Villeneuve, and A. Staudte. Nature Communications 10, 1042 (2019).

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