PRESS RELEASE

Fraunhofer Develops New Generation of Lasers

The Fraunhofer-Gesellschaft is launching a highly ambitious undertaking: the Fraunhofer Cluster of Excellence Advanced Photon Sources CAPS. The cluster aims to achieve international technological leadership in laser systems that reach maximum performance with ultrashort pulses (USP), as well as researching their potential applications, all in cooperation with Fraunhofer partners. The new systems are proposed to surpass all previous USP lasers by one order of magnitude in average laser power. At the same time, the partners are working on the required system technology as well as promising applications in industry and research.

The kick-off event on May 2, 2018 in Aachen marks the beginning of an extraordinary venture. Prof. Reinhart Poprawe, head of the Fraunhofer Institute for Laser Technology ILT, announced together with Prof. Andreas Tünnermann, head of the Fraunhofer Institute for Applied Optics and Precision Engineering IOF, the launch of the Fraunhofer Cluster of Excellence Advanced Photon Sources CAPS. "With twelve institutes, we are stepping up to the challenge of developing a new laser generation and demonstrating applications for industry and research. Together we target the development of a disruptive technology that will help expanding the applications for laser technology significantly – from the scaling of ultraprecise manufacturing processes to the development of new pulse duration and wavelength ranges for research," said the director of the cluster, Prof. Poprawe.

What can USP lasers do?

Even at comparatively small pulse energies, USP lasers generate extremely high intensities in their focus. For a long time, they were only used in basic research. With the development of high-efficiency, high-performance pump diodes, new laser media could be used, in particular ytterbium-doped fibers and crystals. In recent years, USP lasers have achieved sufficient average laser power and robustness for enabling industrial applications.

For applications in micromachining, USP lasers have two major advantages: first, they can process virtually all materials; second, their ablation is particularly precise and, therefore, gentle since the ultrafast interaction hardly leaves any heat in the adjacent material. For these reasons, USP lasers were of interest to medical technologies from the beginning, e. g. for eye surgery using the Femto-Lasik technology.

Editorial Notes
Petra Nolis M.A. | Group Manager Communications | Telephone +49 241 8906-662 | petra.nolis@ilt.fraunhofer.de
Fraunhofer Institute for Laser Technology ILT | Steinbachstraße 15 | 52074 Aachen, Germany | www.ilt.fraunhofer.de

User facility with two application laboratories will start in 2018

For cutting of ultra-hard ceramic materials and fiber-reinforced plastics, the performance of current 100 W class USP lasers is often insufficient in terms of economical processing speeds. Driven by the application potential in the industry and the need for basic research, the partners of the Fraunhofer Cluster of Excellence Advanced Photon Sources CAPS have set themselves the goal of increasing the average power of the USP sources at the Fraunhofer Institutes ILT and IOF up to the 10 kW range. With a budget of about 10 million euros for the first three years, the partners will develop and test beam sources for various applications.

In 2018, application laboratories will be set up at the two institutes. The development of system technology and innovative applications is enabled from an early stage. The Fraunhofer Cluster, which was founded at the beginning of the year, is open to all Fraunhofer Institutes. Currently twelve partners form the consortium: beside Fraunhofer ILT and IOF, the Fraunhofer Institutes FEP, IAF, IIS, IKTS, IMWS, ISE, ISIT, ITWM, IWM and IWS are involved. The consortium aims at developing applications, investigating new processes and facilitating industrially relevant throughputs of well-known processes. Examples range from the micro-structuring and surface functionalization of solar cells, ultra-hard ceramics and battery components to the cutting of glass and lightweight materials.

In addition to achieving breakthroughs in ultraprecise manufacturing with high productivity, the partners also plan to generate coherent radiation down to the soft X-ray range – with photon fluxes two to three orders of magnitude higher than those previously reached. In the field of materials science, the Fraunhofer Cluster aims to establish applications such as the generation and investigation of novel materials. Moreover, new opportunities will arise for imaging biological samples or in the semiconductor field as well as for lithography.

