Postdoc/assistant professor (experimentalist): Compression of high-energy femtosecond pulses

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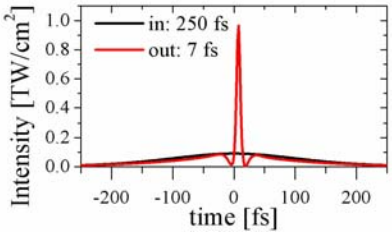
A 2 year experimental position is available, which aims to investigate temporal effects of ultra-short femtosecond pulses in quadratic nonlinear media. The goal is to efficiently compress pulses from high-power fs fiber lasers using soliton effects, as to generate high-energy ultra-short (sub-20 fs) visible and near-infrared pulses.



Soliton compression simulation: a 250 fs pulse from a commercial fiber amplifier compresses to 7 fs in a short nonlinear crystal.

The goal of the project *Femto-VINIR* is to develop a cheap, compact, stable and efficient source of sub-20 fs pulses both in the visible and the near-IR (VINIR). The idea is to compress pulses from a high-power fs fiber laser in a quadratic nonlinear crystal, where phase-mismatched (cascaded) second-harmonic generation takes place. Near-single-cycle pulses can be generated, with applications in ultra-short pump-probe spectroscopy, micromachining with nanoscale precision, nanosurgery, generating attosecond pulses, and generating broad-band frequency combs.

For this project we seek a postdoc/assistant professor to start up an experimental facility for the interaction, generation and measurement of ultra-short few-cycle fs pulses in quadratic nonlinear crystals. At disposal is a state-of-the-art high-energy fs laser system (SpectraPhysics Spitfire Pro Regenerative Amplifier, 3.5 mJ 35 fs pulses at 800 nm). With a commercial optical parametric amplifier, the mJ beam is converted to fs high-energy pulses tunable from around 400 nm to 2 μm. The idea is to use the OPA to mimic pulsed lasers at other wavelengths, in particular the 1 μm region of Yb-doped fiber lasers.

A number of dedicated teams share the high-energy fs laser for medical purposes and for THz wave generation. Building from their experience ultra-short pulse characterization techniques must be developed (auto-correlator with single-cycle resolution, XFROG, etc.). A visit to the group of Frank Wise at Cornell University is also possible: his group has long time experience with characterizing fs pulses and soliton compression in quadratic nonlinear media.

The experimental investigations will then concern the following topics

- Compression of long (>>100 fs) high-energy near-IR (800 nm-1100 nm) pulses in common quadratic nonlinear crystals to sub-10 fs duration.
- Generating sub-10 fs visible pulses using a novel approach.
- Investigating soliton compression in nonlinear waveguides (KTP or LN, e.g.) for increased quality of the transverse beam profile of the compressed pulse.

The position is for 2 years, is open from 1 April 2009, and has a competitive salary. Researchers coming from abroad may also benefit from a low (25%) taxation. The position is for a postdoc or an assistant professor, depending on the experience of the candidate. We are looking for an enthusiastic and skilled experimentalist with a PhD in physics/optics, and with experience from working with fs laser systems, preferably (fiber) laser amplifiers, and from working with measurement and characterization of ultra-short fs pulses. *Femto-VINIR* is a collaboration between DTU Fotonik, Cornell University, and Australian National University, and recently received a grant from the Danish Research Council for Technology and Production Sciences.

Femto-VINIR
Few-cycle femtosecond optical pulses in the visible and near-infrared

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