Control by a focussing of light beams at quasi-resonance acousto-optical interaction

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The nonresonance interaction of a light field with a ultrasonic wave reduces, as is known, to phase modulation of a wavefront of a light wave. Besides modification of a phase surface of a light field can appear. It excites effects of a focussing and undiffractional propagation of light beams. In the present paper the effects of undiffractional propagation and focussing of light beams are investigated in details at quasi-resonance diffraction on a ultrasonic wave in approximation of constant intensity. Acoustooptical focusing device on the base of crystal TeO_2 is analytically and numerically are investigated The conditions of a focussing, focal length, angular aperture of a lens are found at acoustooptical interaction. The possibility of reorganization of it parameters with the help of reorganizations of frequency of ultrasonic wave is shown.

Secondary electrooptical effect in superlattices

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Due to successes by creation of superlattice (SL) research of propagation of electromagnetic waves in such media is of great interest. Application of SL allows to combine useful properties of component of SL and also to expand functionality of devices due to the phenomena, impossible in monocrystals. The most general approach for research the light transformation in SL is to solve Maxwell equations and to take into account conditions on boundaries of layers. But thus, in most cases there is possible only a numerical analysis of processes.

In this paper we assume that the length of a light wave considerably exceeds the period of SL and therefore the phenomena of diffraction on boundaries of layers can be neglected. Then we may use the long-wave approach. Electrooptical properties of such structures are considered and secondary electrooptical effect (SEOE) is taken into account.

As a result the dependence of effective electrooptical parameters of medium on a ratio of thickness, an angle of disorientation of crystallographic axes of a superlattice and strength of an external electric field are obtained.

The following is found:

1) Presence SEOE results in disappearance of electrooptical interaction at the certain ratio of thicknesses of SL components.

2) Electrooptical parameters may change a sign and considerable differ from values without SEOE taking into account.

Thus, it is important to consider SEOE at creation of SL and research of propagation of electromagnetic waves in SL.

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