The new lasers are also interesting for basic research: As an example, laser particle accelerators are more powerful, much smaller than conventional systems, and can even be integrated into existing laboratories. Furthermore, these so-called "secondary sources" can also significantly boost areas such as materials research and medical technology.

The synergies between the Fraunhofer Institutes enable the development of beam sources, process technology and innovative applications at a top international level. These can be made available for industry and research. As such high-power USP lasers become available, the research partners can revolutionize the innovation process in the technological environment of high-power lasers.

Image 1:
Partners of the Fraunhofer Cluster of Excellence Advanced Photon Sources CAPS met for the kick-off meeting on May 2, 2018 in Aachen. The coordinators: Cluster director Prof. Reinhart Poprawe, Fraunhofer ILT (front row, second from right), and Prof. Andreas Tünnermann, Fraunhofer IOF (front row, second from left).
© Fraunhofer ILT, Aachen, Germany / M. Conrad-Franzen.

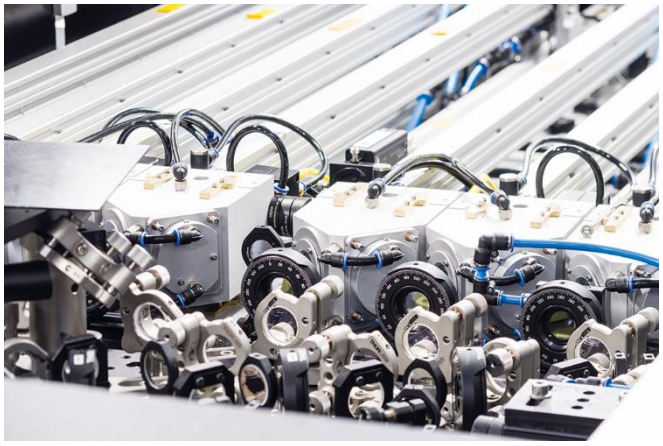

Image 2:
Coherently combined USP fiber lasers of the kW class, as they are made available in the user facility at Fraunhofer IOF.
© Fraunhofer IOF, Jena, Germany.

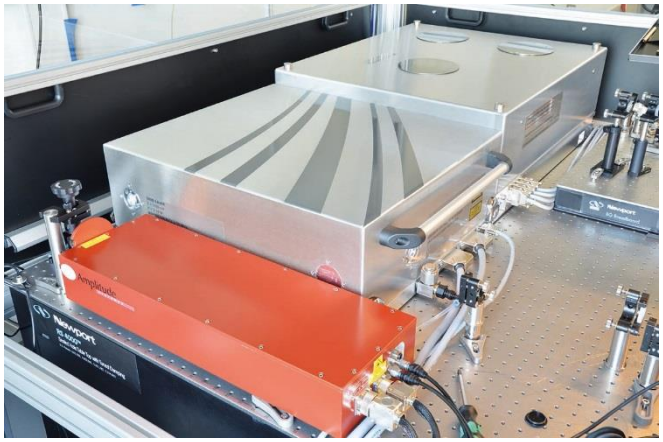

Image 3:
A similar 500 W-InnoSlab USP-beam source is made available in the user facility of Fraunhofer ILT for application-based investigations.
© Fraunhofer ILT, Aachen, Germany.

Contact
Dipl.-Ing. Hans-Dieter Hoffmann | Head of the Competence Area Lasers and Laser Optics | Telephone +49 241 8906-206
hansdieter.hoffmann@ilt.fraunhofer.de | Fraunhofer Institute for Laser Technology ILT | Steinbachstraße 15 | 52074 Aachen, Germany
www.ilt.fraunhofer.de
Prof. Jens Limpert | Head of the Department Fiber and Waveguide Lasers | Telephone +49 3641 947-811 | jens.limpert@iof.fraunhofer.de
Fraunhofer Institute for Applied Optics and Precision Mechanics IOF | Albert-Einstein-Str. 7 | 07745 Jena, Germany | www.iof.fraunhofer.de