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Dynamic imaging a relaxed chemical bond using Infrared laser pulses JUNLIANG XU, J.R. Macdonald Lab, Physics Department, Kansas State University, Manhattan, KS 66506, COSMIN I. BLAGA, ANTHONY D. DICHIARA, EMILY SISTRUNK, KAIKAI ZHANG, PIERRE AGOSTINI, LOUIS F. DIMAURO, Physics Department, The Ohio State University, Columbus, OH 43210, CHII-DONG LIN, J.R. Macdonald Lab, Physics Department, Kansas State University, Manhattan, KS 66506 — According to the quantitative rescattering (QRS) theory, the high-energy ATI (HATI) electron spectra from a molecule M can be used to extract the backscattering differential cross section (DCS) for e^-+M^+ collisions. In this talk, we will present our analysis of experimental HATI data with MIR lasers for N_2 and O_2. The N-N bond length retrieved from the HATI spectra agrees with that for N_2 to within 5%. For $O_2$the retrieved bond length is consistently much smaller than the known O-O bond length, 1.21Å. Instead, it is much closer to the bond length of O_2^+, 1.12Å. We interpret this result in terms of bond relaxation of O_2 following tunneling ionization. O_2^+ has a vibrational period of 17 fs while the returning time for a 2000 nm laser is about ∼5-6 fs, thus allowing the two O atoms to relax from its initial separation of 1.21 Å to the new separation of 1.12 Å of O_2^+.

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