CMT P20 NONLINEAR TRANSMISSION OF SUPERSHORT LASER PULSES BY THIN SEMICONDUCTOR FILMS

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Peculiarities of nonlinear nonstationary transmission (reflection) of supershort laser pulse by a thin semiconductor film, depending on the intensities, envelope shapes and widths were investigated taking into account the processes of exciton–photon interaction, optical exciton–biexciton conversion and two–photon biexciton excitation from the ground state of the crystal. We developed the theory for the case when one pulse with the same frequency excites the excitons, biexcitons from the ground state of the crystal and mixes the exciton and biexciton levels. This case is possible for the crystals like CdS or CdSe, where biexciton bindig energy is vanishingly small. The system of nonlinear differential equations is derived, which describes the time evolution of the real and imaginary components of excitons and biexciton polarization of medium and of the amplitudes of transmitted fields through film. The equations for the field amplitudes are the differential ones for the films with the thickness of the order of the wave length, which are converted into the system of algebraic equations for the films with the thickness much less than the wave length.

For the short pulses of the rectangular shape we have predicted the nonstationary regimes of the total reflection of the incident pulse, of the total bleaching, of the transformation of a short pulse into the train of supershort pulses, of the generation of solitary supershort pulse, the width of which is of some orders less, than the width of the incident pulse.

In the case of the Gaussian incident pulses we obtain the shortening of the transmitted pulses, the generation of several subpulses and occurrence of the selfpulsing regime.

CMT P21 COMPLEX DYNAMICS OF QUANTUM DOTS LASERS UNDER THE INFLUENCE OF EXTERNAL MULTIPLE OPTICAL FEEDBACK

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We report in this paper the numerical results on the dynamical behavior of a semiconductor laser with quantum dots active medium under the influence of multiple external optical feedback. The dynamic behavior is studied based on the Bloch equation model. The locus of external cavity modes is found and the nature of bifurcations and the stability of steady state solutions are analyzed. A bifurcation analysis is carried out revealing the points of Hopf bifurcations. The effect of the different parameters on the stabilization and destabilization of laser emission is investigated. Finally, we find the optimal conditions for CW, periodic and chaotic operation. The synchronization of two unidirectional-coupled (master–slave) systems and the influence of parameters mismatch on the synchronization quality are also studied.