Einladung zum fertigungstechnischen Seminar vom
21. März. 2013, 13:30-17:30 Uhr

„Ultrafast Lasers - Technologies and Applications"

*Hörsaal Hauptgebäude **HG E3**, ETH Zürich*

13.30…13.45: ***Begrüssung und Einführung***

Prof. Dr. Konrad Wegener, IWF, ETH Zürich

13.45…14.30: ***„Digital Photonic Production"***

Prof. Dr. Reinhart Poprawe, Fraunhofer ILT, Aachen
One of the main challenges of modern manufacturing is the dilemma between Scale and Scope, i.e. the ability to produce high volumes at low prices, yet systematically integrating the increasing demand for individual products. As a consequence, concepts for one piece flow at the cost of mass production are developed. One decisive component in this scheme is the perspective of Digital Photonic Production using lasers. Here the focus will be put actual ultrafast laser processes, especially ultrafast precision machining, drilling, cutting, polishing and controlled deposition of functional layers. Examples are individual products for automotive components, human implants, casting tools, functional surface layers. In the presentation the fundamental physical end engineering research challenges will be categorized and addressed. Among those are absorption characteristics as well as ablation and production rates for products from metal and glass up to 3-10 mm^3/s. The individual processes will be analyzed with respect to their state of the art, their research perspectives and their future relevance for the global challenges. Especially the vision and transformation from the application of these processes out of the "Rapid Prototyping" – domain into the domain of "Digital Photonic Production" will be discussed along the lines of series production of components in the today relevant industries.

14.30…15.15: ***„High average power ultrafast lasers"***

Prof. Dr. Ursula Keller, Institute of Quantum Electronics, ETH Zürich
A growing number of applications in science and industry are currently pushing the development of ultrafast laser technologies that enable high average powers. SESAM modelocked thin disk lasers (TDLs) currently achieve higher pulse energies and average powers than any other ultrafast oscillator technology, making them excellent candidates in this goal. Recently, 275 W of average power with a pulse duration of 583 fs were demonstrated, which represents the highest average power demonstrated directly from an ultrafast laser oscillator without any further amplification to date. In terms of pulse energy, TDLs reach more than 40 µJ pulses directly from the oscillator. We will present the key elements that enabled these latest results, as well as an outlook towards the next scaling steps in average power, pulse energy and pulse duration of such sources. These cutting-edge sources will enable exciting new applications, and open the door to further extending the current performance milestones.

15.15…15.45: ***Pause***

15.45…16.30: ***„UKP Laser in der Produktion – Spielzeug oder Werkzeug?"***

Prof. Dr. Michael Schmidt, Lehrstuhl für Photonische Technologien, Universität Erlangen
UKP Laserprozesse am Beispiel von Abtragsprozessen, Glasschweißen und Sub 100nm Strukturierungen. Einordnung gemäß DIN und Relevanz. Neben Beispielen werden knapp auch notwendige Grundlagen beleuchtet.

16.30…17.15: ***„Laser based processes for thin film deposition"***

Prof. Dr. Thomas Lippert, Paul Scherrer Institut, Villigen
The application of lasers for the deposition of thin films has been developed over the last decade to a variety of mature and robust techniques which are utilized for the deposition of a wide range of materials for different applications. The oldest technique for laser based thin film deposition is pulsed laser deposition (PLD) which has been shown first in 1965, but became only popular after the deposition of high Tc films in 1987. PLD is a highly flexible technique which is well suited for the deposition of thin oxide films. These films can be either applied as model systems for energy applications or can be utilized in microdevices. Examples for the application of PLD to deposit model systems for fundamental studies on Li-ion battery electrodes as well as for the deposition of ion conductors for micro-solid oxide fuel cells will be shown. PLD yields normally films or film multilayers without any lateral resolution, but for many applications, e.g. sensors, thin film structures are required. To obtain these structures either lithographic techniques, masks during deposition or post deposition structuring techniques are required, that can be either direct structuring, e.g. by lasers (with or without masks), or other more complex laser based methods which utilize e.g. a liquid medium. Structuring of transparent materials using a liquid medium has been developed to a technique named laser-induced backside wet etching (LIBWE) which can for example be used for the structure quartz into micro-optical elements. An alternative approach to obtain films with lateral resolution is the application of techniques where thin films with a well defined geometry are transferred from a target onto a receiver which may even have a structure on its own, e.g. a electrode structure for sensors. The transfer of thin films with defined geometries has been first reported in 1969, and became known in 1986 under the name of laser-induced forward transfer (LIFT), but also several other names have been used for fundamental very similar processes, such as LAT, LITI, MAPLE- DW etc. One of the further developments of the LIFT process has been the application of laser light absorbing layers between the substrate and the layer to be transferred. These absorbing layers, also named dynamic release layers (DRL) or sacrificial layers protect the transfer layer from the laser, which may cause thermal or photochemical reactions, and allow therefore the transfer at lower laser fluences and also of sensitive materials. A large number of sensitive materials, e.g. bio-materials and polymers, has been transferred by this approach in liquid or solid form. Selected examples, e.g. of light emitting polymers and sensor materials, will be shown to suggest that LIFT is a possible alternative to other non-laser based direct writing techniques, such as ink-jet printing, which require solvents and nozzles.

