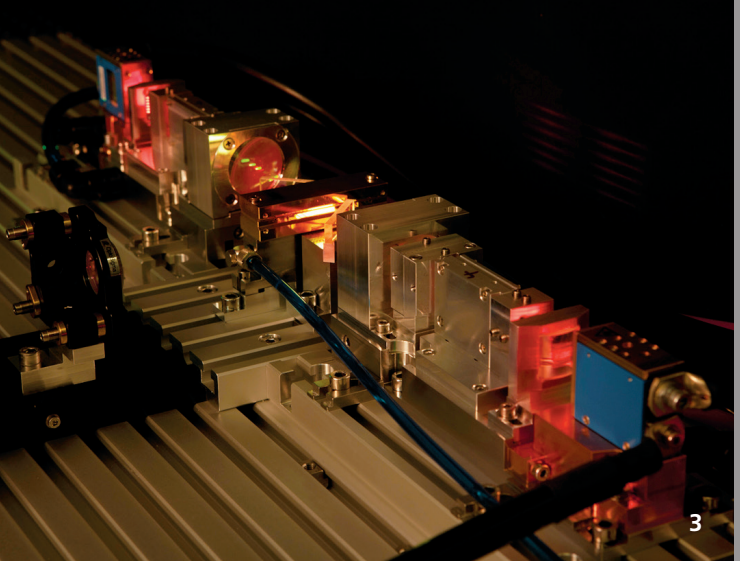

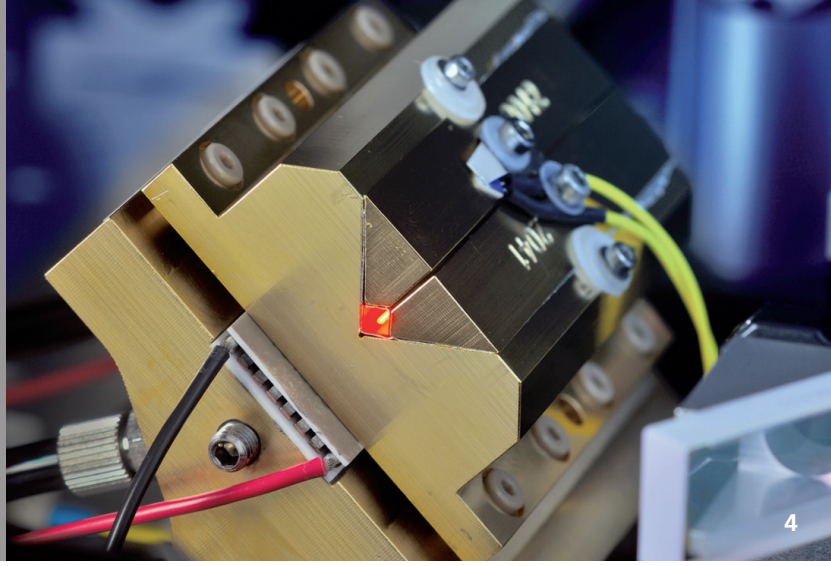

PULSED HO:YLF LASER

Task

Laser sources in the wavelength range around 2 µm and with pulse durations in the nanosecond range have many fields of application: materials processing, remote sensing, science and the military all take advantage of the special absorption properties of 2 µm radiation, as compared to, e.g., 1 µm. As part of the DLR project »CHOCLID« and the ESA project »HOLAS«, a pulsed spectrally narrow-band beam source with a wavelength of 2.051 µm is being developed to detect CO_2 in the atmosphere by means of LIDAR methods.

Method

To generate the required double pulses with 45 mJ and 15 mJ pulse energy and a repetition rate of 50 Hz, a Ho:YLF MOPA system was designed using numerical simulations; it is pumped by diode-pumped Tm:YLF lasers. In the oscillator, pulses should be generated with a constant energy of 4 mJ, which are scaled in an INNOSLAB amplifier to the required pulse energy. Special attention in the design was paid to meeting critical energy densities so as to avoid a laser-induced damage to the optics.

Result

As a pump source for the Ho:YLF oscillator, a Tm:YLF rod laser was built with a cw power of 25 W; currently its power is limited by the pump diodes used. The Ho:YLF oscillator generates pulses of 3.5 mJ with a pulse duration of 35 ns at a frequency of 1 kHz, and 11 mJ with a pulse duration of 25 ns at 100 Hz. The testing at high pulse energies shows that damage thresholds are not exceeded at the operating point of 4 mJ.

A Tm:YLF INNOSLAB laser, having 200 W cw power and adapted beam distribution, was built as a pump source for the prospective Ho:YLF amplifier.

Applications

Except as master oscillator for the following amplifier, the oscillator can be used in the named parameter field in materials processing. The output wavelength of 2 µm is also advantageous for use as pump source of efficient, long-wavelength, optical-parametric oscillators.

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Contacts

M.Sc. Philipp Kucirek
Telephone +49 241 8906-8108
philipp.kucirek@ilt.fraunhofer.de

Dipl.-Phys. Marco Höfer
Telephone +49 241 8906-128
marco.hoefer@ilt.fraunhofer.de

3 Tm:YLF INNOSLAB laser.

4 Ho:YLF oscillator.