

APPLYING XUV SPECTROSCOPY TO OBSERVE SPIN-ORBIT STATE DEPENDENCE ON STRONG-FIELD IONIZATION

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Strong-field ionization (SFI) has become a major workhorse of modern ultrafast spectroscopy and appears at the very heart of the high-harmonic generation process that is responsible for the production of extreme ultraviolet (XUV) laser pulses. When SFI is synchronized to another laser pulse through the pump-probe technique, this attosecond process can be used to arrest the intermediates of ultrafast photochemical reactions as well as explore the electronic structure of both atoms and molecules. In this talk, I will highlight our recent results where XUV transient absorption spectroscopy is used to measure the angular distributions of singly and doubly tunnel-ionized xenon atomic states via 4d core to 5p valence shell transitions between 55 and 60 eV. Orbital alignment measurements and theory are used to examine the role of electron correlation during atomic strong-field double ionization. The experimental M_J alignment distributions are compared to results of a rate-equation model based on sequential ionization and are now applied to account for the alignment prepared by tunneling ionization. The incredible energy and time resolution afforded through XUV spectroscopy is utilized to reveal entirely new information about the strong-field ionization mechanism, including new details about contrasting ionization timescales and orbital alignment of different spin-orbit states. The electron dynamics that operate during tunneling ionization reveal details about electron correlation that are fundamentally important for understanding light-matter interaction.