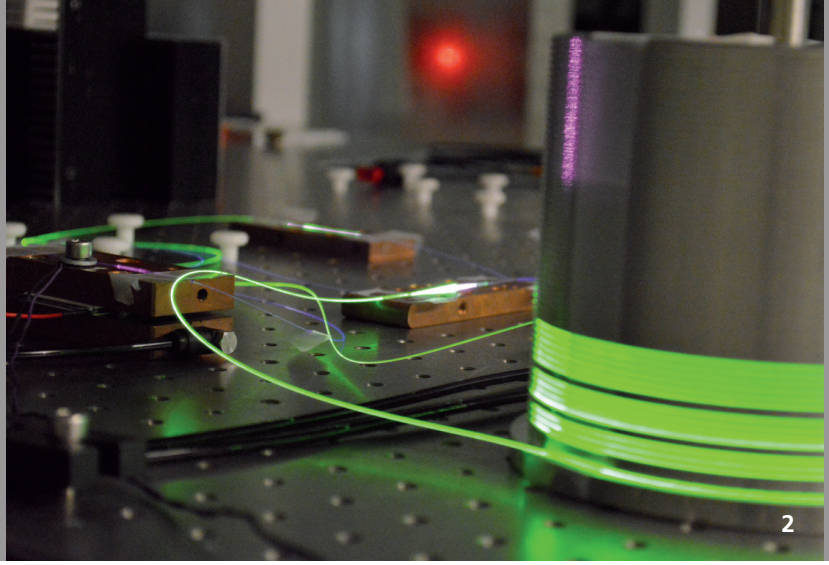

DIODE-PUMPED SINGLE-MODE CW FIBER LASER AT 1532 NM

Task

In a LIDAR system, a single-mode Er:YAG laser is used, which emits at 1645.2 nm, the absorption wavelength of methane. As a pump source, a single-mode cw laser is needed, which should reach a wavelength of 1532.4 nm and a bandwidth of below 1 nm. Furthermore, as this laser shall be used in satellite-based applications, special attention needs to be placed on its efficiency.

Method

Developed at the ILT and already in use, a simulation is temporally and spatially resolved and should be expanded for use with Er/Yb fibers. Thanks to this simulation the laser will be dimensioned for pump wavelength, fiber length and principle laser design (resonator or amplifier). Subsequently, it will be built on the basis of these results. For this, a completely fiber-integrated laser will be developed, with a commercially available Er/Yb co-doped glass fiber as an active medium, which emits at 1532.4 nm.

Result

The experimental set-up consists of a fiber resonator, which by means of a fiber-coupled multi-mode pump diode as pump source, reaches a signal wavelength of 1532.4 nm and a spectral full-width half maximum (FWHM) bandwidth of $\Delta\lambda = 0.32$ nm and emits single-mode signal light with a $M^2 \sim 1.05$ at over 3 W. In the process, the fiber laser reaches an electro-optical efficiency of ~ 10 percent. With this, almost a doubling of the efficiency could be demonstrated compared to a commercial system available at Fraunhofer ILT. Furthermore, the fiber laser exhibits significant scaling potential of the output power and the electro-optical efficiency.

Applications

Thanks to its narrow FWHP bandwidth, easily adjustable central wavelengths and high efficiency compared to commercial systems, this laser is ideally suited as a pump source for applications in the aerospace industry, e.g. for Er:YAG crystal lasers for methane detection. In addition, the laser can be used as a signal source for further applications, as in, e.g., satellite communication.

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2 Er/Yb fiber laser.