Continuous or picosecond pulse laser resonator source

Through a special arrangement of resonator mirrors in the laser arm, the laser can be switched between continuous wave operation (cw) and mode-coupled operation (sub-picosecond pulses) during operation.

- Direct switching from cw operation to mode-coupled operation with a laser restorer
- Flexibility of the laser source
- Reduction in costs and space requirements

Fields of application

The laser system can be used both in the field of macro material processing (welding, cutting, etc.) and in micro material processing (drilling, surface structuring, etc.).

Background

According to the current state of technology, it is not possible to carry out macro and micro material processing processes with an ‘universal‘ laser that can be operated in the cw as well as in the ns, ps and fs range. You need two laser resonators that generate the cw and mode-damped radiation in order to be able to carry out the different operating modes such as welding, cutting and microstructuring.

Problem

The above-mentioned setup with two lasers is very cumbersome and very expensive.

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Service
Technologie-Lizenz-Büro GmbH has been entrusted with exploiting this technology and assisting companies in obtaining licenses.

Solution

At the Institut für Strahlwerkzeuge at the University of Stuttgart, scientists have now developed a laser resonator that makes it possible to generate cw and mode-damped radiation in a single device that can be switched during laser operation.

In common “semiconductor saturable absorber” model scillators (SESAM), the operating mode depends on the fluence on the SESAM, i.e. cw radiation is emitted at fluences below the saturation fluence of the SESAM, while ultrashort pulses are emitted at fluences well above the saturation fluence.

To build the “universal” laser, an adaptive reflecting telescope with two “sharp cut dichroic mirrors” (SDM) is used so that the beam diameter at the SESAM can take on two different sizes, while the beam diameter at the other elements of the resonator (e.g. the laser amplification medium) remains constant. In this way, the output beam can be amplified in a laser amplifier (e.g. thin disk multipass, fiber, slab, etc.) to high average powers for material processing.

The invention enables both macro material processing (welding, cutting, etc.) and micro material processing (drilling, surface structuring, etc.) with the novel switchable laser system.

This increases the flexibility of the laser source while reducing costs and space requirements.