

A87-43540 An SBS mirror with a plasma shutter in a double-pass laser amplifier (VRMB-zerkalo s plazmennym zatvorom v dvukh-prokhodovom lazernom usilitele) S. I. U. NATAROV, P. P. PASHININ, E. I. SHKLOVSKII, and I. A. SHCHERBAKOV, *Kvantovaya Elektronika* (ISSN 0368-7147), Vol. 14, March 1987, pp. 477-480. 11 Refs.

A gadolinium scandium gallium garnet: Cr (3+), Nd (3+) laser with an SBS mirror and plasma shutter is studied. The use of these lasers permits control of the radiation duration in a wide range. In the regime of SBS-compression of light pulses in CCl₄, a Stokes pulse duration of about 5 ns is obtained which is close to the theoretical limit.

A87-43532 Mode-locking in a neodymium laser with a shutter made of gadolinium-scandium-gallium garnet (Sinkhronizatsiia mod neodimovogo lazera s zatvorom iz gadolinii-skandii-gallievogo granata) M. I. DEMCHUK, E. V. ZHARIKOV, A. M. ZABAZNOV, I. A. MANICHEV, V. P. MIKHAILOV et al., *Kvantovaya Elektronika* (ISSN 0368-7147), Vol. 14, Feb. 1987, pp. 423, 424. 11 Refs.

The mode-locking regime of a neodymium laser using shutters made of GSGG crystals is studied. With a GSGG transmission coefficient of 20 percent and a crystal length of 1 cm, ultrashort pulses with a minimum duration of 80 ns and an energy of 0.5 mJ are generated. It is shown that GSGG crystals can be used successfully as passive shutters for mode-locking in the NIR range ($\lambda = 1.06$ microns). The advantages of these shutters over those utilizing polymethine dyes are discussed.

A87-43483 Comparison of bulk and surface optical-breakdown thresholds in NaCl crystals (Sopostavlenie porogov opticheskogo probioia v ob'eme i na poverkhnosti kristallov khloristogo natriia) V. N. SMIRNOV, *Zhurnal Tekhnicheskoi Fiziki* (ISSN 0044-4642), Vol. 57, March 1987, pp. 523-530. 22 Refs.

The paper examines formation thresholds of bulk and surface microscopic and macroscopic damage in NaCl specimens under the effect of CO₂-laser pulses. At diameters of the irradiated region of less than 1 mm, the bulk microdamage threshold is lower than the surface threshold. It is concluded that near-surface plasma is produced by superthreshold heating of absorbing irregularities of the surface layer of the specimen due to crystal-growth and surface-finishing processes.

A87-35940 Phase conjugation during vector self-diffraction by polarization holograms (Obrashchenie volnogo fronta pri vektornoi samodifraksii na polarizatsionnykh gologrammakh) A. A. BORSHCH, N. V. KUKHTAREV, and V. N. SEMIOSHKO, *Akademiia Nauk SSSR, Izvestiia, Seriya Fizicheskaya* (ISSN 0367-6765), Vol. 51, Feb. 1987, pp. 307-310.

Theoretical and experimental results are presented on vector self-diffraction (VSD) under conditions of anisotropic linear absorption in semiconductors. Vector holograms were recorded in CdS crystals using second-harmonic radiation from a neodymium-phosphate glass laser at a wavelength of 0.526 micron. The holograms thus recorded made it possible to realize phase conjugation with a 90-deg rotation of the polarization plane under VSD. Phase doubling in a diffracted non-Bragg beam was also obtained.

A87-35928 Moisture measurement with a lidar based on a parametric light generator (Izmerenie vlazhnosti PGS-lidarom) A. P.

KUBYSHKIN, V. I. KUZNETSOV, A. V. MIGULIN, I. N. ROI, and A. I. KHOLODNYKH, *Akademiia Nauk SSSR, Izvestiia, Seriya Fizicheskaya* (ISSN 0367-6765), Vol. 51, Feb. 1987, pp. 219-223. 5 Refs.

