ΓΕΝΙΚΟ ΣΕΜΙΝΑΡΙΟ ΤΜΗΜΑΤΟΣ ΦΥΣΙΚΗΣ

PHYSICS COLLOQUIUM

Thursday, 18 December 2008
17:00-18:00

3rd Floor Seminar Room

"Femtosecond control of magnetic systems"

Prof. Ilias Perakis,
Department of Physics, University of Crete

Abstract

Femtosecond nonlinear optical spectroscopy provides the means to investigate physical phenomena that occur within a time window comparable to the fundamental timescales of electronic and atomic motion. This opportunity offers a unique view of non-equilibrium properties of cooperative condensed matter systems that are not accessible with conventional time-integrated experimental techniques such as linear optical spectroscopy or inelastic neutron scattering. In the femtosecond temporal regime, the system is not in thermodynamic equilibrium. Issues such as quantum coherence, non-thermal populations, and the validity of the free energy concept then come into play.

A recent development in condensed matter physics is the control of magnetic systems at the quantum level with femtosecond optical pulses. Such an approach to the quantum control of matter goes beyond traditional investigations of optical properties. It can lead to the design of fast photonic devices with a functional role in information storage and processing, memories, network components, etc. Such novel applications however are faced with fundamental non-equilibrium many body physics questions not addressed so far.

In this talk I will discuss our recent theoretical and experimental efforts that led to the prediction and first observation of femtosecond collective spin coherent dynamics in ferromagnetic III(Mn)V semiconductors. Such dynamics is much faster than the timescales of the conventional physical mechanisms and depends on the material bandstructure and magnetic interactions.