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Laser Induced Electron Diffraction A. STAUDTE, NRC, M. MECKEL, Frankfurt University, D. COMTOIS, INRS-EMT, D. ZEIDLER, D. PAVICIC, NRC, H. BANDULET, H. PEPIN, J.C. KIEFFER, INRS-EMT, R. DOERNER, Frankfurt University, D.M. VILLENEUVE, P.B. CORKUM, NRC — If a molecule is subjected to a strong, infrared laser field usually an electron from the Highest Occupied Molecular Orbital (HOMO) will tunnel into the continuum. Due to the oscillating laser field a temporally confined electron wavepacket is created and quickly accelerated away from the parent ion. However, some portion of this electron wavepacket will be swept back over the parent molecule once before departing. This laser driven electron scattering off its parent molecule is believed to be a useful method to determine molecular structure through electron diffraction. We have used COLTRIMS to measure the three-dimensional electron momentum distribution of aligned O_2 and N_2 molecules singly ionized by an intense laser pulse. We find that the low energy part of the electron spectrum carries the fingerprint of the HOMO. In the high energy part of the 3D electron spectrum we identify the first fingerprint of laser induced electron diffraction. Using a simple classical trajectory model we achieve a good agreement with the experiment. The method can be possibly extended to more complex molecules since the interference fringes are largely insensitive to the symmetry of the HOMO of the molecule and thus only reflect the internuclear separation.

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