The paper describes the design and operation of a parametric-light-generator lidar intended to measure atmospheric water-vapor content. An experimental lidar of this type has been constructed which makes wide-band moisture measurements using the differential absorption technique at a wavelength of 0.93 micron with a spatial resolution of 7.5 m. The possibility of wavelength tuning over a wide spectral region (0.65-3.5 microns), encompassing the vibrational transitions of many atmospheric gases, may make this lidar suitable for determining the concentrations of other atmospheric constituents. A block diagram of the lidar is presented.

A87-43483 Comparison of bulk and surface optical-breakdown thresholds in NaCl crystals (Sopostavlenie porogov opticheskogo probioia v ob'eme i na poverkhnosti kristallov khloristogo natriia) V. N. SMIRNOV, *Zhurnal Tekhnicheskoi Fiziki* (ISSN 0044-4642), Vol. 57, March 1987, pp. 523-530. 22 Refs.

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A87-35940 Phase conjugation during vector self-diffraction by polarization holograms (Obrashchenie volnogo fronta pri vektornoi samodifraksii na polarizatsionnykh gologrammakh) A. A. BORSHCH, N. V. KUKHTAREV, and V. N. SEMIOSHKO, *Akademiia Nauk SSSR, Izvestiia, Seriya Fizicheskaya* (ISSN 0367-6765), Vol. 51, Feb. 1987, pp. 307-310.

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A87-35928 Moisture measurement with a lidar based on a parametric light generator (Izmerenie vlazhnosti PGS-lidarom) A. P. KUBYSHKIN, V. I. KUZNETSOV, A. V. MIGULIN, I. N. ROI, and A. I. KHOLODNYKH, *Akademiia Nauk SSSR, Izvestiia, Seriya Fizicheskaya* (ISSN 0367-6765), Vol. 51, Feb. 1987, pp. 219-223. 5 Refs.

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Japanese Aerospace Literature This month: *Laser Optics*

A88-41321 Degenerate photon echoes - Simultaneous storage of multiple optical data. M. MITSUNAGA, M. K. KIM, and R. KACHRU, *Optics Letters* (ISSN 0146-9592), Vol. 13, June 1988, pp. 536-538. 13 Refs.

It is shown that simultaneous and spatially overlapping multiple photon echoes can occur following application of a single optical pulse followed by multiple pairs of counterpropagating pulses in various directions (degenerate photon echoes). This scheme has been experimentally verified in Pr(3+):LaF₃ for the doubly degenerate case. In the small-pulse-area regime, the two echoes are observed to be independent with no cross talk between them. From the viewpoint of transient optical memory, this makes it possible to store multiple independent optical data in one sample spot and to retrieve any one of them, thereby multiplying the memory capacity of the crystal.

A88-40652 Chaos in a directly modulated semiconductor laser. YOSHIKAZU HORI, HIROYUKI SERIZAWA, and HISANAO SATO, *Optical Society of America Journal, B: Optical Physics* (ISSN 0740-3224), Vol. 5, May 1988, pp. 1128-1133. 9 Refs.

The fundamental possibility of chaos generation in directly modulated semiconductor lasers is studied on the basis of the rate equation with the form of a driven nonlinear oscillator. The origin of chaos generation and the effect of the spontaneous emission factor, which affects the nonlinearity of the dumping force and the restoring force in the rate equation, have been clarified.

A88-40645 Laser instability and chaotic pulsation in a CO₂ laser with intracavity saturable absorber. MAKI TACHIKAWA, KAZUHIITO TANII, and TADAO SHIMIZU, *Optical Society of America Journal, B: Optical Physics* (ISSN 0740-3224), Vol. 5, May 1988, pp. 1077-1082. 27 Refs.

A CO₂ laser with a gaseous saturable absorber shows a variety of periodic self-pulsation, passive Q switching (PQS), depending on the lasing conditions and the characteristics of the absorbing molecules. A novel rate-equation model is presented, that comprehensively describes the transient pulse structures of PQS in the CO₂ laser system. The numerical calculation based on the present model predicts that a chaotic PQS pulsation also is realized in a limited parameter region.

