

# The Beams and Applications Seminar Series

## Motivation and Development of Ultrafast Laser-Based Accelerator Techniques for Chemical Physics Research

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**Bldg. 401, room B2100**

**Friday, Mar. 19, 1:30 pm**

Host: Y. Li, ASD

The most common chemical reactions that occur in our universe are the result of the interactions between highly ionizing radiation and atoms or molecules. While throughout our galaxy the vast majority of these chemical events occur in the gas phase, here on earth they also occur in the condensed phase. The outcomes of most high energy chemical reactions are determined by ultrafast processes such as ultrafast energy transfer, thermalization, and solvation. However, due to the lack of a suitable femtosecond source of ionizing radiation, the primary processes of radiation chemistry still remain very mysterious. The first part of this talk will focus on ultrafast laser studies whose goal is to probe these very important fundamental events. While the ultrafast laser studies provide many new insights the results clearly show that lasers are not capable of reproducing the chemistry that is unique to ionizing radiation. This is primarily a result of different mechanisms of energy deposition in the condensed phase. This will lead into the second part of the presentation which will address our current efforts to develop a subpicosecond source of energetic electron and x-ray pulses. The Terawatt Ultrafast High Field Facility (TUHFF) has been constructed in the Chemistry Division. TUHFF contains a 20TW laser system whose output is currently being optimized to relativistically accelerate subpicosecond electron pulses to the MeV level. In addition to the production of femtosecond electron pulses, future efforts will be directed towards using TUHFF for accelerating heavier particles such as protons. This will enable TUHFF to be used for a wide range of research projects that will have a significant impact for both chemistry and physics.

### **For more information visit**

<http://www.aps.anl.gov/asd/physics/seminar.html>

Visitors from off-site please contact Yuelin Li

([ylli@aps.anl.gov](mailto:ylli@aps.anl.gov), 630-252-7863) to arrange for a gate pass.

This ANL seminar series is a CARA activity and focuses on the physics, technology and applications of particle and photon beams. It is sponsored jointly by the ASD Division, the AWA group of the HEP Division, and the ATLAS group of the PHY Division.