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Strong-field dissociation dynamics of NO^{2+}: A multiphoton electronic or vibrational excitation?[1] BETHANY JOCHIM, M. ZOHRABI, U. ABLIKIM, B. GAIRE, F. ANIS, K.D. CARNES, B.D. ESRY, I. BEN-ITZHAK, J. R. Macdonald Laboratory, Department of Physics, Kansas State University, Manhattan, KS 66506 USA, E. WELLS, Department of Physics, Augustana College, Sioux Falls, SD 57197 USA, T. UHLÍKOVÁ, Department of Analytical Chemistry, Institute of Chemical Technology, Prague, Czech Republic — We utilize a 3-D momentum imaging technique to study laser-induced dissociation of a metastable NO^{2+} beam into $N^+ + O^+$. Using an estimated initial vibrational population, measured kinetic energy release and angular distribution spectra, and time-dependent Schrödinger equation calculations, we identify the most likely dissociation pathways. While lower intensity pulses ($<10^{15}$ W/cm^2) drive perpendicular transitions between the lowest two electronic states, for higher intensity pulses ($\sim 10^{16}$ W/cm^2), dissociation parallel to the laser polarization becomes prominent. Contrary to commonly-held intuition that electronic transitions always prevail, we find that the dominant process underlying this highly-aligned feature is a multiphoton permanent dipole transition solely within the electronic ground state, leading to its continuum.

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