A88-36590 Evaluation of power penalties caused by feedback noise of distributed feedback laser diodes. MINORU SHIKADA, SHINJI TAKANO, SADA O FUJITA, IKUO MITO, and KOUICHI MINEMURA, *Journal of Lightwave Technology* (ISSN 0733-8724), Vol. 6, May 1988, pp. 655-659, 6 Refs.

Power penalties caused by optical feedback noise of distributed feedback laser diodes were evaluated experimentally and theoretically. It was found that power penalties could be suppressed when the beam-relative intensity noises were reduced to less than -135 dB/Hz at 2 Gb/s. This goal can be satisfied using a commercially available optical isolator that has more than 25-dB isolation in the laser transmitter.

A88-42185 Longitudinal mode competition and asymmetric gain saturation in semiconductor injection lasers. I - Experiment. NA-GAATSU OGASAWARA and RYOICHI ITO, *Japanese Journal of Applied Physics, Part 1* (ISSN 0021-4922), Vol. 27, April 1988, pp. 607-626, 37 Refs.

An experimental study of longitudinal mode competition in transverse-mode-controlled laser diodes has been performed, and the output power change associated with both random mode switching and hysteretic mode jumping has been examined. The results show that, in most devices, the output power is decreased as the lasing mode jumps from a shorter to a longer wavelength, and that it is increased at mode jumping toward shorter wavelengths. It is suggested that this feature is related to an experimentally observed asymmetry in gain saturation. A terminal voltage change associated with mode jumping is also noted.

A88-42178 1.55-micron butt-jointed distributed Bragg reflector lasers grown entirely by low-pressure. YUICHI MOVPE TOHMORI and MAMORU OISHI, *Japanese Journal of Applied Physics, Part 2* (ISSN 0021-4922), Vol. 27, April 1988, pp. L693-L695, 6 Refs.

Distributed Bragg reflector lasers of 1.55-micron wavelength were fabricated entirely by low-pressure MOVPE growth. An active waveguide was connected to a passive waveguide by a butt-joint technique. In the butt-jointed structure, the optical field axis in the active region was matched to that in the passive region. Devices fabricated were operated at currents as low as 13 mA. Spectrum linewidth as narrow as 3.4 MHz was obtained at four times the threshold current.

A88-42072 Proposal of distributed reflector (DR) structure for high efficiency dynamic single mode (DSM) lasers. KAZUHIRO KOMORI, SHIGEHISA ARAI, YASU HARU SUEMATSU, MASAHIRO AOKI, and ISAMU ARIMA, *Institute of Electronics, Information and Communication Engineers, Transactions* (ISSN 0913-574X), Vol. E71, April 1988, pp. 318-320, 9 Refs.

Design features and theoretically projected performance results are presented for a distributed-reflector (DR) dynamic single-mode laser. On the basis of an analysis of the lasing mode, it becomes possible to demonstrate the obtainability of the DR's single-facet output by maintaining the superior single mode. In order to minimize the effects of design error, a bundle-integrated guide structure can be used within attainable thickness variation tolerances.

A88-38694 Output optimization for an optical fiber-coupled type CO₂ lasers. HEIHACHI SATO and SHIROU KAMIOKA, *Institute of Electronics, Information and Communication Engineers, Transactions* (ISSN 0913-574X), Vol. E71, March 1988, pp. 232-238, 9 Refs.

An optical-fiber-coupled type laser has been optimized by taking account of field disturbance on a coupling aperture mirror, and this has been examined by using a conventional CO₂ laser. Solving the eigenequations for a quasi-hemispherical resonator with a coupling aperture to find the field distribution on the plane mirror with an aperture, its effective transmittance is analytically evaluated as a function of normalized aperture by the mirror size and is well approximated by the power series expansion up to the fourth order for various mirror Fresnel numbers and the g parameter of the resonator. The coupling aperture is then optimized to yield the maximum power. As a result, the optimum aperture becomes a minimum at a specific g_2 parameter of the concave mirror: $g_2 = \text{about } 0.73$, implying that the optimum configuration is slightly off a pure hemispherical setting. By this optimization a maximum output power of 6.0 W was extracted from an aperture of 2.4 mm.

