



HIGH-BRIGHTNESS DIODE LASER MODULES IN THE RED SPECTRAL RANGE

Task

High-brightness beam sources with emission in the red spectral range are required for direct materials processing, medical technology or pumping solid-state lasers, e.g. an alexandrite laser for climate research. A diode laser module for direct, longitudinal pumping of an alexandrite laser should achieve a pulsed output power of at least 10 W with a minimum 35 Hz pulse repetition rate and around 200 μ s pulse duration.

Method

An optomechanical concept for the tight overlay of the radiation using a minimal number of optical components for collimation and focusing was selected. The concept can be tailored quickly to individual customer requirements for the entire spectral range from UV through to IR. The optics was designed using commercial ray-tracing software for optimum intensity distribution of the pump radiation in the crystal. In order to ensure an even temperature of the diodes and hence a spectral width that is as small as possible, the shape of the heat sinks was modified accordingly.

Result

A diode laser module with an optical output power of more than 13 W (peak pulse output in the focus) was set up. The spectral width at 2.2 nm corresponds to the statistical dispersion of the individual emitters. 96.5 percent of the output power is linearly polarized. The beam quality is $M^2 = 45$ in the fast axis and $M^2 = 38$ in the slow axis.

Applications

The development of high-brightness diode laser modules in the red spectral range enables flash lamps to be replaced as a pump source while substantially increasing the energy efficiency of alexandrite solid-state lasers and extending maintenance-free operating times.

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