GENERATION AND STUDY OF FEW-FEMTOSECOND VIBRATIONAL WAVE-PACKETS VIA STRONG-FIELD IONIZATION

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Strong-field ionization (SFI) using ultrashort, high-intensity laser pulses presents a unique opportunity for studying dynamics of molecular systems given its capability to generate coherent vibrational and electronic motion. Furthermore, the very interaction that drives the tunneling ionization is at the root of high harmonic generation of extreme ultraviolet light (XUV). Our homebuilt XUV spectrometer is uniquely suited to utilize SFI to study coherent, vibrational wave-packets of small molecules in the gas phase given its ability to observe transitions from localized core shells to delocalized valence shells to glean information about their larger molecular systems (e.g. oxidation state, spin state, magnetic quantum number, and local bonding environment). Its temporal resolution provides the capability to observe electronic motion and vibrational coherences that occur on the few-femtosecond time period. This presentation will focus on the techniques for generating few-cycle XUV pulses and our preliminary computational and experimental results on the dynamics and mechanisms behind the SFI of simple gas phase systems of fundamental importance for understanding light-matter interactions.