17.15…17.20: ***Update Swissphotonics NTN***

Dr. Christoph Harder, Swissphotonics NTN

17.30…: ***Apéro***

Fertigungstechnisches Seminar: **Ultrafast Lasers - Technologies and Applications**

Donnerstag,	*21. März 2013, 13:30 – 17.30 Uhr*
Ort	*ETH Zentrum, Hauptgebäude **HG E3***
	Eine Voranmeldung ist nicht nötig. Programmänderungen sind jederzeit möglich. Keine Parkplätze. Wir freuen uns auf Ihre Teilnahme!

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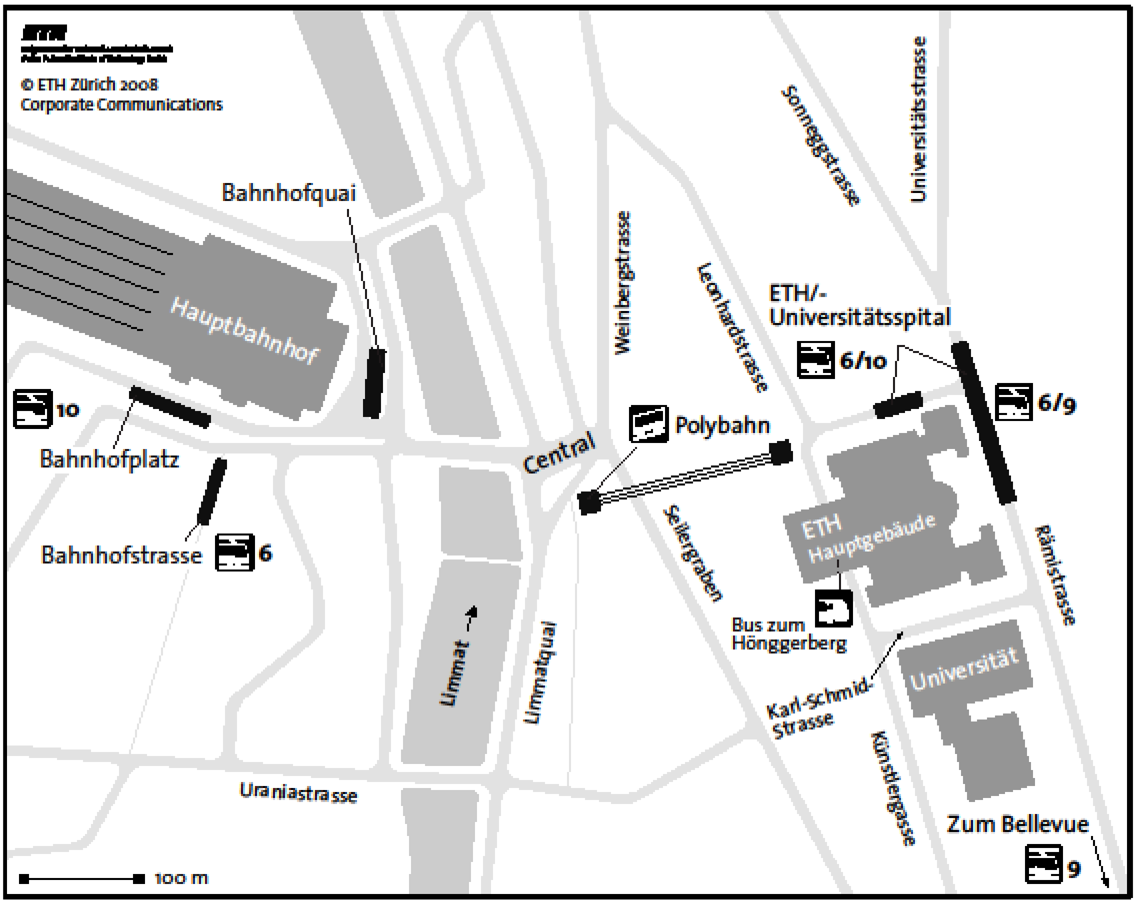
Anreise

Lageplan ETH Hauptgebäude:



Vom Hauptbahnhof:	*Tramlinie 10, Fahrtrichtung Flughafen ZH / Oerlikon* *Tramlinie 6 (Bahnhofstrasse), Fahrtrichtung Zoo*
Vom Central:	*Polybahn*
Vom Bellevue:	*Tramlinie 9, Fahrtrichtung Heuried / Hirzenbach*
Parkplätze:	*Die ETH Zürich verfügt über keine Parkplätze. Im Unispital Parkhaus sind wenige Parkplätze verfügbar.*
Vom Flughafen:	*Ab der Tramstation "Zürich Flughafen" mit Tramlinie 10 bis zur Haltestelle "ETH/Universitätsspital". Fahrzeit: 30 Minuten.* *Sie benötigen ein Ticket für 3 Zonen.* *Wenn Sie den ganzen Tag in Zürich verbringen, empfiehlt sich eine Tageskarte (Gültigkeit 24 Stunden).*

Das Tram fährt zwischen 6 Uhr morgens und 23 Uhr abends alle 7 bis 15 Minuten.