

Classical and quantum nonlinear optical waves

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Abstract

We report on a general introduction of nonlinear optical waves propagating in different materials. We discuss some basic theoretical models, and experiments. We discuss temporal, spatial and spatio-temporal nonlinear waves, in optics of modern interest. We also introduce some techniques used to study quantum effects in a non-perturbative framework, with applications in quantum fluids of light and advanced nonlinear optics. A basic introduction to numerical methods for solving nonlinear equations and stochastic nonlinear equations for quantum phenomena is given. The course aims at providing an overview of experiments and theory, with emphasis on recent applications as optical computing and quantum nonlinear waves. Visits to the laboratory of nonlinear photonics with some small scale experimental work are also possible.