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Project title: Ultrafast Laser with Radial and Azimuthal Polarizations for High-efficiency Micro-machining Applications

Collaborative Project (STREP)

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D8.2 – Initial National and European press release

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Coordinator: Dr Marwan Abdou-Ahmed (USTUTT)

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Dissemination Level		
PU	Public	**X**
PP	Restricted to other programme participants (including the Commission Services)	
RE	Restricted to a group specified by the consortium (including the Commission Services)	
CO	Confidential, only for members of the consortium (including the Commission Services)	

D8.2: Initial National and European press release

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Ultrafast_RAZipol Press Release

A European Consortium has been granted €3.2m to develop ultrafast high-average power laser amplifier systems emitting beams with radial and azimuthal polarizations.

As part of the European Commission's Seventh Framework Programme for Research and Technological Development, the European consortium Ultrafast_RAZipol has been granted € 3.2 million for a project which main goal is to demonstrate **laser material processing at unprecedented levels of productivity and precision using beams with radial and azimuthal polarization**. The challenge is not only to achieve high productivity at moderate levels of precision or highest quality at low speeds, but to reach both targets at the same time.

The three-year project Ultrafast_RAZipol – full title "Ultrafast Lasers with Radial and Azimuthal Polarizations for High-efficiency Micro-machining Applications" – started on 1st November 2013 and is led by the laser development and laser optics department (headed by Dr. Marwan Abdou Ahmed) of the Institut für Strahlwerkzeuge (IFSW) at the Universität Stuttgart (USTUTT) in Germany.

The ultrafast laser source planned for **RAZIPOL** project combines several quite unique features. Its modular 3-stage master oscillator power amplifier (MOPA) concept offers a high degree of **flexibility** to generate a broad range of pulse durations, pulse energies and repetition rates. The MOPA combines an **ultrafast oscillator** together with a **Single Crystal Fibers** as 1st amplification stage and **thin-disk multipass amplifier** as final amplification stage (Booster).

Although the potential range of material processing applications for this laser source is extremely broad, within the project, we will focus on two demonstration applications. The first application will be based on a fast scanner system which facilitates the production of complex structures like a "lab on a chip" on large (e.g. up to 8" diameter), nearly planar surfaces (e.g. wafers). A high throughput optical engine will support the wafer conversion industry in general to transfer processes like wet chemistry, micro sandblasting and mechanical dicing to more cost effective laser-based systems.

For this application, the MOPA system providing up to **500W average power** will be set up for repetition rates in the **20-40 MHz** range with pulse duration of approximately **1 ps**. The second application will be trepanning drilling of deep, high aspect holes with tight tolerances. In this case, the MOPA system providing up to **200W average power** will be set up for generating **high pulse energies** (0.2-1 mJ) at pulse duration of about **5 ps**.

Partners on the Ultrafast_RAZipol project, coordinated by Universitaet Stuttgart USTUTT - IFSW's Dr. Marwan Abdou Ahmed, include Time-Bandwidth Products AG (TBWP) Centre National de la Recherche Scientifique (CNRS), Fibercryst SAS (FIB) Next Scan Technology BV (NST) GFH GmbH (GFH), Schweisstechnische Lehr- und Versuchsanstalt SLV Mecklenburg-Vorpommern (SLV M-V) and Class 4 Laser Professionals AG (C4L).

USTUTT (IFSW; www.ifsw.uni-stuttgart.de) as well as being the project coordinator, will be in charge of the design, realization and characterization of the high-power thin-disk multipass amplifiers and the radial/azimuthal polarization optics.

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TBWP (www.time-bandwidth.com) TBWP will focus on the development of the laser oscillators, as well as laser synchronization and integration of the full laser system with scanners and other machine parts for the targeted material processing application.

CNRS (www.cnrs.fr) will be responsible for the design, and demonstration of ultrafast amplifiers based on Yb:YAG Single Crystal Fiber.

FIB (www.fibercryst.com) will be in charge of the design, realization of the high power single crystal fibers gain modules.

NST (www.nextscantechnologie.com) will be in charge of design and production of ultra-high speed modulator and large format polygon scanner.

GFH (www.gfh.com) will focus on the process and application development for both the HRR and the LLR systems. Moreover GFH will be in charge of the integration and evaluation of the new equipment into micromachining system (Laser, beam steering unit, beam shaping, process monitoring).

SLV M-V (www.slv-rostock.de) will in charge of applications development for structuring thin metallic and dielectric layers for chip production using HRR laser system as well as the prototype test for lab-on-a-chip (LOC´s) production on 6” wafer

C4L (www.class4laser.ch) will be in charge of the machine set-up, Laser and optics integration for the LRR system as well as the development of the drilling processes.

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