

# Russian and Japanese Aerospace Literature

During 1994 the *AIAA Journal* will carry selected abstracts on leading research topics from Russian aerospace literature and, as space permits, from similar Japanese literature. The topics will be chosen and the abstracts reviewed for pertinency by *AIAA Journal* editors. This month features Solid-State Lasers from Russia and Artificial Intelligence from Japan.

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## Russian Aerospace Literature This month: Solid-State Lasers

**A93-53343** Relaxation oscillations in solid-state ring lasers with arbitrary mode polarization (Relaksatsionnye kolebaniya v tverdotel'nykh kol'tsevykh lazerakh s proizvol'noj polarizatsiej mod.). O. E. NANIJ and M. R. PALEEV, *Kvantovaya Elektronika* (ISSN 0368-7147), Vol. 20, No. 7, July 1993, pp. 699-704.

Research supported by Moskovskij Gosudarstvennyj Univ. Publication Date: Jul. 1993 24 Refs. An expression is obtained for the relaxation oscillation frequency of a solid-state ring laser with arbitrary polarization of optical modes, arbitrary coupling coefficients, and amplitude and frequency nonreciprocity of the cavity. The analysis made is also valid for linear double-mode and two-channel solid-state lasers. (Author)

**A93-47184** New techniques for measuring optical nonreciprocity in solid-state ring lasers (Novyye vozmozhnosti izmereniya opticheskoy nevzaimnosti v tverdotel'nom kol'tsevom lazere). I. I. ZOLOTVERKH and E. G. LARIONTOV, *Kvantovaya Elektronika Moscow* (ISSN 0368-7147), Vol. 20, No. 5, May 1993, pp. 489-492.

New methods are proposed for measuring the amplitude and frequency nonreciprocity in the resonator of a solid-state ring laser (SRL) operating in the automodulation regime. It is shown that the amplitude nonreciprocity can be determined by measuring the difference between the autooscillation phases of the intensities of two counterpropagating waves. Expressions are derived relating the amplitude and frequency nonreciprocities to the experimentally measured autooscillation parameters. Particular consideration is given to the feasibility of measuring frequency nonreciprocity by comparing two signals: the intensity of one of the generated modes and the signal of the photomixing of two counterpropagating waves. (AIAA)

**A93-43081** New materials based on LaBGeO<sub>5</sub>-Nd(3+) compounds for solid state lasers with diode-laser pumping (Novyye materialy na osnove soedinenij LaBGeO<sub>5</sub>-Nd(3+) dlya tverdotel'nykh lazerov s diodno-lazernoj nakachkoj). A. A. KAMINSKIY, S. N. BAGAEV, A. V. BUTASHIN, H. R. VERDUN, W. KOECHNER, and B. V. MILL', *Rossiyskaya Akademiya Nauk, Doklady* (ISSN 0869-5652), Vol. 329, No. 2, March 1993, pp. 169, 170.

Results of lasing experiments are reported for LaBGeO<sub>5</sub>-Nd(3+) crystal and glass samples pumped by the emission of GaAlAs diodes. In the experiments, single-mode continuous-wave and quasi-continuous-wave stimulated emission of Nd(3+) ions was obtained at room temperature from both crystal and glass LaBGeO<sub>5</sub> samples. It is noted that the reported emission characteristics can be significantly improved by optimizing the geometrical and spectroscopic parameters of the active elements as well as the pumping scheme. (AIAA)

**A93-15284** Actively mode-locked picosecond Cr-Yb-Er-glass laser (Pikosekundnyi lazer na Cr-Yb-Er-stekle s aktivnoi sinkhronizatsiej mod.). A. B. GRUDININ, E. M. DIANOV, B. I. DENKER, V. G. KOZLOV, S. E. SVERCHKOV, and A. K. SENATOROV, *Kvantovaya Elektronika* (ISSN 0368-7147), Vol. 19, No. 2, Feb. 1992, pp. 140-142.

