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Appearance of the optical turbulence and strange attractors breakdown in the coherent exciton and biexciton systems

A. H. Rotaru, V. Z. Tronchu

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Abstract

Much attention is being paid of late to the study of cooperative processes in the exciton region of the spectrum. Previously, using generalized Keldysh equations that describe coherent excitons and photons that are weakly nonhomogeneous in space and in time, the theory of optical bistability (OB) was developed in the exciton region of the spectrum, and optical switchover between branches of optical-bistability loop was investigated. The paper presents a theoretical investigation of regular and chaotic self-pulsations in a CuCl crystal with the participation of coherent excitons and biexcitons. We proposed the method of chaotic self-pulsation breakdown in the system of coherent excitons and biexcitons. The method consists in action of external periodical turbulence (Y/spl tilde/=Y+/spl alpha/ sin(/spl omega//spl tau/)) upon a stochastic system. The range of amplitude values and frequencies of an external harmonic pump were found at which the chaotic oscillation regime becomes nonlinear periodic by transformation of strange attractor into a limit cycle.