Such crystals include natural crystals and artificial three-dimensional periodical structures. In VFEL while relativistic electron beam passing through such photonic crystals in conditions of dynamical diffraction quasi-Cherenkov parametric radiation appears and obeys to special law [Baryshevsky V.G., Feranchuk I. D. Phys. Lett. A. 102 (1984), 141]. This law is valid for all wavelength ranges and substantially differs from its analogues in other electronic devices such as traveling wave tubes, backward-wave tubes, free electron lasers and other. Different sides of chaotic dynamics of such generation are investigated. The complicated root to chaos in VFEL is demonstrated starting with the generation threshold.

Laser pulse control of DCl^+ photofragmentation

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The prospects of the control of deuterium chloride ion (DCl+) photofragmentation with the laser field generated by two time-shifted interfering femtosecond laser pulses is investigated theoretically. The analysis performed by means of computer simulation within the Schroedinger wave function formalism. The calculations provide evidence that the ratio of product ion yields Cl^+ versus D^+ can be manipulated by appropriate choice of laser pulse parameters, in particular central laser wavelength, pulse duration, intensity and chirp. The analysis of time dependent populations reveals competition between intra- and inter - electronic state excitation, enabling the understanding of quantum control at the molecular level.

On some peculiarities in transition from de Sitter's to Minkowski model: iteration procedure in the radial equation for a scalar particle

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Though the problem of Hawking radiation in de Sitter space-time, in particular details of penetration of a quantum mechanical particle through the de Sitter horizon, has been examined intensively there is still some vagueness in this subject. The present paper aims to clarify the situation. A known algorithm for calculation of the reflection coefficient $R_{\varepsilon j}$ on the background of the de Sitter space-time model is analyzed. It is shown that the determination of $R_{\varepsilon j}$ requires an additional constrain on quantum numbers $\varepsilon R/\hbar c >> j$, where R is a curvature radius. When taking into account this condition, the value of $R_{\varepsilon j}$ turns out to be precisely zero. It is shown that the basic instructive definition for the calculation

of the reflection coefficient in de Sitter model is grounded exclusively on the use of zero order approximation in the expansion of a particle wave function in a series on small parameter $1/R^2$, and it demonstrated that this recipe cannot be extended on accounting for contributions of higher order terms. So the result $R_{ij} = 0$ which has been obtained from examining zero-order term persists and cannot be improved. Iteration procedure in the basic radial equation for a scalar particle is performed that provides us with differential equations describing the contributions of zero, first and second orders on $1/R^2$ respectively.

Interaction of light beams on reflection dynamic holograms in single-crystals

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The basic physical principles of the interaction of two counterpropagating light beams on dynamic reflection holograms recorded in the Denisyuk scheme in single-crystals due to the diffusion formation of space-charge field are considered. We analyze the nonlinear response relating to both phase (photorefractive) and amplitude (absorption) components of the reflection grating. Along with conventional linear electro-optic effect the additional elasto-optic contributions to the phase grating induced by secondary phenomena are taken into account. We consider two converse effects, piezoelectric and flexoelectric ones, as the causes of existence of the elastic-strain gratings in the single-crystal materials. It was shown that qualitative distinctions in photorefractive response induced by linear electro-optic effect and by converse flexoelectric effect together with the elasto-optic one are exhibited at phase demodulation in an adaptive interferometric setup utilizing interaction of two counterpropagating light beams on the reflection holograms. Based on the experiments with such interaction in the (100)-cut $Bi_{12}TiO_{20}$:Fe,Cu crystals we established that theirs flexoelectric coefficient f11 can be estimated as the value in the range from 1.9 to 5.3 nC/m.

Stimulated Brillouin scattering suppression in fibers via longitudinal acoustic velocity design

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We propose novel technique to suppress the stimulated Brillouin scattering (SBS) in fibers and fiber amplifiers for high power single frequency operations by high-accuracy acoustic waveguide structure control.