The temporal characteristics of a Cr-Yb-Er-glass laser are presented. The application of a highly efficient modulator using an LiNbO<sub>3</sub> crystal made it possible to form 13-ps pulses at 1.54 micron under active mode locking.

**A93-39162** The effect of optical aberrations on the quality of two-element laser output radiation (Vliianie opticheskikh aberratsii na kachestvo vykhodnogo izlucheniya dvukhelementnogo lazera). P. O. MALASHIN and O. O. SILICHEV, *Kvantovaya Elektronika* (ISSN 0368-7147), Vol. 20, No. 4, April 1993, pp. 380-386.

The effect of the weak aberration of an intracavity lens on the mode structure and the quality of two-element multimode laser output radiation is investigated theoretically. Perturbation theory is used to obtain the coefficients of mode distortion caused by the optical aberration of intracavity elements. A general condition for the dynamical stability of a two-element laser cavity with respect to small fluctuations of optical power of the active elements' thermal lenses is suggested. Recommendations on optimizing the optical design of solid-state laser activities aimed at reducing the influence of aberrations on the quality of the transverse structure of the output radiation are given. An example of a calculation of a two-element industrial solid-state laser design is presented.

**A93-39155** Highly stable single-frequency solid-state lasers (Vysokostabil'nye odnochastotnye tverdotel'nye lazery). N. V. KRAVTSOV and O. E. NANIJ, *Kvantovaya Elektronika* (ISSN 0368-7147), Vol. 20, No. 4, April 1993, pp. 322-344.

An overview of theoretical and experimental investigations on the development and production of highly stable single-frequency CW solid state lasers is presented. The design features, approaches, and the basic characteristics of the new-generation solid-state lasers—tiny monolithic solid-state semiconductor-pumped lasers (chip lasers)—are described. (AIAA)

**A93-31070** Active correction of the thermal lens of a solid state laser. II - Application of controllable resonator configuration (Aktivnaia korrektsiya teplovoy linzy tverdotel'nogo lazera. II - Ispol'zovanie rezonatora upravliaemoi konfiguratsii). G. V. VDOVIN and S. A. CHETKIN, *Kvantovaya Elektronika* (ISSN 0368-7147), Vol. 20, No. 2, Feb. 1993, pp. 167-171.

A laser deformable quartz mirror has been designed and fabricated. It is shown experimentally that control of the solid state laser resonator configuration based on a deformable mirror and an apodized output mirror makes it possible to increase the radiation axial brightness by more than an order of magnitude and to have a gain in output power as compared to a laser with a Fabry-Perot resonator. The resonator configuration capable of providing the optimum energy output, brightness, and modal selectivity is determined.

**A93-15287** Inter-ion interactions in YSSG:Cr, Tm and YSSG:Cr, Tm, Ho laser crystals (Mezhionnyye vzaimodeistviya v lazernykh kristallakh ISGG:Cr, Tm i ISGG:Cr, Tm, Ho). D. A. ZUBENKO, M. A. NOGINOV, S. G. SEMENKOV, V. A. SMIRNOV, and I. A. SHCHERBAKOV, *Kvantovaya Elektronika* (ISSN 0368-7147), Vol. 19, No. 2, Feb. 1992, pp. 150-156.

The energy transfer from Tm(3+) to Ho(3+) ions and the interaction between excited Tm(3+) ions and excited Tm(3+) and Ho(3+) ions were investigated quantitatively in YSSG:Cr(3+), Tm(3+), Ho(3+) and YSSG:Cr(3+), Tm(3+) crystals. The effect of the above-mentioned processes on the performance of two-micron lasers is analyzed.

