«Femtosecond laser pulse filamentation at wavelength 800 nm with Bessel beam in a transparent solid dielectric»

Vasiljev E.V.

Scientific advisor: Shlenov S.A.

Abstract: This diploma work is devoted to the problem of laser pulse filamentation in a transparent solid dielectric.

To solve this problem a software package for PC was written. The basis of this package is the model of ultrashort pulse propagation in the slowly evolving wave approximation, taking into account such effects as diffraction, dispersion, pulse front steepness, Kerr-effect, plasma nonlinearity, linear and non-linear absorption. Software code uses uneven computational grid in the beam cross-section and adaptive step along the longitudinal coordinate. For frequency-angular spectra of axisymmetric beams the algorithm of Hankel transform on the computational grid of a special kind was implemented.

Individual components of the software packages have been tested for specific examples with known solutions.

A comparative analysis of the femtosecond laser pulse filamentation in fused silica in a collimated Gaussian beam and the beam focused by an axicon at different positions to the sample was made. Spatio-temporal evolution of femtosecond pulse at a wavelength of 800 nm in the collimated Bessel-Gaussian beam propagating in fused silica in a single filament regime was also obtained.