Abstract of the master's thesis
«Picosecond laser pulse formation at aberrational thermal lens and saturation gain conditions»

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The masters thesis is aimed to study the conditions of steady laser generation in high peak power picosecond solid-state laser systems with pulsed diode end-pumping at presence of thermal lens in the active laser element. One of the main objectives of the paper is the development of efficient method for modeling and analysis of radiation spatial structure for lasers with axially symmetric cavities at presence of significant aberrational part in thermal lens.

The method developed in the current thesis is based on Laguerre–Gaussian beams space transmission matrixes for optical elements construction and computation of eigenvalues and eigenvectors in this space. This approach allows to adequately describe the effect of aberrational thermal lens on laser cavity eigenmodes structure in case of average pump power variation.

The master's thesis consists of introduction, four chapters, summery, conclusions and references.

In the first chapter laser cavity eigenmode representation in the Laguerre–Gaussian beams space is considered. There derived expressions for embedded Laguerre-Gaussian basis parameters estimation for arbitrary beam and also equations for determination of basic optical elements transmission matrixes in the Laguerre-Gaussian space.

In the second chapter active element model constructed taking into account aberrational thermal lens and inhomogeneous distribution of population inversion observed in case of end pumping. Approach to description of laser pulse amplification process in case of gain saturation is proposed.

In the third chapter picosecond laser cavity eigenmodes structure modeling process is described. Numerical calculation results for the beam parameters dependency on pump pulse repetition rate are presented. Special attention is paid to the mode switching effect.

In the forth chapter comparison of experimentally measured beam parameters dependency with the numerical simulation results is conducted.

The master's thesis consists of 69 sheets. The paper includes 24 illustrations, one attachment and 33 references.