Strong-field dissociation dynamics of NO$^{2+}$: A multiphoton electronic or vibrational excitation? BETHANY JOCHIM, E. WELLS, Augustana College, M. ZOHRABI, B. Gaire, U. ABULIKEMU, K.D. CARNES, B.D. ESYR, I. BEN-ITZHAK, Kansas State University — A 3-D momentum imaging technique is employed to study intense ultrafast laser-induced dissociation of a metastable NO$^{2+}$ beam. We focus on N$^+$ + O$^+$ coincidences and explore possible dissociation pathways using estimates of the initial vibrational population and transition rates between the X $^2\Sigma^+$ and A $^2\Pi$ states together with kinetic energy release and angular distribution spectra. Our analysis suggests that lower intensity pulses ($<10^{15}$ W/cm$^2$) drive perpendicular transitions between these states. Higher intensity pulses ($\sim10^{16}$ W/cm$^2$), on the other hand, yield a prominent contribution from molecules breaking parallel to the polarization. While the results are preliminary, an intriguing possibility is that this feature is due to a direct 2-photon transition to the vibrational continuum of the X $^2\Sigma^+$ state, i.e., a multiphoton vibrational excitation on the electronic ground state.

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