A88-28294 Fiber-optic passive ring-resonator gyroscope using an external-cavity laser diode. MASANOBU TAKAHASHI, SHUICHI TAI, KAZUO KYUMA, and KOICHI HAMANAKA, *Optics Letters* (ISSN 0146-9592), Vol. 13, March 1988, pp. 236-238, 11 Refs.

A fiber-optic passive ring-resonator gyroscope that uses an external-cavity laser diode is reported. The external-cavity laser diode is useful as the light source for the gyroscope if an appropriate cavity length is chosen. A rotation detection sensitivity of 0.01 rad/sec was obtained with an integration time of 10 sec.

A88-30878 Optical pulse compression using high-frequency electrooptic phase modulation. TETSURO KOBAYASHI, HIROSHI YAO,

KAZUHIKO AMANO, YASUSHI FUKUSHIMA, AKIHIRO MORIMOTO et al. *IEEE Journal of Quantum Electronics* (ISSN 0018-9197), Vol. 24, Feb. 1988, pp. 382-387, 14 Refs.

An electrooptic method of generating and compressing optical pulses in the picosecond range is described. The method utilizes electrooptic phase modulation together with group delay/velocity dispersion and is applicable to most CW lasers. From the theoretical analysis, it is shown that normal as well as anomalous dispersion is applicable for pulse compression and that nearly transform-limited pulses can be obtained by the optimum choice of group-delay dispersion. In experiments, pulse compression was utilized for a CW Ar laser using a LiTaO₃ electrooptic phase modulator with a diffraction grating. Almost transform-limited pulses of 2.1 ps were obtained at 9.35-GHz repetition. The possibility of generating subpicosecond pulses down to several tens of femtoseconds pulses is also discussed.

A88-26928 Unstable resonator with phase-unifying coupler for high-power lasers. KOJI YASUI, MASA AKI TANAKA, and SHIGENORI YAGI, *Applied Physics Letters* (ISSN 0003-6951), Vol. 52, Feb. 15, 1988, pp. 530, 531, 11 Refs.

A novel unstable resonator with a phase-unifying output coupler has been developed. The output coupler structured with a partial-reflection region in its center surrounded by an antireflection region unifies the phases of laser beams passing through these regions. Thus, a near-Gaussian far-field pattern beam has been obtained with a divergence full-angle of 1.08 mrad on the application to a high-power CW CO₂ laser.

A88-24866 Second-harmonic and sum-frequency generation to 4950 and 4589 in KTP. K. KATO, *IEEE Journal of Quantum Electronics* (ISSN 0018-9197), Vol. QE-24, Jan. 1988, pp. 3, 4, 9 Refs.

KTiOPO₄ (KTP) has been found to be phase matchable for type-2 second-harmonic and sum-frequency generation down to 4950 and 4589 Å, respectively. Sellmeier's equations which are highly accurate from 1.152 microns to 4590 Å are reported.

A88-28814 Development of a microwave electro-optic modulator for a laser distance-measuring instrument. SHIGERU NAKAYAMA, *Japanese Journal of Applied Physics, Part 1* (ISSN 0021-4922), Vol. 26, Dec. 1987, pp. 2102-2106, 18 Refs.

An electrooptic modulator which operates at a frequency of around 32 GHz in the S-band microwave region was analyzed and developed for use in a laser distance-measuring instrument. A reentrant cylindrical cavity was constructed by using a KDP crystal inside the cavity. The cavity efficiency was theoretically analyzed by a finite-element method. The modulator had a laser intensity modulation index of 8 percent, which had been obtained with a microwave input peak power of 1 W. The modulator was tested in the laboratory for distance measurements with the result that the modulator was capable of measuring a distance within an instrumental accuracy of 1 mm.

A88-25297 Direct observation of the differences between Raman scattering and population inversion transition for their emission frequencies and pulse waveforms. YOSHIO NISHI and KOREYUKI TUNASHIMA, *International Journal of Infrared and Millimeter Waves* (ISSN 0195-9271), Vol. 8, Nov. 1987, pp. 1453-1470, 11 Refs.

