vibrational resonance. At the optimal amplitude of the current modulation a complete synchronization of optical switchings between polarization states with modulated optical signal is observed which can be in-phase or anti-phase with respect to the optical signal. The effect of a delay of the response of the bistable laser with respect to the modulating optical signal is found out which can be controlled by the current modulation. The influence of the asymmetry of a bistable quasi-potential on the efficiency of optical switching is experimentally demonstrated. These results can be important for enhancement of sensitivity of sensors based on a bistable laser as well as for development of optical switches for optical communication systems, controlled through the current modulation.

The possibility of using distributed space-time models for simulation of various operational modes of solid-state laser

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On an example of solid-state diode-pumped lasers it has been demonstrated the necessity to use spatially distributed laser model for simulation of various modes of operation (e.g., cw, Q-switch, Q-switched mode-lock) for such lasers. Simulation of such system's pecularities as nonuniformity of the pump, existence of saturable absorber elements as well as large time delay feedback are also discussed.

Theoretical investigation of hybrid mode-locking in two-section semiconductor quantum dot lasers

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In the present work theoretical investigations of hybrid mode-locking in semiconductor quantum dot lasers were carried out using a mode-locking model based on a set of 3 delay-differential equations. The reverse bias modulation was described by a periodic variation of the carrier relaxation rate in the absorber section. Dependence of the locking range on the modulation amplitude and modulation shape has been studied numerically and analytically using asymptotic analysis. It has been shown that in the case of pulsed modulation shape locking range is asymmetric with respect to the frequency of passively mode-locked laser. This asymmetry is related to the dependence of the pulse repetition frequency on the modulation amplitude. Finally it has been demonstrated that the hybrid mode-locking regime can be achieved in the case when the modulation frequency is approximately twice higher or lower than the pulse repetition rate of the free running passively mode-locked laser.