

## Prof. Yoshiaki Teranishi / Institute of Physics

### AMO Physics, Ultrafast Phenomenon, Quantum Control, Molecular Dynamics Simulation

We are “Atomic-Molecular-Optical Physics Lab” of Institute of Physics, NCTU. We are interested in “dynamics” of quantum/classical particles.

**(a) Quantum Control:** We have developed an analytical theory to find a laser pulse to achieve desired transitions between quantum states. As an application of our analytical control theory, we have proposed a new spectroscopic method called the quantum control spectroscopy, which enables us to obtain state selective spectra in the case of overlapping resonance (Fig. 1). We are also interested in controlling electronic motion in aromatic molecules.

**(b) Molecular Processes in Intense Laser Fields:** It was believed that a molecule is ionized when an intense ( $\sim 10^{14}$  W/cm<sup>2</sup>) laser pulse is irradiated. However, recent experiments revealed that neutral excited states are created by the intense laser pulse (Fig. 2). We found that the excitation is attributed to an intrinsic excitation mechanism. We expect that this new mechanism has various applications such as remote sensing, weather control by lasers, etc.

**(c) Others:** Furthermore we study the dynamics of interacting classical/quantum particles. Examples are melting dynamics of Wigner crystal, laser trapping of nano particles, and the formation of antiprotonic atoms (Fig. 3).

**Key Facilities:** Work station (Xeon E5620), Work station (dual- Xeon E5620)x3, Work station (dual- Xeon E5-2630)x4. Package software: Gaussian09, Molpro.

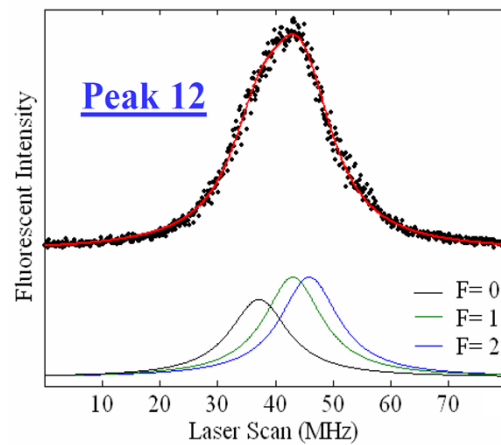


Fig.1

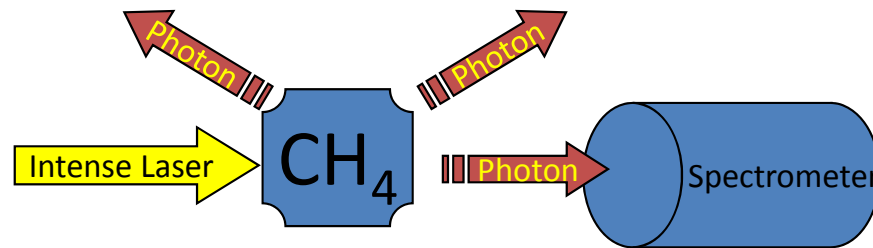


Fig.2

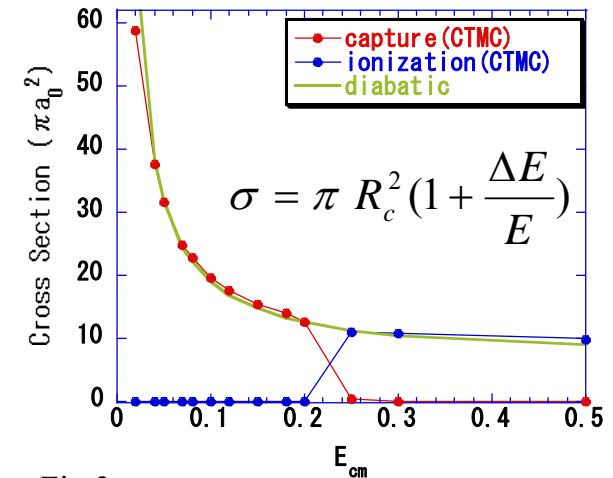


Fig.3