**A93-33353 Improving the mode-locking efficiency of CW solid-state lasers with an additional cavity (Povyshenie effektivnosti sinkhronizatsii mod nepreryvnykh tverdotel'nykh lazerov s dopolnitel'nym rezonatorom).** V. L. KALASHNIKOV, V. P. KALOSHA, V. P. MIKHAILOV, and M. I. DEMCHUK, *Kvantovaya Elektronika* (ISSN 0368-7147), Vol. 19, No. 12, Dec. 1992, pp. 1159-1163.

A fluctuation model of lasing for a CW solid-state laser with an additional cavity is considered. This model demonstrates an increase in the efficiency of self-mode-locking in the case of which the system generates a stable ultrashort pulse train, by using a saturable absorber in the main cavity or the additional cavity. The efficiency improvement consists in an extension of the ranges of the laser parameters for which the self-mode-locking occurs, a substantial decrease in the threshold pump intensity, and a reduction in the regime's sensitivity to the phase mismatch of the cavity lengths. (AIAA)

**A93-31069 Lengthening of the ultrashort pulse train in the YAG:Nd<sup>3+</sup> laser with passive negative feedback (Udlinienie tsuga UKI v lazere na IAG:Nd<sup>3+</sup> / s passivnoi otritsatel'noi obratnoi svyazi).** S. G. ROZUVAN and E. A. TIKHONOV, *Kvantovaya Elektronika* (ISSN 0368-7147), Vol. 20, No. 2, Feb. 1993, pp. 163-166.

The optical parameters of a solid state laser generating extended ultrashort pulse trains due to passive negative feedback and passive mode-locking are studied. Experiments involved the YAG:Nd<sup>3+</sup> laser with a modified Sagnac interferometer. The use of a 3274-U dye nonlinear absorbent and a GaAs semiconductor plate as the negative feedback element placed in the resonator makes it possible to obtain a tenfold lengthening of the train's envelope width with a twofold shortening of the monopulses.

**A93-31066 Passive mode-locking characteristics of CW wideband solid-state lasers (Osobennosti passivnoi sinkhronizatsii mod v nepreryvnykh shirokopolosnykh tverdotel'nykh lazerakh).** V. L. KALASHNIKOV, V. P. KALOSHA, V. P. MIKHAILOV, I. G. POLOIKO, and M. I. DEMCHUK, *Kvantovaya Elektronika* (ISSN 0368-7147), Vol. 20, No. 2, Feb. 1993, pp. 149-152.

A numerical simulation of the lasing dynamics of a CW solid-state wideband laser with a saturable absorber is presented. Closed regions of pump intensity and shutter absorption cross sections, in the case of which a stationary train of ultrashort pulses is generated, are found. The behavior of these closed regions and characteristics of output emission depending on the laser parameters is analyzed. The possibility of mode-locking of CW solid-state lasers with slow saturable absorbers, when the relaxation time is much greater than the resonator round-trip period, is demonstrated.

**A93-26847 Effect of solid-state ring laser parameters on characteristics of self-modulation oscillators (Vlianie parametrov tverdotel'nykh kol'tsevykh lazerov na kharakteristiki avtomodulatsionnykh kolebaniy).** I. I. ZOLOTVERKH and E. G. LARIONTOSEV, *Kvantovaya Elektronika* (ISSN 0368-7147), Vol. 20, No. 1, Jan. 1993, pp. 67-70.

Self-modulation regimes of the first kind are studied theoretically for the case of arbitrary detuning of the laser frequency relative to the amplification line center and arbitrary moduli and phases of the feedback coefficients. Antiphase and in-phase self-modulations of the counter-running wave intensities are considered. The solutions obtained make it possible to calculate the characteristics of the self-modulation oscillations for a wide range of parameters of solid-state ring lasers. A theoretical estimate of the temperature drift rate of the self-modulation frequency in a monolithic YAG:Nd(3+) ring laser is obtained.

