Laser technology | Optics | Physical science | Technology Offer

COMPASS - Compact Multi-Pass Amplifier System: Powerful ultra-short pulse laser amplifier (kW range)

Field of application

Ultra-short pulse laser (USP) systems have found particularly widespread use in the field of industrial micromachining. They are especially well suited for microstructuring and the production of fine channels. Due to the low heat input, a wide variety of materials – even particularly thin or brittle semi-finished products – can be processed with a high throughput, including those on a micro- or nano-scale. The higher the output powers of the laser source, the more productive the overall system.
At the Institut für Strahlwerkzeuge at the University of Stuttgart, a multi-pass amplifier has now been realized that offers a previously unattainable output power in the kW range as well as a compact design. The range of possible applications covers the entire spectrum of industrial laser processing.

State of the art

Until now, output powers of several kilowatts could only been achieved using complex arrangements that had large spatial requirements and were susceptible to external interference factors.

Innovation

The amplifier concept developed at the University of Stuttgart convinces in its capability to efficiently use the free solid angle, which does not only allow for a highly compact design, but also leads to improved stability. This, in turn, enables an additional increase of the achievable output power.
The core of the system is a particularly compact optical element that folds the beam path several times over the laser disk. The reduced optical path length compared to conventional arrangements creates greater system stability against external interference. In principle, the system is scalable and limited only by the manufacturing tolerances of the mirrors, their mounting accuracy and the increasing path lengths with each mirror pair that is added. After passing through the entire system, the beam can exit the amplifier coaxially to the input beam and is separated via its rotated polarization. Depending on the application, other decoupling mechanisms could also be realized, e.g. with minor modifications for unpolarized beams.
Applicability of the basic principle is not limited to disk lasers and there are many possibilities for modification and extension.

Reference number: 15/061TLB

Your benefits at a glance

- ✓ Increased output power and high pulse energy for ultra-short pulse lasers (kW range)
- ✓ Stable, efficient & inexpensive
- ✓ Installation space only approx. 0.4 m³ incl. laser pump optics
- ✓ Excellent performance scalability and high flexibility
- ✓ Avoidance of small focuses in the beam path
- ✓ Can be used as an oscillator (resonator)

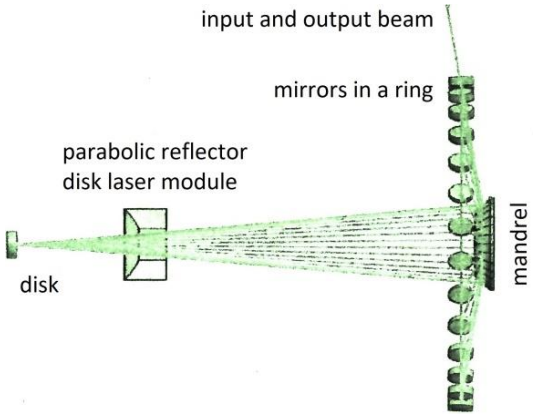

Figure: Schematic with classic disk laser pump optics and invented mandrel and mirror ring [IFSW, University of Stuttgart].

Technology transfer

TLB GmbH manages inventions until they are marketable and offers companies opportunities for license and collaboration agreements.

Patent portfolio

European and US patent applications are pending (EP 3236545 A1 and US 2017/0310073 A1).

Contact

Dr.-Ing. Michael Ott
ott@tlb.de
Technologie-Lizenz-Büro (TLB)
der Baden-Württembergischen Hochschulen GmbH
Ettlinger Straße 25, D-76137 Karlsruhe
Tel. 0721 79004-0, Fax 0721 79004-79
www.tlb.de