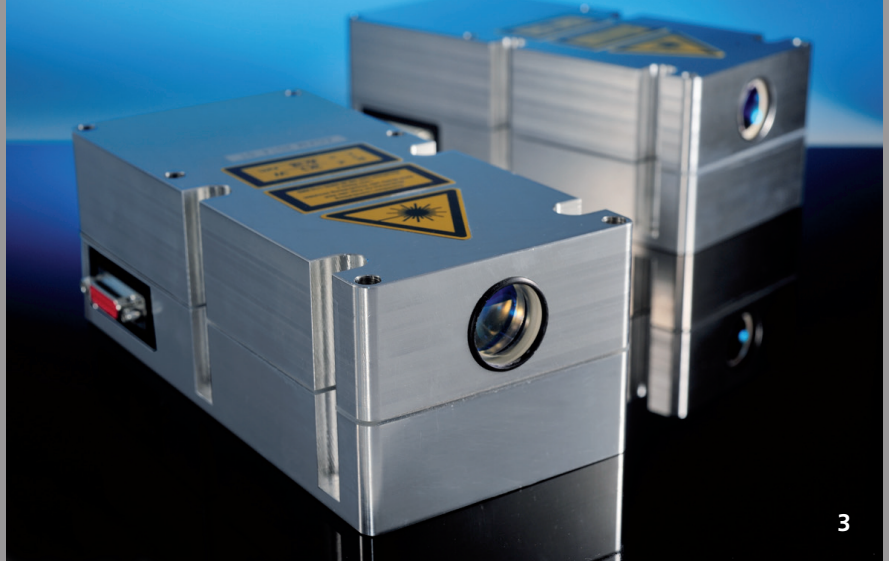

PULSED DIODE-LASER MODULE WITH LINE-SHAPED INTENSITY DISTRIBUTION

Task

Demanding applications within measurement and exposure technology require line-shaped intensity distributions in the range of 1 kW/cm² and a homogeneity of > 90 percent combined with adjustable pulse durations in the range of a few microseconds.

Method

Because of their fundamental-mode emission in the vertical direction and multi-mode emission in the lateral direction, diode-laser edge emitters are very suitable for generating linear intensity profiles. For easy integration into existing equipment, the beam source developed here is hermetically sealed and equipped with integrated drive electronics, trigger inputs, interlock interfaces and monitor outputs. The heat is dissipated by heat conduction so that the cost of a water cooler is omitted. If necessary, active cooling can be integrated.

Result

The pulse duration of the diode laser module implemented can be freely adjusted in the range between 1 µs and 1 ms. The demonstration model is operated at a repetition rate of 500 Hz and a pulse duration of 5 µs. The measured rise time to reach the maximum intensity is 300 ns. Peak power can be increased as needed from the current 10 W to approx. 50 W. In addition to the wavelength of 808 nm, the dimension of the line can be adapted to the application.

At a working distance of 45 mm, the demonstrated full width at half maximum (FWHM) of the intensity distribution is 65 µm in the vertical direction and 9 mm in the lateral direction. The standard deviation of the homogeneous intensity distribution in the lateral direction is only 4 per cent despite an inexpensive optical design.

Applications

In measurement and exposure technology, linear intensity profiles with defined geometry are commonly used to record shape and position in the range of a few micrometers up to the millimeter range. Radiation with power densities of up to 2 kW/cm² allows measurements to be made within a few microseconds. In addition, a high signal-to-noise ratio is achieved due to the short illumination duration and the spectrally narrow-band emission. When the pulse parameters are adjusted, the inexpensive modules are also suitable for the precise application of process heat.

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3 Compact, hermetically sealed diode laser module.