SPECIAL AMO PHYSICS SEMINAR

"Towards Supercontinuum Spectroscopy and Control of Ultrafast Molecular Processes"

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Strategies for effectively controlling the state of a molecular system through the interaction with light offer a route to spectroscopic techniques with enhanced specificity as well as the possibility of atomic scale manipulations of functional material and chemical reactions [1-5]. Elementary to this endeavor is the capability to address the time scale as well as resonance conditions involved in driving a particular molecular process. In view of this, the precision with which a molecular system can be controlled is largely determined by the bandwidth of the field driving the manipulation. The possibility of employing the octave-spanning radiation obtained from the filamentation of standard amplified femtosecond pulses in gaseous media is explored in this context [6]. The spectral phase of this supercontinuum source is first characterized with respect to the stability necessary for the application to this task. By employing standard pulse shaping techniques, the principle of encoding the spectral phase of the white-light envelope with the information to complement the dynamics and resonances in a sequence of transitions that lead to the desired final state is pursed. The method is introduced to controlling the course of a chemical reaction through the sequential manipulation of the spin and charge states of the chemical participants in a photo-catalytic process.

Wednesday, September 16, 2009
4:00 p.m. Room 501
Engineering /Physics Building

Texas A&M University
Department of Physics

(coffee and cookies to be served at 3:45 p.m.)

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[3] P. Brumer, M. Shapiro, "Laser Control of Molecular Processes," *Annu. Rev. Phys. Chem.* **43** 257 (1992).

[4] T. Baumert, J. Helbing, G. Gerber, L. Woeste, A. H. Zewail, J. Troe, J. Manz, T. Kobayashi, V. S. Letokhov, U. "Chemical Reactions and Their Control on the Femtosecond Time Scale," *Solvay Conference on Chemistry*, **vol. 101**, John Wiley and Sons: NewYork,1997.

[5] M. O. Scully, G. W. Kattawar, R. P. Lucht, T. Opatrny, H. Pilloff, A. Rebane, A. V. Sokolov, M. S. Zubairy, "FAST CARS: Engineering a laser spectroscopic technique for rapid identification of bacterial spores," *Proc. Natl. Acad. Sci. USA* **99**, 10994 (2002).

[6] B. E. Schmidt, W. Unrau, A. Mirabal, S. Li, M. Krenz, L. Woeste, T. Siebert, "Poor man's source for sub 7 fs: a simple route to ultrashort laser pulses and their full characterization," *Opt. Express* **16**, 18910 (2008).