Complementary Imaging of the Nuclear Dynamics in Laser-Excited Diatomic Molecular Ions in the Time and Frequency Domains

ALEX KRAMER, Drake University, M. MAGRAKVELIDZE, NWMSU, K. BARTSCHAT, Drake University, U. THUMM, KSU — We investigated the bound and dissociative nuclear motion of vibrationally excited diatomic molecular by numerically calculating fragment-kinetic-energy-release spectra in the time and frequency domains. While the time-domain analysis shows nuclear oscillation periods, revival times, and the nuclear-probability-density evolution, quantum-beat (QB) imaging of the bound nuclear motion in the frequency domain complements time-domain investigations of the nuclear dynamics by revealing (i) QB frequencies and the nodal structure of vibrational states within a given adiabatic molecular potential curve and (ii) laser-electric-field-dressed molecular potential curves [1]. Our study of the variances and uncertainty products indicates increasing classical characteristics of the nuclear wave packet motion and fine-structure effects for increasingly massive dimers [2].


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