MAX-BORN-INSTITUT FÜR NICHTLINEARE OPTIK UND KURZZEITSPEKTROSKOPIE IM FVB E.V.

Institutskolloquium

Am **2. November 2005, 16:00 Uhr** spricht:

Prof. Dr. Gérard Mourou

Directeur Laboratoire d' Optique Appliquée
ENSTA Chemin de la Hunière Palaiseau

über

Relativistic Optics a New Route to Attosecond Physics and Relativistic Engineering

Ort: **Max-Born-Saal,**
MBI, Max-Born-Str. 2a

Interessenten sind herzlich eingeladen.

Prof. Dr. W. Sandner

"Relativistic Optics a New Route to Attosecond Physics and Relativistic Engineering"

Gérard A. MOUROU (Laboratoire d'Optique Appliquée, France)

Ultra high intensity lasers can produce high-energy photons (x-ray, g-ray) electrons and protons. They are the direct consequence of the relativistic character of the electrons driven by the very large laser fields associated to laser pulse intensities higher than $10^{18}W/cm^2$.

In the l^3 regime the pulses are only few optical periods in duration, focused over one wavelength. In this condition, all the pulse's electromagnetic field is contained within an irreducible volume of few lambda cubed. The laser-matter interaction in the l^3 relativistic regime as shown in PIC simulation clearly indicates a new route to the efficient generation of isolated attosecond pulses of UV and EUV photons as well as synchronized attosecond MeV electron bunches. The manifestation of the relativistic behavior has recently been observed experimentally through the relativistic deflection of the optical pulse. Also a new process based on coherent Thomson scattering is predicted to produce EUV or even X-ray with extremely efficiency close to unity. Because the relativistic interaction occurs in the micrometer volume we can talk about a new field that we would call Relativistic Engineering that would include Relativistic Micro-electronics and Relativistic Micro-optoelectronics.

We will also show that the efficient relativistic compression and deflection encountered in the l^3 regime could lead toward intensities close to the Schwinger intensity with relatively compact systems, opening the exciting possibility to use the vacuum as the main nonlinear medium.