Abstract Submitted
for the DAMOP10 Meeting of
The American Physical Society

Multi-dimensional quantum-beat spectroscopy of the rotational-vibrational dynamics in D_2^+[1] UWE THUMM, Kansas State University, MARTIN WINTER, MPI-KS, Dresden, RUEDIGER SCHMIDT, TU Dresden — The ionization of D_2 in a short and intense laser pulse generates a rotational-vibrational (RV) nuclear wave packet in D_2^+. By solving the time-dependent Schrödinger equation in full dimensionality, we simulate the coherent evolution of such wave packets and discuss their ro-vibrational dynamics. Within a harmonic time-series analysis of the evolving nuclear probability density [1], we characterize the RV dynamics in D_2^+ in an external intense linearly polarized infrared laser field in terms of quantum-beat (QB) spectra in which both, the internuclear distance and molecular orientation relative to the linearly polarized laser field are resolved. Based on numerical examples for the nuclear dynamics without and under the influence of pulsed and continuum-wave (cw) laser light, we discuss and quantify the signature of RV couplings in QB spectra [2] and to what extent the quantum-beat analysis of measured time-dependent fragment kinetic energy release spectra is expected to image the laser-dressed RV structure of D_2^+.

[1] U. Thumm *et al.*, Phys. Rev. A **77** 063401 (2008).
[2] M. Winter *et al.*, Phys. Rev. A **80** 063401(R) (2009).

[1]Supported by the US DOE and NSF.

Uwe Thumm
Kansas State University

Date submitted: 21 Jan 2010 Electronic form version 1.4