Over the past two decades, the tailoring of a light field for manipulating the dynamics of a system at the quantum level has taken a prevalent role in modern atomic, molecular and optical physics. As first described by L. V. Keldysh, the ionization of an atom by an intense laser field will evolve depending upon the light characteristics and atomic binding energy. Numerous experiments have systematically investigated the dependence of the intensity and pulse duration on the ionization dynamics. However, exploration of the wavelength dependence has been mainly confined to wavelengths near 1 µm, or in the language of Keldysh to the multiphoton or mixed ionization regime. It is technically possible to perform more thorough tests the strong-field limit (tunneling), and exploit the scaling laws at wavelengths greater than 1 µm. In addition, wavelength tuning in the visible region is uncovering a universal “interferometric” behavior that was missed at fixed frequency.

This new perspective on strong-field interactions is driving a renewed interest in the fundamental physics and a renaissance in applications. This talk will examine the implication of the strong-field scaling as it pertains to the production of energetic particles, the generation of attosecond pulses and molecular imaging.