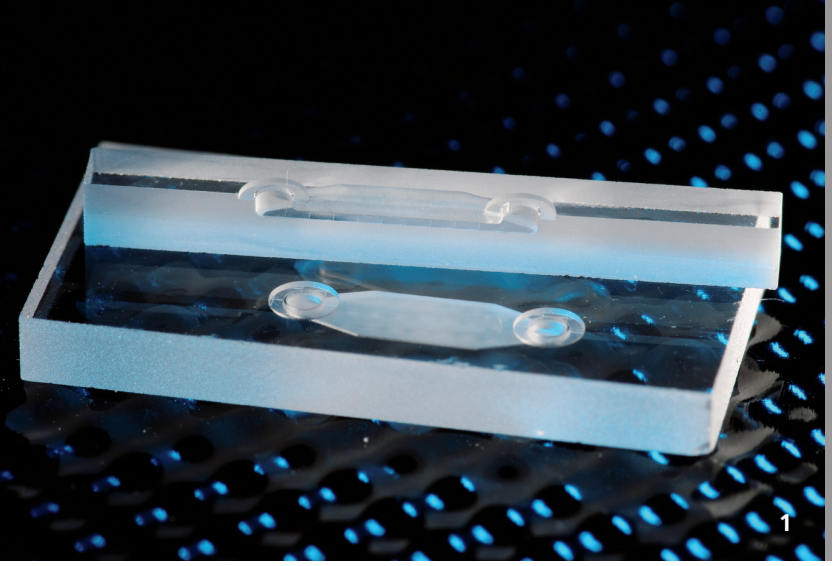

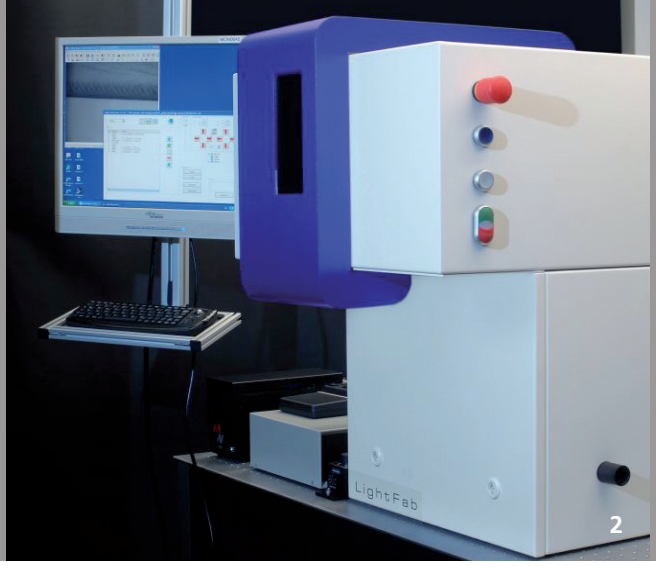

HIGH-SPEED MICROSCANNER

Task

New high-power fs slab amplifiers with an output between 150 W and 1 kW and repetition rates > 5 MHz enable an increase in productivity for digital photonic production – the direct manufacture of parts from CAD data using laser radiation without masks or molding tools. The development of a micro-focusing system with high-speed beam deflection and CAM software is required to exploit this potential for manufacturing 3D microcomponents with 1 µm precision.

Method

A modular high-speed microscanner has been set up on the basis of acousto-optic beam deflection, galvanometer mirrors and linear axes. CAM software has also been developed to synchronously control the laser output power, the various beam deflection modules and the linear axes. The system is marketed commercially by the spin-off company LightFab. For the digital photonic production of microstructured 3D components, 3D CAD data are broken down into 2D path data; these are then successively fed by the CAM software which controls the microscanner modules and the laser (Fig. 1).

Result

The workpiece is clamped in the high-speed microscanner behind the sliding door that has a laser protection window (Fig. 2). To use an already existing 3-axis system, the high-speed microscanner is alternatively mounted on the z axis. The microscanner system contains a microscope with a camera to align the workpiece and to check the machining results. For a focus radius of 1 µm, a telecentric lens with a 10 mm focal length is used and a track speed of up to 12 m/s achieved on a track radius of 400 µm so that pulses with repetition rates of up to 5 MHz are spatially separated.

Applications

The high-speed microscanner facilitates the production of 3D microcomponents using In-volume Selective Laser Etching (ISLE) irrespective of the batch size and the product complexity. Other applications include microstructuring using material ablation, two-photon polymerization and high-speed microwelding.

Contacts

Dr. Jens Gottmann
Phone +49 241 8906-406
jens.gottmann@ilt.fraunhofer.de

Dr. Ingomar Kelbassa
Phone +49 241 8906-356
ingomar.kelbassa@ilt.fraunhofer.de

1 3D microchannel in silica glass produced using ISLE.

2 High-speed microscanner.

Fraunhofer Institute for Laser Technology ILT, www.ilt.fraunhofer.de
DQS certified by DIN EN ISO 9001, Reg.-No.: DE-69572-01