Long-time Dynamics and Interaction of Ultrashort Light Pulses

Michail Todorov

Department of Applied Mathematics and Computer Science,
Technical University of Sofia, 1000 Sofia, Bulgaria
`mtod@tu-sofia.bg`

Keywords: Ultrashort light pulses, nonlinear envelope equations, nonintegrable dynamical systems.

The propagation dynamics and interaction of ultrashort light pulses is presented. The pulse propagation behavior is studied by numerical simulations of mathematical models at realistic physical conditions. The spatiotemporal dynamics of ultrashort light pulses within dispersive equations like generalized (3+1)D nonlinear Schrodinger equation and (3+1)D nonlinear envelope equations as governing equations as well as at ionization free and ionization regimes is revealed and summarized.

The complex structure and the presence of terms with different physical sense requires the coordinate splitting to be preceded by splitting by physical factors (processes). In contrast to the coordinate splitting this kind of splitting can be exact in some nodes and in the intervals it can be controlled. We show that this method is relevant for study of propagating ultrashort localized pulses in nonlinear waveguides. The nonintegrability of the considered dynamical systems and the missing exact solutions requires to provide the investigation only numerically.

The obtained results are reliable and give good predictions for the material quantities and dynamics of the light pulses.