The emission frequency and pulse waveform characteristics of both induced Raman scattering and population inversion transition are investigated for the case of a TEA-CO₂ laser excitation. An intracavity etalon is used to study the emission frequencies, and a MOM point contact diode is used to numerically analyze the rate equations. It is suggested that the two distinct molecular classifications of Raman scattered emissions and FIR emissions from a population inversion transition differ in terms of their transition dipole moment.

A88-20243 The refractivity of CO₂ gas in the region of 10 microns. H. MATSUMOTO, *Applied Physics B - Photophysics and Laser Chemistry* (ISSN 0721-7269), Vol. B 44, Nov. 1987, pp. 147-149, 7 Refs.

The refractivity of the CO₂ gas is measured with an experimental error of 2 percent in the 10-micron region, using the 10.4 CO₂ laser line. The frequency of the CO₂ laser is swept through the Doppler profile of the laser line. The experiment is achieved using a 630-nm He-Ne/10.6-micron CO₂ laser interferometer with a 2 m-long vacuum cell. From the result, it is found that the Koch's formula also holds for the wavelengths in the 10-micron region within an accuracy of 2 percent.

A88-39381 High average power Nd:Gd₃Ga₅O₁₂ slab laser. HIROHIKO HAYAKAWA, KAZUO MAEDA, TOSHI AKI ISHIKAWA, TAKESHI YOKOYAMA, and YOSHIMASA FUJII, *Japanese Journal of Applied Physics, Part 2* (ISSN 0021-4922), Vol. 26, Oct. 1987, pp. L1623-L1625, 7 Refs.

A Nd-doped Gd₃Ga₅O₁₂ slab laser in normal pulsed operation at 1.06 microns is described. At the pulse repetition rate of 10 pps and pulse duration of 3 ms, the maximum output power was 230 W, and the slope

efficiency was 2.4 percent. No remarkable decrease of slope efficiency was observed between 1 pps and 10 pps. The instability of the laser resonator is discussed with reference to the Mach-Zehnder interferograms under pumping.

A88-15838 Scanning laser radar system for rendezvous and docking in space. HIROBUMI SAITO, ICHIRO NAKATANI, KEIKEN NOMIYA, and AKIRA FURUYA, IAF, 38th International Astronautical Congress, Brighton, England, Oct. 10-17, 1987. 7 pp. 7 Refs. (IAF Paper 87-53).

A scanning laser radar system for rendezvous and docking in space is being developed. This laser radar system will be utilized in an autonomous satellite retrieval experiment which is planned as one of the future missions to be conducted on Japanese Space Flyer Unit (SFU) in 1990s. Rendezvous and retrieval operation will be automatically performed by on-board instruments. The laser radar system performs ranging, tracking, as well as attitude determination in short range.

A88-14838 Experimental evidence of ionization burnthrough and absorption resonance in radiative energy transport in hot dense matter. T. MOCHIZUKI, K. MIMA, N. IKEDA, R. KODAMA, H. SHIRAGA et al., *Physical Review A - General Physics, 3rd Series* (ISSN 0556-2791), Vol. 36, Oct. 1, 1987, pp. 3279-3287. 23 Refs.

Radiative energy transport in hot dense matter has been investigated in the sub-keV region. In a medium-Z element (aluminum), ionization burnthrough has been observed. Burn-through speed is estimated to be 600,000 g/sq cm sec or more at an X-ray intensity of 7.4×10 to the 12th W/sq cm. At a high Z (gold), the spectral structure of transmitted X-rays indicates the formation of an X-ray heat conduction band via absorption resonance. Penetration depth of radiative energy transport in Au is found to be 3-4 times larger than that in aluminum.

A88-29003 Optimization of permanent linear wiggler for free electron laser by using the 3-D finite element method. T. NAKATA, N. TAKAHASHI, A. IMADA, N. TABUCHI, and M. KUMADA, *IEEE Transactions on Magnetics* (ISSN 0018-9464), Vol. MAG-23, pt. 2, Sept. 1987, pp. 3774-3776. 10 Refs.