**A93-15292 Optimization of the parameters of dynamically stable cavities in CW-pumped solid-state lasers (Optimizatsiia parametrov dinamicheski stabil'nykh rezonatorov nepreryvnonakachiyaemykh tverdotel'nykh lazerov).** M. I. DEMCHUK, I. A. MANICHEV, V. P. MIKHAILOV, G. A. PRIBYTOK, and A. K. KHOROSHUN, *Kvantovaya Elektronika* (ISSN 0368-7147), Vol. 19, No. 2, Feb. 1992, pp. 175-179.

A modified Magny procedure is used to perform a numerical analysis on dynamically stable cavities with an internal focusing element. The maximum TEM(00) mode volume in the active element and the stability-zone width as well as the geometrical parameters of the cavity at which the maximum volume of the fundamental mode can be achieved have been calculated as functions of the focal length of the induced thermal lens in the middle of the stability zone reduced to the cavity length. A procedure for designing dynamically stable laser cavities has been proposed and confirmed experimentally, taking actual instability sources in CW-pumped laser systems into account.

**A92-30333 Analysis of cooling methods for the radiators of solid state lasers (Review) (Analiz metodov okhlazhdeniia izluchatelei tverdotel'nykh lazerov /Obzor/).** A. V. ATAMAS', *Promyshlennaya Teploekhnika* (ISSN 0204-3602), Vol. 13, No. 4, 1991, pp. 25-32.

The methods currently used for the cooling of the radiators of solid state lasers are compared in terms of their capability to ensure excess heat transfer from the active element, provide the time required for the establishment of the quasi-stationary operating regime, and ensure the limiting pump pulse repetition rate with the recovery of the temperature regime of the active element between the successive pulses. The relations and graphs for estimating the thermal power density limits for the active element and the required heat transfer coefficients and temperature gradients between the active element and the coolant.

**A93-23083 Amplitude-frequency response and parametric noise suppression in a ring chip-laser (Amplitudno-chastotnye kharakteristiki i parametricheskoe podavlenie shumov v kol'tsevom chip-lazere).** N. V. KRAVTSOV, O. E. NANIL, and N. M. SHABAT'KO, *Kvantovaya Elektronika* (ISSN 0368-7147), Vol. 19, No. 10, Oct. 1992, pp. 994-996.

The resonant character of the response of a chip-laser to periodic external perturbations is studied. The possibility of the parametric suppression of low-frequency noise in such lasers is shown. Experimental results demonstrate the presence of characteristic resonances in the amplitude-frequency response of the ring chip-lasers whose position is sensitive to the optical nonreciprocity of the resonator.

**A93-18137 Four-frequency lasing in a solid-state ring laser (Chetyrekhschastotnaia generatsiia v tverdotel'nom kol'tsevom lazere).** O. E. NANIL and M. P. PALEEV, *Kvantovaya Elektronika* (ISSN 0368-7147), Vol. 19, No. 9, Sept. 1992, pp. 882, 883.

The feasibility of four-frequency lasing in a solid-state ring laser (SSRL) with two modes of different polarizations generated in each direction is studied. This regime makes it possible to increase the measurement accuracy of optical nonreciprocal effects. It is demonstrated theoretically that such a regime can be obtained in an SSRL with a nonplanar cavity in the presence of intracavity second harmonic generation in a nonlinear element with a type II phase synchronism.

**A93-16736 Self-modulation lasing regime in solid-state ring lasers with nonplanar cavities (Avtomodulatsionnyi rezhim generatsii v tverdotel'nykh kol'tsevykh lazerakh s neploskimi rezonatorami).** O. E. NANIL, *Kvantovaya Elektronika* (ISSN 0368-7147), Vol. 19, No. 8, Aug. 1992, pp. 762-768.

The self-modulation lasing regime in solid-state ring lasers is considered as the superposition of two eigenmodes in a ring cavity with back reflectors. The 4 x 4 matrix formalism is used to determine the eigenmodes in a ring cavity with back reflectors.

