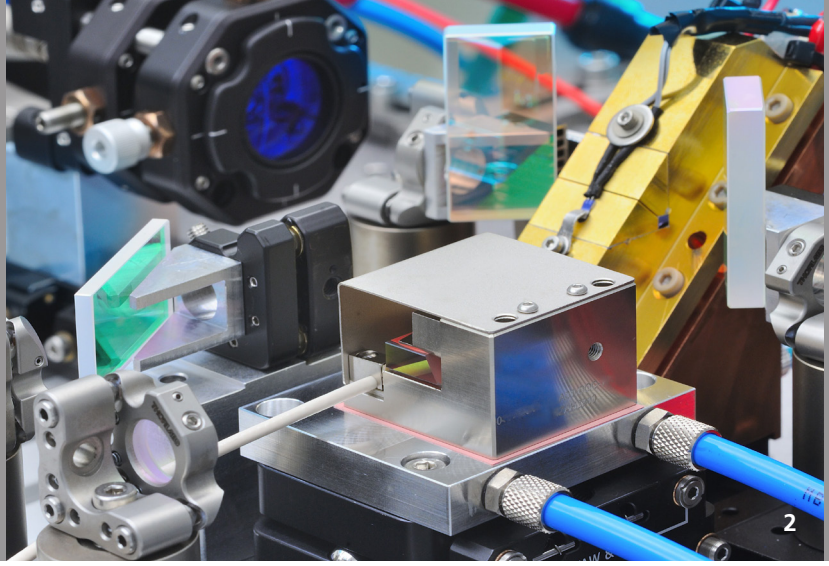

PULSED TM:YLF LASER BEAM SOURCE AT 1.9 µM

Task

As part of the project »DIVESPOT« with the Max Planck Institute for the Structure and Dynamics of Matter, Fraunhofer ILT has developed a pulsed laser-beam source that has an output wavelength of 1.9 µm. The beam source will serve to optically pump the amplification medium Cr:ZnSe. Since the luminescence lifetime of Cr:ZnSe in the upper state is only about 5 µs at room temperature, the power must be made available for efficient pumping in high-energy short pulses. The project aims to achieve repetition rates of up to 10 kHz and pump pulse energies in the mJ range.

Method

To generate laser light with a wavelength of 1.9 µm, Fraunhofer ILT has constructed a solid-state laser with Tm:YLF as a gain medium. An acoustic-optical modulator is used for the Q switch. The requested output parameters require a high average power in the oscillator. In order to achieve sufficient heat dissipation, the institute has installed the laser crystal, therefore, in an optimized heat sink. In addition, soldering technology is used to connect the crystal optimally to the heat sink. To provide the required optical pumping power, highly brilliant laser diodes pump the Tm:YLF rod from both ends.

Results

The institute has developed and built a pulsed laser beam source emitting at a wavelength of 1.9 µm. The repetition rate can be freely selected between 1 and 9 kHz. In this case, regardless of the repetition rate, a pulse energy of at least 2 mJ can be generated in single mode operation. The pulse lengths of the system are in the range between 300 and 650 ns.

Applications

The developed laser beam source can be used to optically pump the laser medium Cr:ZnSe. The 1.9 µm laser beam sources are suitable for use in the medical field, e.g., as a laser scalpel in surgery. Another possible application is in plastic welding.

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Contact

Benjamin Erben M.Sc.
Telephone +49 241 8906-657
benjamin.erben@ilt.fraunhofer.de

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

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