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Vibrationally-resolved structure in O_2^+ dissociation by intense ultrafast laser pulses M. ZOHRABI, J. MCKENNA, SANKAR DE, B. GAIRE, MAIA MAGRAKVELIDZE, IRINA BOCHAROVA, K.D. CARNES, I.V. LITVINYUK, C.L. COCKE, B.D. ESRY, I. BEN-ITZHAK, J.R. Macdonald Laboratory, Physics Department, Kansas State University — One of the common aspects of intense laser experiments performed on molecules is the lack of vibrational structure in their dissociation spectra. In fact, as far as we are aware, the only observation of vibrational structure has been in ion-beam experiments for the simplest molecule, H_2^+. It is less intuitive to expect to see vibrationally resolved structure in the larger diatomic molecules. In this talk we report a measurement that shows the first observation of vibrational structure in the dissociation of a massive molecule, O_2^+. To demonstrate the persistent nature of this structure, we measure the dissociation spectra from both an O_2^+ ion beam target and also by initially ionizing O_2 with a laser pulse, which also drives the dissociation of the daughter O_2^+. Thus, our measurements encompass both types of target: O_2^+ populated with an incoherent and coherent ensemble of vibrational states. Supported by the Chemical Sciences, Geosciences and Biosciences Division, Office of Basic Energy Sciences, Office of Science, U.S. Department of Energy.

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