**A93-15277 A new disordered Ca<sub>2</sub>Ga<sub>2</sub>SiO<sub>7</sub>:Nd(3+) crystal for high-power solid-state lasers (Novyi razuporiadochennyy kristall Ca<sub>2</sub>Ga<sub>2</sub>SiO<sub>7</sub>:Nd(3+) dlia moshchnykh tverdotel'nykh lazerov).** A. A. KAMINSKII, V. A. KARASEV, V. D. DUBROV, V. P. IAKUNIN, B. V. MILL', and A. V. BUTASHIN, *Kvantovaya Elektronika* (ISSN 0368-7147), Vol. 19, No. 2, Feb. 1992, pp. 111-113.

A new efficient flashlamp-pumped solid-state laser using disordered Ca<sub>2</sub>Ga<sub>2</sub>SiO<sub>7</sub>:Nd(3+) crystals (the 4F<sub>3/2</sub>-4I<sub>11/2</sub> lasing channel) has been developed and investigated. The luminescence spectra of Nd(3+) ions in these crystals are examined, and the lasing characteristics are assessed.

**A92-53981 Generation of pulse trains in a solid state laser with a resonator of large optical length (Generatsiia tsugov impul'sov v tverdotel'nom lazere s rezonatorom bol'shoi opticheskoi dliny).** E. S. GULIAMOVA, N. N. IL'ICHEV, A. A. MALIUTIN, P. P. PASHININ, and S. M. SHPUGA, *Methods for the control of laser characteristics* (A92-53976 23-36). Moscow, Izdatel'stvo Nauka, 1991, pp. 118-129.

Results of a study of the emission characteristics of lasers with a resonator of large optical length are reported. It is shown, in particular, that for both active and active-passive mode locking, the use of negative feedback based on the emission spike energy makes it possible to obtain train pulses with a total width of about 100 microsec for an individual spike width of 5 ns. The addition of a passive modulator to the resonator does not change the general kinetics of the emission but makes it possible to significantly increase the rate of spike width reduction.

**A92-53979 Effect of water bleaching for intense emission at a wavelength of 3 microns and control of erbium laser parameters (Effekt prosvetleniia vody dlia intensivnogo izlucheniia s lambda of about 3 mkm i upravlenie parametrami erbievogo lazera).** K. L. VODOP'IANOV, L. A. KULEVSKII, and A. A. MAZNEV, *Methods for the control of laser characteristics* (A92-53976 23-36). Moscow, Izdatel'stvo Nauka, 1991, pp. 82-101.

Observations of the strong bleaching of water and other fluids containing the OH group with hydrogen bonds under the effect of intense (0.1-100 J/sq cm) emission at a wavelength of 2.94 microns are reported. Thus, for laser emission with an energy density of 100 J/sq cm incident on a cell, the mean transmission of the cell is 90 percent, as compared with the initial transmission of 15 percent. This effect has made it possible to use water and ethanol as a passive gate for modulating the Q factor of the YAG:Er(3+) laser. Stable giant pulses with an energy of 20 mJ, a repetition rate of 1-2 Hz, and a zero spatial mode have been obtained.

**A92-30353 Large silicon mirrors in power optics (Krupnogatarnitnye kremnievye zerkala v silovoi optike).** V. V. APOLLONOV, M. V. GARTMAN, A. M. PROKHOROV, M. I. ROGAILIN, V. A. SHMAKOV, and V. D. SHTINOV, *Pis'ma v Zhurnal Tekhnicheskoi Fiziki* (ISSN 0320-0116), Vol. 17, Dec. 26, 1991, pp. 40-43.

The feasibility of fabricating large laser mirrors from pure silicon is investigated. In particular, attention is given to several possible methods of fabricating large optical elements of silicon, including electron-beam welding of single-crystal silicon plates, casting of polycrystalline silicon ingots, and direct forming of polycrystalline silicon plates on graphite or C-Si-SiC substrates. Of the methods examined, electron-beam welding of single-crystal silicon plates and local melting of polycrystalline silicon on C-Si-SiC composite substrates are found to be particularly promising.

