

University of Washington Department of Physics

PHYSICS COLLOQUIUM

Robert A. Kaindl (Lawrence Berkeley National Lab)
"Ultrafast Terahertz Spectroscopy: From Excitons to Cooper-Pairs"

Monday, October 27, 2008

4:00 PM, Ronald Geballe Auditorium, Rm. A-102

Abstract: Ultrafast spectroscopy is a powerful tool to study key microscopic processes that occur on short timescales in molecules, solids, and biological systems. I will discuss experiments that employ coherent THz light pulses to study the dynamics of low-energy excitations and carrier correlations in semiconductors and superconductors. Bound electron-hole pairs (excitons) in semiconductors exhibit characteristic inter-level transitions analogous to atoms. This enables "intra-excitonic" spectroscopy as a new tool to explore the physics of electron-hole pairs in low-dimensional systems. I will review experiments that trace the temperature, density, excitation energy, and time dependence of intra-excitonic resonances, to directly map out excitonic phase diagrams and to follow exciton formation and ionization kinetics. A quite different type of charge pairing, whose mechanism is not yet understood, occurs in high- T_c cuprate superconductors such as YBCO or Bi-2212.

Femtosecond studies covering an ultrabroadband THz range reveal the ultrafast fill-in of the infrared pseudogap and a complex, multi-component recovery dynamics. The electromagnetic response in the few-THz range, in turn, couples directly to Cooper pairs and quasiparticle excitations. This allows for direct probing of these species on ultrafast timescales and provides insight into the kinetics of charge pair formation. Such experiments trace correlated states via their transient low-energy response, motivating further ultrafast studies and the use of intense THz pulses for resonant excitation, probing, and control of low-energy states in complex materials.

Tuesday, October 28

Condensed Matter & Atomic Seminar

4:00 PM, Rm. C-421, PAT

Xiaohu Gao, UW Bioengineering

Thursday, October 30

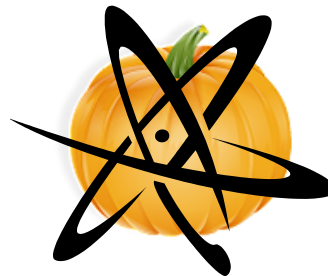
Astronomy Colloquium

4:00 PM, Rm. A-102, PAA

Miller Goss, UW Astronomy

"Very Long Baseline Array Observations of Pulsars: Distances and Proper Motions"

Seminars



Oct 27th-Oct 31st