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Abstract of the diploma thesis

Regularized superfilamentation of high-power femtosecond laser radiation

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In present work we investigate fusion of several coherent femtosecond filaments and formation of a superfilament in the geometrical focus of a lens. Using full 3*D*+1 Forward Maxwell Equation, we reproduce the filaments' collision, the formation of the superfilament and the overcome of the intensity clamping. The peak intensity and the peak plasma density of the fused filament exceed clamped level by 40 % and by 400 %, respectively. We estimate an energy absorption in this regime. We show that 30 % of incident energy is transferred to the internal energy of the medium (versus 10 % in case of single filamentation) and demonstrate that such efficiency is due to the collisional relaxation of free electrons rather than due to the ionization loss itself. Also we show that the filaments' collision provides newly born high-frequency radiation which forms a cross in the k_x–k_y domain and an enhanced blue shift of the integrated spectrum (more than 10 nm from its original peak at 800 nm).