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Combined output windows for high-power lasers

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As the power of modern lasers grows, the potential of classical output windows becomes nearly depleted. Thermooptical processes in a window result in significant growth of beam divergence. The paper is devoted to some practical aspects of increasing radiation strength of output windows in high-power lasers. The numerical simulation of combined windows described below has been conducted [1,2]. High-power lasers are usually designed using unstable cavity. The beam intensity profile in near field in such lasers usually has a ring shape, so the central part of the window does not undergo severe radiation load. In this case, it can be made of different opaque material that is cheaper and mechanically stronger. The central part of the window is separated from the peripheral one using ductile vacuum gasket. The radiation strength of the window can be increased by placing PCM cooling system in the central part in order to enhance heat sink. Output windows made of polycrystalline CVD diamond with higher bulk absorption coefficient are widely used in CO2-lasers as the size of single-crystalline diamond available on the market does not allow using it as a window material. In case of Gaussian beam profile it is efficient to "strengthen" the central part of the window which experiences maximal loads during operation. We suggest using the combined windows made of polycrystalline diamond with a single-crystalline central region for transmitting the most of the energy. The peripheral polycrystalline part is used for vacuum isolation and heat sink. The application of combined windows made of two slabs with opposed dn/dt coefficients has been considered as well. An output window for CO2-laser made of ZnSe and KCl which allows to improve beam divergence has been examined.

Biography

M V Rogozhin received his master's degree in physics at Moscow Institute of Physics and Technology (MIPT) in 2015. He is currently a postgraduate student at Department of Physical and Quantum Electronics and holds a position of an engineer in Laboratory of Laser Navigation Systems in the same institution. Area of scientific interest: output windows in high-power lasers. Author of a number of publications in the above-mentioned area.

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