The optimal configuration of magnets of a linear wiggler, which produces the flux focussing and wiggling of an electron beam, has been investigated in order to improve the performance of a device for producing free electron lasers. The effects of the distribution of magnetization, the structure and the magnet height on the flux distribution in the wiggler are examined. The optimal configuration of the wiggler is obtained by numerical analysis. (Author)

A87-30902 Adjustable gain and bandwidth light amplifiers in terms of distributed-feedback structures. MAKOTO YAMADA and KYOHEI SAKUDA, *Optical Society of America Journal A: Optics and Image Science* (ISSN 0740-3232), Vol. 4, Jan. 1987, pp. 69-76. 10 Refs.

Three different types of distributed-feedback semiconductor optical amplifier (DFB-SOA) are studied: periodic, linearly tapered, and linearly chirped DFB-SOA's. The features of these amplifiers are as follows: because of weak distributed-feedback structures caused by corrugations, wide bandwidth and high gain can be realized, i.e., higher gain than for traveling-wave-type amplifiers and wider bandwidth than for Fabry-Perot-type amplifiers. Two different applications for these three different types of DFB-SOA can be considered, viz., as transmission and as reflection structures; however, one transmission structure is better than the other. To reduce reflections from the amplifiers to the input side, either linearly tapered coefficients with negative taper or linearly chirped DFB-SOA's are useful. The noise level (caused by spontaneous emissions) of the proposed amplifiers can be lower than for traveling-wave-type amplifiers because a lower injection current is required for the same level of amplification.

A87-29105 Singlet oxygen generator using a porous pipe. K. TAKEHISA, N. SHIMIZU, and T. UCHIYAMA, *Journal of Applied Physics* (ISSN 0021-8979), Vol. 61, Jan. 1, 1987, pp. 68-73. 5 Refs.

The results of a study of an improved new method for generating O₂ (1Delta) for use in a chemical oxygen-iodine laser are presented. The generator, using a porous pipe, was found to produce O₂(1Delta) with an excitation efficiency of more than 80 percent and a maximum production of O₂ molecules from the unit surface area of 2.2 mmol/min cm has been attained.

A88-35970 Present status of optical ISL studies in Japan (inter-satellite link). YOJI FURUHAMA, KOJI YASUKAWA, KANSHIRO KASHIKI, and YASUO HIRATA, *Proceedings of the meeting on Optical systems for space applications*; Society of Photo-Optical Instrumentation Engineers, 1987, pp. 141-149. 47 Refs.

The current status of optical intersatellite link (ISL) R&D and related optical technologies in Japan are reviewed. Emphasis is placed on semiconductor laser diodes, photodetectors, CCDs, and modulation/demodulation techniques. Directions of future research on optical devices and communication systems are examined.

A87-54126 Principles and development of spatial filtering velocimetry. Y. AIZU and T. ASAKURA, *Applied Physics B - Photophysics and Laser Chemistry* (ISSN 0721-7269), Vol. B 43, Aug. 1987, pp. 209-224. 57 Refs.

As one of the interesting optical techniques for measurements of the velocity, the spatial-filtering method is treated briefly in this review. The basic theory of the method is examined by analyzing the filtering characteristics of a spatial filter using the power spectral density function. The signal analyses are summarized as one of the techniques used in the spatial filtering method. Various configurations of the spatial filtering velocimeter are classified into four typical groups and outlined according to a variety of spatial filters employed in the velocimeters.

A87-40401 Spectral width of saturated absorption spectra of Cs with a laser diode. SHIN-ICHI OHSHIMA, YASUHIRO NAKADAN, and YASUKI KOGA, *IEEE Journal of Quantum Electronics* (ISSN 0018-9197), Vol. QE-23, May 1987, pp. 473-475. 7 Refs.

The saturated absorption spectra and line widths of the Cs-D₂ line are examined in terms of incident power. The optical configuration used to obtain the saturation spectra is described. It is observed that the minimum spectral width is 20 MHz when the incident power is less than 0.1 mW, and the line width is limited by the natural width and the spectral width of the laser and the residual Doppler broadening caused by the cross angle of the incident beam and the reflected beam.