**A92-53980 Repetitively pulsed solid state lasers with SBS mirrors (Impul'sno-periodicheskie tverdotel'nye lazery s VRMB-zerkalami).** P. P. PASHININ, V. S. SIDORIN, and E. I. SHKLOVSKII, *Methods for the control of laser characteristics* (A92-53976 23-36). Moscow, Izdatel'stvo Nauka, 1991, pp. 102-117.

A method for generating high-contrast light pulses of controlled width in the nanosecond and subnanosecond ranges is proposed which uses the properties of optical breakdown plasma in combination with a stimulated Brillouin scattering (SBS) mirror. An optical scheme implementing this method is presented, and the emission parameters are discussed. The reproducibility of the emission parameters of the scheme is 80 percent in the repetitively pulsed mode with a frequency of 0.2-5 Hz.

**A92-53976 Methods for the control of laser characteristics (Metody upravleniia kharakteristikami lazerv).** P. P. PASHININ, *Izdatel'stvo Nauka* (AN SSSR, Institut Obshchei Fiziki, Trudy. Vol. 28), 1991, 152 pp.

The papers contained in this volume focus on methods for controlling the spatial, temporal, and spectral characteristics of laser emission, with emphasis on the use of nontraditional approaches and new physical phenomena. In particular, attention is given to tunable dye lasers with lumped-distributed feedback, the use of the coupled-wave method for calculating the longitudinal mode spectrum of lumped-distributed feedback lasers, and thermocapillary conversion of laser beams by thin layers of absorbing fluids. Papers are also presented on repetitively pulsed solid state lasers with SBS mirrors, Generation of pulse trains in a solid state laser with a resonator of large optical length, and a repetitively pulsed CO<sub>2</sub> gas-discharge waveguide laser with combined excitation and controlled shape of the emission pulse.

**A92-46567 Features of the SBS of a single-mode focused broadband pump (Osobennosti VRMB odnomodovoi sfokusirovannoi shirokopolosnoi nakachki).** D. A. GLAZKOV, A. A. GORDEEV, I. G. ZUBAREV, and S. I. MIKHAILOV, *Kvantovaia Elektronika* (ISSN 0368-7147), Vol. 19, No. 3, March 1992, pp. 286-289.

SBS reflection is studied in the case of focusing of radiation with a broad spectrum into the active medium. Beam broadening rather than phase conjugation is shown to occur in this case, which is equivalent, upon retention of the wavefront curvature, to a narrowing of its radiation pattern. The influence of beam focusing sharpness on this effect is considered. It is suggested that the phenomenon under consideration be used for the development of a round-trip XeCl amplifier.

**A92-44000 Spectral and temporal fluctuations of broadband laser radiation (Spektral'nye i vremennye fluktuatsii izlucheniia shirokopolosnykh lazerv).** A. V. MASALOV, *Nonlinear and quantum optical phenomena in nonequilibrium media* (A92-43995 18-74). Moscow, Izdatel'stvo Nauka, 1991, pp. 181-216.

Statistical properties of broadband laser radiation are analyzed with particular attention given to the characteristics that are essential for nonlinear light-matter interaction, i.e., the probability distribution for intensity and high-order spectra. The similarity and diversity of broadband laser radiation and Gaussian statistics are discussed. The appearance of non-Gaussian statistics in the process of multiphoton ionization of atoms by laser radiation is analyzed. High-order laser radiation spectra are examined in detail. The processes of harmonic generation and multiphoton absorption are described with the aid of high-order spectra. Yield fluctuations in the nonlinear process under broadband laser radiation are analyzed. Experimental data on multiphoton light-matter interaction are presented.

