Intense Laser-Atom Physics in the Long Wavelength Limit

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Over the last fifteen years, 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 Keldysh [1], the ionization of an atom by an intense laser field will evolve depending upon the light characteristics and atomic binding energy. Numerous experiments have thoroughly investigated the dependence of the intensity and pulse duration on the ionization dynamics of inert gas atoms. However, exploration of the wavelength dependence has been mainly limited to wavelengths less than 1 μm, or in the language of Keldysh to the multiphoton or mixed ionization regime. It is now technically possible to perform more thorough test, and perhaps exploit, the scaling laws at wavelengths greater than 1 μm. In addition, excitation with mid-infrared light augments a variety of atomic systems which will tunnel ionize, as well as posing different model atomic structure, e.g. one- and two-electron like systems.

This talk will examine the implication of the strong-field scaling as it pertains to the production of high energy particles and the generation of attosecond pulses. We will interpret the intense laser-atom interaction using a semi-classical trajectory model.

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1. L.V. Keldysh, Sov. Phys. JETP 20, 1945 (1964).