Diploma thesis abstract

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We have performed numerical simulations of multiple filament regularization. The method is based on the introduction of an amplitude mask into the laser beam transverse section. The mask is represented by a square mesh with the period d, which includes opaque boundaries of the size $h << d$. This mesh introduces the prescribed intensity perturbations seeding multiple filaments. These filaments create a regular pattern in spite of random intensity perturbations either in the initial beam or in the refractive index of the medium. The controlling properties of the mesh are mainly defined by its geometrical parameters. The work is aimed at the development of the general algorithm allowing one to choose the optimum mesh parameters for various input pulse energy and strength of the random intensity perturbations.

In addition we have studied numerically the possibility to produce the converging array of multiple filaments when the mesh is inserted into the geometrically focused beam. Our simulations were reproduced in the experiment in the Institute of Spectroscopy of the Russian Academy of Sciences. Numerical simulations show good agreement with the experimental results.