**A92-30369 Investigation of the quality of phase conjugation in the case of stimulated Brillouin scattering in the repetitively pulsed regime (Issledovanie kachestva obrashcheniia volnovogo fronta pri vyzhdenom rasseianii Mandel'shtama-Brilliuena v impul'sno-periodicheskom rezhime).** S. G. GRECHIN, A. L. LUK'IANOV, and A. S. CHERKASOV, *Moskovskii Gosudarstvennyi Tekhnicheskii Universitet, Vestnik, Seriya Priborostroenie* (ISSN 0236-3933), Jan.-Mar. 1991, pp. 79-84.

The paper presents results of an investigation of the effect of adiabatic thermal processing in the case of SBS on the quality of phase conjugation in connection with the repetitively pulsed regime of solid-state lasers. The theoretical analysis is based on a numerical solution of the nonlinear wave equation for the Stokes wave in the near-threshold region of the stimulated scattering, taking into account the contribution of adiabatic thermo-optical distortions characterized by the thermal load factor. The theoretical results were confirmed qualitatively by experiments on condensed media.

**A92-28288 Plane active elements of solid state lasers with a sliding zigzag beam path (Ploskie aktivnye elementy tverdotel'nykh lazerv so skol'zhashchimi zigzagobraznymi khodom luche).** G. N. VINOKUROV, V. M. VOLYNKIN, A. S. EREMENKO, B. G. MALININ, E. P. MIRONOV, V. G. PANKOV, A. A. POPLAVSKII, T. M. RAZNOBRIANTSEVA, and Z. V. SHIROKSHINA, *Kvantovaia Elektronika* (ISSN 0368-7147), Vol. 18, Oct. 1991, pp. 1188-1191.

An analysis of the geometry of plane laser elements with a zigzag beam path is presented, and the use of such active elements in solid state lasers is discussed. An active laser element made of phosphate glass with a silicon dioxide coating, characterized by a sliding zigzag beam path, is proposed, implemented, and investigated experimentally and theoretically. It is shown that the use of such active elements in solid state lasers makes it possible to significantly simplify the design of zigzag lasers.

**A92-28321 A repetitively pulsed neodymium laser with a slab amplifier using yttrium orthoaluminate (Impul'sno-periodicheskie neodimovyi lazery na ortoaluminatitrii s plastinchatym usilitelem).** P. P. PASHININ, V. S. SIDORIN, V. V. TUMORIN, and E. I. SHKLOVSKII, *Kvantovaia Elektronika* (ISSN 0368-7147), Vol. 18, Nov. 1991, pp. 1316-1318.

An active element in the form of a slab made of neodymium-doped yttrium orthoaluminate is employed to develop modifications of a laser system with an SBS mirror. The laser system operates at a pulse repetition rate up to 5 Hz at an output energy of 3 J in the diffraction limited beam.

**A92-27572 A conjugated-resonator laser using a corner reflector (Lazer s sopriazhennym rezonatorom na osnove ugoikovogo otrazhatelia).** V. V. VEREMEI, T. A. GORBUNOVA, S. N. KARPUKHIN, and S. A. ORLOV, *Kvantovaia Elektronika* (ISSN 0368-7147), Vol. 18, Aug. 1991, pp. 996-998.

The design of a resonator which is equivalent to a conjugated one and which uses a corner reflector and polarization dumping of the radiation is proposed for a YAG:Nd(3+) laser. Energy and spatial-angular characteristics of the stimulated emission are compared for the resonator under consideration and for an unstable telescopic resonator. It is shown that the energy and divergence of the radiation from the resonator which is equivalent to the conjugated one are comparable with parameters of the telescopic resonator.

**A92-27558 Adaptive intracavity control of the mode structure of solid-state laser radiation (Adaptivnoe vnutrirezonnatornoe upravlenie modovym sostavom izlucheniia tverdotel'nogo lazera).** M. A. VORONTSOV, A. V. KORABIN, V. I. POLEZHAEV, and V. I. SHMAL'GAUZEN, *Kvantovaia Elektronika* (ISSN 0368-7147), Vol. 18, Aug. 1991, pp. 904, 905.

