

Laser Diode Module of High Energy Brightness with Fiber Optic Output LMD-50

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The results of the development of a high-energy diode laser module with a fiber-optic output for pumping fiber lasers are presented.

The last decade has seen rapid progress in materials, designs, and manufacturing technologies for diode lasers. The global output of diode lasers of types consistently exceeds 40% (6.9846 billion USD) of the production of lasers of all types in 2019. [1]. High-power diode lasers are most widely used in the market for laser processing plants for material processing, pumping systems for fiber and solid-state lasers. In this regard, the creation of high-power, highly efficient diode laser modules is a priority task. A laser diode module LMD-50 was developed RME Inject, LLC and its production started. In the process of developing this module, the topology and manufacturing technology of an active element - a laser diode (LD) and a precision assembly of the module - were created. An optical scheme for outputting radiation from the module case was designed and optical micro-lens elements were manufactured to achieve a laser output power of 50 W in a continuous mode in the core of an optical fiber with a diameter of 105 μm and a numerical aperture of 0.22. The overall dimensions of the module case are: 78 (L) x28 (W) x13.5 (H) mm. The external view of the module is shown in the photo Fig. 1.



Fig. 1. External view of the laser diode module LMD-50.

The main parameters of the LD module are shown in Table 1 below.

Table 1

Parameter	Units	Min.	Nom.	Max.
CW Laser Output Power	W	44	50	54
Central Laser Wavelength	nm	973	976	979
Laser spectrum half-width (FWHM)	nm	4	5	6
Temperature shift of laser wavelength	nm/°C		0,35	
Operating Current Shift of the Laser Wavelength	m/A		0,9	
Efficiency	%		46	
Operating Current	A		12	
Threshold Current	A		0,6	
Operating Voltage	V		9	
Differential Efficiency	W/A		6,5	
Fiber Outer Protective Coating Diameter	μ	Teflon (ETFE)	900	

An analysis of the designs of LD modules with fiber optic output produced by foreign companies: Jenoptik, DILAS / Coherent, II-VI, Lumentum, Suzhou Everbright Photonics, Jilin Province Changguang Rays Laser Technology, BWT Beijing, showed that only DILAS / Coherent is produced LD module with the same rated output power of 50 W, suitable for a number of applications. The LMD-50 module has a laser wavelength of 976 +/- 3 nm, which is optimal for pumping fiber lasers. In terms of the main technical parameters, a LD module of high energy brightness with a fiber-optic output LMD-50 corresponds to a foreign analogue. Materials made in Russia were used in the design of the LMD-50 LD module, therefore, the use of modules in new domestic developments of fiber lasers and laser devices eliminates the need for imports, dependence on a monopoly supplier, and opens up new opportunities for creating domestic fiber lasers.

The laser diode module is intended for use as a source of high-power optical radiation and has good prospects for use in equipment for widespread use in systems for diode pumping of fiber lasers; laser micromachining of materials; medical devices and scientific research.

References

- [1] Annual Laser Market Review & Forecast 2020: Laser markets navigate turbulent times, Jan 28th, 2020; Electronic resource: URL: <https://www.laserfocusworld.com/lasers-sources/article/14073907/laser-markets-navigate-turbulent-times> (date of access: 07/10/2020).