A87-45872 A copper vapor laser by using a copper-vapor-complex reaction at a low temperature. TOSHIYUKI KANO, HIROSHI TANIGUCHI, and HIROSHI SAITO, *Institute of Electronics, Information and Communication Engineers, Transactions* (ISSN 0913-574X), Vol. E70, April 1987, pp. 312-314. 13 Refs.

The performance of a copper vapor laser that uses a metal-vapor-complex (CuAl₂Br₇) for metallic copper is evaluated. The design and operation of the 100-cm long laser tube used in this experiment are described. The laser-pulse and current-pulse waveforms were measured. It is observed that for the current-pulse waveforms the pulse width is about 300 ns; the peak value is 200-300 A in the first swing of the current pulse; and the pulse repetition frequency is about 5 kHz. For the laser-pulse waveform, the peak power is 2 kW, the pulse width is 23 ns, and the pulse repetition frequency is 3-5 kHz. The characteristics of the laser output power versus the He buffer gas flow rate are analyzed. The maximum laser power was obtained when the He flow rate was 40-45 cu cm.

A87-44557 Optical properties and lasing of Ti(3+) doped BeAl₂O₄. YUSABURO SEGAWA, AKIKO SUGIMOTO, PIL HYON KIM, SUSUMU NAMBA, KIYOSHI YAMAGISHI et al., *Japanese Journal of Applied Physics, Part 2* (ISSN 0021-4922), Vol. 26, April 1987, pp. L291-L292. Research supported by the Science and Technology Agency of Japan.

The absorption and photoluminescence spectra of Ti(3+) doped chrysoberyl (BeAl₂O₄) were studied, as well as its lasing operation. The photoluminescence spectrum of Ti:BeAl₂O₄ has two peaks at 750 nm and 850 nm and the lifetime of both these lines is 5.0 microsec, which is longer than that of Ti(3+) doped sapphire (Al₂O₃). With an excitation power of 15 mJ, lasing wavelength was 803 + or - 20 nm, and the pulse duration was less than 80 ns.

A87-37796 The applications of the Stark effect to the stabilization of the CO₂ laser and the submillimeter laser. K. SAKAI, T. YOSHIDA, K. KUBA, Y. KATO, and Y. ICHIOKA, *International Journal of Infrared and Millimeter Waves* (ISSN 0195-9271), Vol. 8, March 1987, pp. 307-316.

Methods based on the Stark effect are described for the dither-free frequency stabilization of the optically pumped submillimeter laser. A CO₂ pump laser was stabilized using the Stark Lamb dip signal of a submillimeter laser in an external Stark cell. An estimated frequency stability better than + or - 1.4×10 to the -8th, for one hour recording, was obtained by this method. The frequency of the submillimeter laser was stabilized using the dc and ac Stark effects for a metal-dielectric rectangular waveguide laser. An estimated frequency stability of + or - 6×10 to the -8th was obtained for 119-micron line of CH₃OH laser for one hour recording.

A87-32154 Using a 1.5 micron DFB InGaAsP laser in a passive ring cavity-type fiber gyroscope. MOTOICHI OHTSU and SATOHIKO ARAKI, *Applied Optics* (ISSN 0003-6935), Vol. 26, Feb. 1, 1987, pp. 464-470. 22 Refs.

It has been demonstrated that a 1.5 micron distributed feedback In-GaAsP laser can be used as a coherent light source in a passive ring cavity-type fiber gyroscope. A formula for the detector shot noise-limited sensitivity of detection of rotation was derived for this type of gyroscope. Its value in the present experimental setup was estimated as being $0.8 \times \tau$

$\exp(-1/2)$ degree/hour, where τ represents the integration time of measurements. Experiments showed that the uncertainty of the detection of rotation was 1.5 deg/h at $\tau = 100$ s, which was governed by the slight reflection of light at the AR-coated fiber edges and residual frequency fluctuations of the laser.

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