A pulsed solid-state laser with a system of adaptive intracavity control of the surface profile of the output mirror is investigated. The automatic control of the radiation mode structure was implemented experimentally. The adaptive intracavity correction of the tilts, defocusing, and astigmatism of the wavefront made it possible to stabilize the radiation pattern diagram and to increase the total power under conditions of the fundamental mode during an increase in the intensity at the beam axis.

**A92-10885 A monopulse YSGG:Cr, Nd laser with 4-percent efficiency (Monoimpul'snyi YSGG:Cr, Nd-lazer s KPD 4 percent).** V. V. LAPTEV, V. A. MIKHAILOV, D. A. NIKOLAEV, S. K. PAK, E. V. RAEVSKII, A. P. FEFELOV, S. I. KHOMENKO, and I. A. SHCHERBAKOV, *Kvantovaia Elektronika* (ISSN 0368-7147), Vol. 18, May 1991, pp. 579-581.

A flashlamp-pumped Q-switched pulsed laser with a 4-percent efficiency and a 450 mJ/pulse energy was developed on the basis of a Cr- and Nd-doped yttrium-scandium-gallium garnet crystal. The salient features of the laser are the use of an optomechanical modulator operating on the basis of total internal reflection and a specially configured illuminator. The parameters of the laser cavity for achieving maximal efficiency of the laser are analyzed.

**A91-47573 Frequency dithering in a ring laser with an autoillumination wave reflected from a moving mirror (Chastotnaia podstavka v kol'tsevom lazere s volnoi avtopodsvetki, otrazhaushcheisia ot dvizhushchegosia zerkala).** E. L. KLOCHAN, E. G. LARIONTOV, and G. E. TIUL'BASHEVA, *Moskovskii Universitet, Vestnik, Seriya 3—Fizika, Astronomiia* (ISSN 0579-9392), Vol. 32, Mar.-Apr. 1991, pp. 47-52.

An analysis is made of a solid-state ring laser with an autoillumination wave in which part of the radiation is extracted from the laser resonator and is delivered to the active medium via a moving mirror. It is shown that the autoillumination wave can be used to achieve frequency dithering in the laser. Either sign-variable or constant frequency dithering can be obtained, depending on the character of the mirror motion.

**A91-45033 An efficient laser with a rectangular active element (Effektivnyi lazer s priamougol'nym aktivnym elementom).** A. A. DANILOV, E. IA. NIKIRUI, V. V. OSIKO, V. G. POLUSHKIN, S. N. SOROKIN et al., *Kvantovaia Elektronika* (ISSN 0368-7147), Vol. 18, March 1991, pp. 296, 297.

The development of a solid-state laser with a rectangular active element is reported. At a high average power, a laser of this type based on an Nd-activated GGG crystal displayed a power of 180 W at a pulse repetition rate of 25 Hz and an absolute efficiency of about 3 percent. At an emitted beam divergence of not greater than 10 rad, the specific output power amounted to 7.5 W/cm.

**A91-35691 Formation of regions of effective ultrashort-pulse compression in a passive shutter (Formirovanie oblasti effektivnogo szhatiia UKI v passivnom zatvore).** M. I. DEMCHUK, I. A. MANICHEV, and V. P. MIKHAILOV, *Kvantovaia Elektronika* (ISSN 0368-7147), Vol. 18, Jan. 1991, pp. 61-66.

A numerical analysis of a single pass of a Gaussian pulse through a two-level two-component saturable absorber is presented. The two-component absorber considered here provides for maximum efficiency of single-pass pulse compression at a fixed input intensity for a wide range of input durations. This latter circumstance makes it possible to use these absorbers attractive as passive shutters for passively mode-locked solid-state lasers with ultrashort-pulse intensity stabilization for minimization of the duration of the emitted radiation.