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**Quantum-beat Spectroscopy of Molecular Dynamics in Ultrashort Laser Fields** UWE THUMM, Kansas State University, THOMAS NIEDERHAUSEN, Kansas State University (now University of Madrid), BERNOLD FEUERSTEIN, THORSTEN ERGLER, ARTEM RUDENKO, ROBERT MOSHAMMER, JOACHIM ULLRICH, Max-Planck Inst. fuer Kernphysik, Heidelberg — Reaction Microscope-based, complete, and time-resolved Coulomb explosion imaging of vibrating and dissociating $D_2^+$ molecules with femtosecond time-resolution allowed us to perform an internuclear distance (R-)dependent Fourier analysis of the corresponding wave packets. Our wave packet propagation calculations demonstrate that the obtained two-dimensional R-dependent frequency spectra enable the complete characterization of the wave packet dynamics and directly visualize the field-modified molecular potential curves in intense, ultrashort laser pulses, cf., Phys. Rev. Lett. **99** 153002 (2007) and Phys. Rev. A **77**, 063401 (2008).

Uwe Thumm

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