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Visualizing electron rearrangement in space and time during the transition from a molecule to atoms[1] AGNIESZKA JARON-BECKER, JILA and Department of Physics, University of Colorado, 440 UCB, Boulder, CO 80309-0440, WEN LI, Department of Chemistry, Wayne State University, Detroit, MI 4802, CRAIG W. HOGLE, VANDANA SHARMA, XIBIN ZHOU, HENRY C. KAPTEYN, MARGARET M. MURNANE, ANDREAS BECKER, JILA and Department of Physics, University of Colorado, 440 UCB, Boulder, CO 80309-0440 — Imaging and controlling reactions in molecules and materials at the level of electrons is a grand challenge in physics and chemistry. Using reaction microscope techniques along with calculations using the strong-field approximation, we show that we can capture the entire valence shell electron density in a molecule as a molecular bond breaks. To this end, we use an intense ultrashort laser pulse to ionize a Bromine molecule at different times during dissociation. The total ionization signal and the angular distribution of the ion yields is observed. Our results show that both signals vary strongly over a surprisingly long time after the start of the dissociation process.

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