CFEL SCIENCE

SEMINAR

3rd May 2011 - 14:15

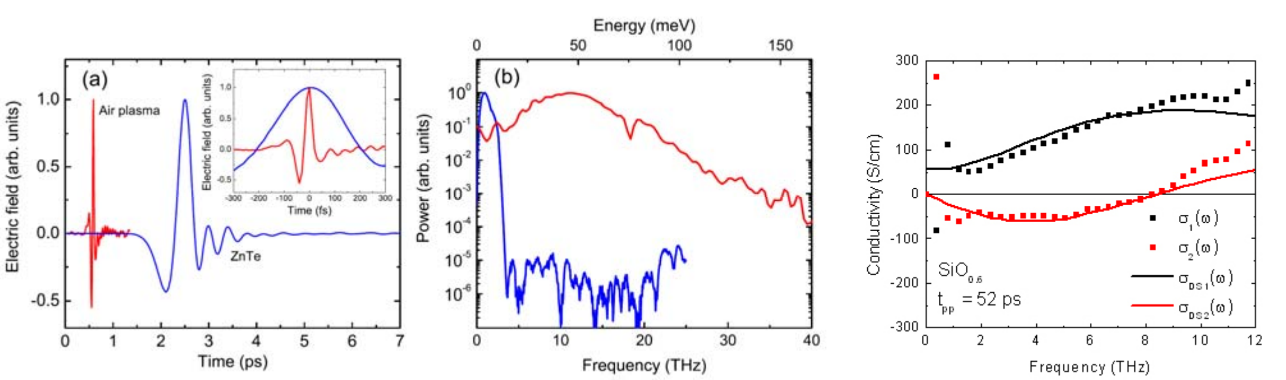
FLASH HALL (28c) - Seminar Room

Peter Uhd Jepsen

Department of Photonics Engineering,
Technical University of Denmark, Kongens Lyngby, Denmark

Time-resolved Terahertz Spectroscopy of condensed matter

THz spectroscopy has proven to be a highly versatile probe of the full dielectric function of materials with a time resolution limited only by the response time of the experiment. Thus, it is possible to characterize the development of the dielectric function in the 0-80 meV energy range (0-20 THz), with a time resolution of 35 fs. The conductivity spectrum of photoconductive materials will be discussed, with special emphasis on materials with a non-Drude response. Such systems include disordered systems and systems with dimensions comparable to the mean free path of the charges. One particular example of a non-Drude system is nano-islands of silicon embedded in a dielectric matrix. In this system preferred backscattering at particle boundaries can give rise to non-Drude conductivity. There has been debate about the physical interpretation and validity of the applied conductivity models (in particular the Drude-Smith model) due to their seemingly phenomenological character. The measurement of the dielectric function over as broad a frequency range is crucial for conclusive insight into the carrier dynamics, and the interpretation of simple conductivity models.



Figures: Ultrabroadband THz light, covering the 0-30 THz range, applied to the investigation of conductivity dynamics in disordered nanosystems. The example shows the transient photoconductivity of silicon nanoparticles embedded in a glass matrix, with strong deviations from the classical Drude model.

Host: A. Cavalleri, CFEL, MPSD-CMD