HI-Jena delivers a temporal contrast boosting module for the PHELIX facility

With increasing on-target intensities the temporal contrast of laser pulses has become one of the most critical parameters for modern high power laser systems, because many processes are strongly conditioned by pre-ionization occurring during the leading edge of a laser pulse. For this reason, this topic is a central question to the laser development at the Helmholtz Institute Jena.

Several techniques have been studied to increase this important figure of merit. Recently a solution based on an ultrafast optical parametric amplifier (uOPA) was demonstrated, which offers a compact and practical solution for the front end of high-energy glass petawatt lasers, allowing for a boost in temporal contrast of several orders of magnitude in a single stage. However, the ideal pump pulse duration for this application must be below 1 picosecond, in order to avoid temporal pedestal effects in the picosecond regime.

The Helmholtz Institute has developed a sub picosecond OPA module for the petawatt laser facility PHELIX located at GSI. This project has brought together the groups of Jens Limpert and Joachim Hein in Jena and the PHELIX team at GSI for developing a novel pump-laser for the OPA contrast boosting stage. The laser used as a pump source for the OPA is injected by the Mira 900 oscillator of the PHELIX laser. These pulses are first stretched by using a volume Bragg grating (VBG) in order to maintain low intensities during the amplification. Subsequently recompression is accomplished with the same VBG. After frequency doubling the pump pulse is sent to a BBO crystal for parametric amplification of the signal pulse which is also provided by the PHELIX oscillator.

In Figure 1 temporal contrast measurements of the PHELIX front end using a local compressor at the 20 mJ level are shown. In the setup, the uOPA stage is located directly after the oscillator and the number of roundtrips in the regenerative amplifier of PHELIX was reduced to account for the smaller number of passes necessary to reach its saturation. The measurements which were performed with a third-order cross-correlator (Sequoia, Amplitude Technologies) show a drop of the ASE-level when the uOPA output is increased. This drop reaches more than 4 orders of magnitude compared to the case without the uOPA module (upper curve). This experimental data confirms, as predicted by theory, that the ASE-level in a chirped-pulse-amplification system linearly depends on the energy of the seed pulse.

Figure 1: Temporal contrast measurement of the PHELIX front end as a function of the input seed energy.
May 2012

**HI-Jena takes part in the common detector development platform of the Helmholtz Association**

More information:
http://www.helmholtz.de/aktuelles/presseinformationen/artikel/artikeldetail/helmholtz_foerdert_plattform_fuer_detektortechnologie_und_systeme/

**Upcoming HI-Jena Seminars**

13. 06.  S. Fuchs (Jena)  "Optical coherence tomography using broad-bandwidth XUV and soft x-ray radiation“

27. 06.  A. Gopal (Jena)  "THZ radiation from relativistic electrons in solid targets"

**Upcoming Online Seminars (broadcasted from GSI)**

6. 06.  S. Tashenov (Heidelberg)  "Spin dynamics of electrons in strong fields studied via bremsstrahlung from a polarized electron beam"

**Recent Publications**

**Chromatic energy filter and characterization of laser-accelerated proton beams for particle therapy**

Ingo Hofmann, Jürgen Meyer-ter-Vehn, Xueqing Yan and Husam Al-Omari

*NIM A 681, 44 (2012)*

doi: 10.1016/j.nima.2012.04.022
Further Announcements

EMMI-JINA Workshop on Nuclear Physics Processes in Dynamic High Energy Density Plasmas

An international EMMI-JINA workshop on "Nuclear Physics Processes in Dynamic High Energy Density (HED) Plasmas" will be held from October 13th to October 17th, 2012. This workshop will bring the international community together at the centrally located Notre Dame London Centre, to discuss the nuclear science opportunities in dynamic plasmas as they are available at new and upcoming high energy density laser and accelerator facilities (e. g. FAIR, FRIB, NIF-LLNL, OMEGA-LLE, PETAL-LMJ, POLARIS-HIJ, ELI, PHELIX-GSI) in Europe and the North-American Continent.

A one-day EMMI-JINA school is planned to be held on Saturday October 13th, 2012 at the GSI-Darmstadt, For this meeting in Darmstadt accommodations near the GSI are available; the meeting starts at Saturday morning and ends in the early afternoon.

The main part of the workshop is planned for Monday October 15th, through Wednesday October 17th, 2012 at the London Centre of the University of Notre Dame (JINA). For the London meeting, talks will be scheduled from Monday morning until Wednesday afternoon.

First announcement: http://www.jinaweb.org/events/NPP2012/

Contact at HI-Jena:

Secretary: Tel.: 03641-947600
E-Mail: s.hundack@gsi.de

Admin. Assistent: Tel.: 03641-947603
E-Mail: b.kirchner@gsi.de

Helmholtz-Institut Jena, Fröbelstieg 3, 07743 Jena
1\textsuperscript{st} Phd student barbecue meeting took place on May 10\textsuperscript{th}

After two hours of cleaning up the savaged garden at the backside of the institute building, we had a barbecue enjoying the famous Thüringer Bratwurst. This get-together of the Phd students and other members of the HI-Jena was a great success and everyone is looking forward for the next barbecue meeting.

Members of the HI-Jena entered the 7\textsuperscript{th} Jenaer Teamlaufl

After the great success in the last year, members of the HI-Jena entered also the recent race event. The HI-Jena team was ranked 126\textsuperscript{th} out of 280 teams. Congratulations!