Abstract Submitted
for the DAMOP15 Meeting of
The American Physical Society

Probing calculated O_2^+ potential curves with an XUV–IR pump–probe experiment[1] PHILIPP COERLIN, Max-Planck Institute fuerKernphysik, Heidelberg, ANDREAS FISCHER, MICHAEL SCHOENWALD, ALEXANDER SPERL, TOMOYA MIZUNO, Max-Planck Institute fuer Kernphysik, Heidelberg, THOMAS PFEIFER, ROBERT MOSHAMMER, Max-Planck Institute fuerKernphysik, Heidelberg, UWE THUMM, Kansas State Universoty — We study dissociative photo-ionization of O_2 in a kinematically complete XUV–IR pump–probe experiment, preparing a vibrational wave packet in the potential of the binding $O_2^+(a\,^4\Pi_u)$ state by ionization with a single XUV photon. After a variable time–delay the wave packet is promoted to the repulsive $O_2^+(f\,^4\Pi_g)$ state by a weak IR probe pulse. Comparing the results of a coupled–channel simulation with the experimental kinetic–energy-release and quantum–beat spectra, we are able to discriminate between the adiabatic O_2^+ potential–energy curves (PECs) calculated by Marian et al., Mol. Phys. 46, 779 (1982) and Magrakvelidze et al., Phys. Rev. A 86, 023402 (2012). The overall agreement between simulated and experimental results is good; however, not all features of the experimental spectra could be reproduced using these PECs. Using a Morse potential adjusted to the experimental data instead, most features of the experimental spectra are well reproduced by our simulation. This optimized Morse potential is remarkably similar to the theoretically predicted PECs, demonstrating the sensitivity of our experimental method to small changes in the shape of the binding potential.

[1]Supported by the DoE, NSF, and Alexander von Humboldt foundation.

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Date submitted: 29 Jan 2015 Electronic form version 1.4