Extreme localization of femtosecond mid-infrared laser radiation under anomalous group velocity dispersion

Dormidonov A E[1,@], Zaloznaya E D[1,2], Simonova V A[1], Kompanets V O[3], Chekalin S V[3] and Kandidov V P[2]

[1] Dukhov Research Institute of Automatics (VNIIA), Luganskaya 9, Moscow 115304, Russia

[2] Lomonosov Moscow State University, Leninskiye Gory 1, Moscow 119991, Russia

[3] Institute of Spectroscopy of the Russian Academy of Sciences, Troitsk, Russia

[@] dormidonov@gmail.com

The results of a thorough study of the femtosecond mid-infrared wave packet compression under anomalous group velocity dispersion condition in transparent dielectrics are presented. The consequence of coordinated and joint localization of light field both in space and in time is the formation of an extremely compressed wave packet, the duration of which is close to the period of optical oscillations and the radius is equal to several wavelengths [1–3]. "Breathing" of such single-cycle pulses caused by carrier-envelope phase shift as well as periodic modification of dielectrics induced by them are investigated for the first time. A method based on the registration of the modulation depth of perturbations induced in the dielectric by ultrashort pulses is proposed to determine their duration. Based on the analysis of the results of theoretical and experimental studies, the main regularities of the formation and propagation of extremely compressed wave packets during filamentation under anomalous group velocity dispersion condition are formulated.

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