THE INVESTIGATION OF THERMAL LENS PROPERTIES IN THE ACTIVE ELEMENT OF LASER AMPLIFIER WITH HIGH POWER DIODE PUMP

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A femtosecond laser system with a pulse repetition rate up to 1 kHz is being developed at the Institute of Laser Physics of the SB RAS. The key component of the system is the channel of laser amplification based on crystals doped with Yb^{3+} ions. The channel is designed to produce 300 W of average output power. Thermal effects in high-power laser amplifiers are decisive for the parameters of the radiation at the output of system.

The aim of the work is to define the dependence of thermal lens focal distance in Yb:YAG active element of a multipass amplifier on diode pump power using geometrical method.

In this paper the results of experimental measurements of thermal lens focal distance dependence in Yb:YAG active element on diode pump power in range 10-120 W are given. For this power range, the focal distance of the thermally induced lens changes from 5.67 to 0.44 m for vertical axis, and from 3.06 to 0.4 for horizontal axis. Calculation of the dependence thermal lens focal distance on the pump power and a comparison with experimental data are given, the results are in good agreement. All the obtained data are used for development of the all diode-pumped cryogenically cooled all solid state laser system operating at 1 kHz repetition rate.

Key words: high power laser, laser amplifier, thermal lens, diode pump, end pumping, Gaussian beams, ytterbium ions, dopant ions.

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