Diploma thesis abstract
Alexander V. Grigorievskiy
Scientific Advisor Dr. Olga G. Kosareva
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Femtosecond laser pulse filamentation in the course of axicon focusing into the bulk condensed medium

We performed numerical simulations of high-peak-power femtosecond laser pulse filamentation in the bulk of condensed medium. The simulations are based on the three dimensional cylindrically symmetric nonstationary model, which includes Kerr nonlinearity, self-produced laser plasma, material dispersion of the second and the higher orders. Control of plasma channels produced by a femtosecond pulse is performed using the axicon or parabolic lenses with various geometrical focusing distances. The longitudinal homogeneity of the plasma channel produced by the axicon is the largest as compared with the channels produced by the lenses. The light field energy fluctuations within the axicon plasma channel do not exceed 1.5% of the initial pulse energy. The effect of higher – order material dispersion as compared to the second-order dispersion is in the steepening of the pulse leading front and change in the longitudinal positions of the local electron density maxima.

We have found that axicon focusing results in splitting of the conical emission rings in the high-frequency part of the spectrum. Spatial distribution of the white light continuum in the range 600-800 nm is in qualitative agreement with experimental data obtained in the Institute of Spectroscopy of the Russian Academy of Science.