Diploma thesis abstract

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Numerical study of filamentation femtosecond powerful laser pulses in the turbulent atmosphere at lengthy distance

In this diploma work investigated filamentation femtosecond powerful laser pulses in the turbulent atmosphere at lengthy, including kilometers routes within the computational experiment. Detected that with the growing importance of continuous atmospheric turbulence average of an earlier formation the first "hot spots" and increased statistical dispersion distance where it is formed. With increasing peak power dispersion in the values of the cross coordinates of the first "hot spots" of the momentum gained by decreasing. These patterns are not changing external scale atmospheric turbulence varies from 1 m to 10 m and internal scale varies from 3 mm to 10 mm. It has been shown that impulse with negative chirp it more likely that the formation of the first "hot spot" at the distance (about one kilometer) of the radiating aperture. The air routes found spatial separation of the high density of energy and the high concentration of electrons in the plasma channels.

The work includes methodical part related on the development of parallel algorithms for the filamentation and analysis of the influence ionization threshold at multifilamentation picture. The proposed parallel algorithm for the numerical solution tried by a series of tests on various computing clusters. Analysis of the results of numerical experiments with different thresholds of plasma showed save qualitative picture of multifilamentation. Shown to quantify the lateral size plasma channel by the scale of the task with low ionization threshold (at current grid with less nodes).