Soviet and Japanese Aerospace Literature

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Soviet Aerospace Literature
This month: *Photoelectric Technologies*

A90-49095 Carrier transport mechanisms and photoelectrical properties of PbSnTe/PbTeSe heterojunctions. V. V. TETERKIN, V. B. ALENBERG, F. F. SIZOV, E. V. SUSOV, IU. G. TROIAN et al., *Infrared Physics* (ISSN 0020-0891), Vol. 30, No. 6, 1990, pp. 499-504. 10 Refs.

I-V, C-V characteristics, R(0)A product, and spectral photoresponse are analyzed in lattice-matched PbSnTe/PbTeSe heterojunctions grown by the molecular epitaxy method. Bulk generation-recombination and diffusion current is shown to be dominant at T higher than 30 K. The leakage current is presumably dominated by surface tunneling or by bulk defects at the depletion at T = 30 K or lower. Values of the R(0)A product of 0.8–6.25 Ohm-sq cm at T = 77 K are obtained. When the temperature decreases to 4.2 K, the R(0)A product increases by about two orders.

A90-48216 Measurement of the emission current during the switching of the polarization direction of ferroelectrics (Izmerenie emissionnogo toka pri perekliuchenii napravleniia poliarizatsii segnetoelektrika). A. SH. AIRAPETOV, A. K. KRASNYKH, I. V. LEVSHIN, and A. IU. NIKITSKII, *Pis'ma v Zhurnal Tekhnicheskoi Fiziki* (ISSN 0320-0116), Vol. 16, March 12, 1990, pp. 46-49. 7 Refs.

It has been shown in earlier studies that the switching of the spontaneous polarization direction of ferroelectrics by an external electric field leads to the emission of electrons from their surface. Here, experimental results are presented to demonstrate the possibility of using the effect of polarization direction switching in ferroelectrics for producing nanosecond electron beams with current densities exceeding, at least by an order of magnitude, those of all known thermionic sources and comparable with those produced in laser-based photoemission guns.

A90-43024 Linearity of the energy characteristics of photodetecting p-n(+) structures based on indium antimonide (O lineinosti energeticheskikh kharakteristik fotopriemnykh p-n/+/–struktur na osnove antimonida indiia). IU. V. VOROB'EV, L. G. GASTEVA, N. I. EVSTAF'EVA, E. I. ISMAGILOVA, V. V. KARPOV et al., *Optoelektronika i Poluprovodnikovaia Tekhnika* (ISSN 0233-7577), No. 17, 1990, pp. 41-46.

The mechanisms and types of nonlinearity of the energy characteristics of photodetecting p-n(+) structures based on InSb are investigated theoretically and experimentally. Two mechanisms of nonlinearity are identified, which are associated with the dependence of the strong field width on the photosignal level and with changes in the diffusion length of minority charge carrier in the adjacent base region. The first mechanism leads to the sublinearity of the energy characteristic at high excitation intensities, the second at intermediate intensities. In the second case, the characteristic remains linear at both low and high intensities.

A90-45102 Photosensitivity of alpha-Si:H p-i-n and Schottky barrier structures in the UV radiation region (Fotochuvstvitel'nost' p-i-n struktur i struktur s bar'erom Shottki na osnove aSi:H v oblasti UF izluchenila). ZH. ATAEV, V. A. VASIL'EV, A. S. VOLKOV, M. M. MEZDROGINA, and E. I. TERUKOV, *Pis'ma v Zhurnal Tekhnicheskoi Fiziki* (ISSN 0320-0116), Vol. 16, Jan. 12, 1990, pp. 47-50. 6 Refs.

The p-i-n and n-i-M structures investigated here were prepared by the decomposition of a gas mixture (SiH4-Ar) in a glow discharge. The 2000-A i-layer was prepared by the ion-plasma sputtering of a mosaic target (Si-Dy) in a hydrogen atmosphere. An analysis of the results obtained shows that the p-i-n and n-i-M (Pd, Pt) structures based on a-si:H and a-Si:H(Dy) can be used as efficient photodetectors in the UV range. They are characterized by high quantum efficiency (0.4–0.5 electron/photon), fast response, and practically unlimited detection surfaces.

A90-44665 Photoinduced second-harmonic generation in gamma-ray-irradiated optical fibers. E. V. ANOIKIN, E. M. DIANOV, P. G. KAZANSKII, and D. IU. STEPANOV, *Optics Letters* (ISSN 0146-9592), Vol. 15, Aug. 1, 1990, pp. 834, 835. 10 Refs.

Evidence is presented on photoinduced second-harmonic generation (SHG) in optical fibers irradiated by gamma rays. Data are presented showing that, as a result of exposure of Ge and (Ge + Ce) fibers to gamma rays (from Co-60, at a dose of 10 to the 6th rad and with a rate of 400 rad/sec), the SHG convergence efficiency in these fibers increased by a factor of 20. The increase is explained on the basis of SHG induction by a photovoltaic mechanism.

A90-38291 Injection-photon annealing of radiation induced defects during heterostructure concentrator solar cells operation. V. M. ANDREEV, V. S. KALINOVSKII, V. R. LARIONOV, V. D. RUMIANTSEV, and O. V. SULIMA, *Proceedings of the Twenty-fourth IECEC–89 Intersociety Energy Conversion Engineering Conference*, Washington, DC, Aug. 6–11, 1989. Vol. 6 (A90-38029 16–20). New York, Institute of Electrical and Electronics Engineers, 1989, pp. 2823–2825.

An improvement of the p-AlGaAs-p-GaAs-n-GaAs solar cells (SC) by decreasing the p-GaAs and p-AlGaAs thicknesses up to 0.3 microns and 100 A, respectively, is discussed. The drop in photocurrent in the SC after 6.7-MeV proton bombardment at a dose of 6 x 10 to the 12/sq cm was less than 10 percent. Additional ways to decrease the concentration of radiation-induced defects in the SC are injection (due to current flow) and photon (due to photoexcitation) annealing. These processes have been realized during operation of SC converting 15–100-fold concentrated sunlight.

A90-40283 A photoelectric instrument for automating television and optoelectronic observations of weak meteors (Fotoelektricheskii pribor dlia avtomatizatsii televizionnykh i optiko-elektronnykh nabliudenii slabykh meteorov). S. MUKHAMEDNAZAROV, G. NECHAEV, A. ATAEV, and V. SHUL'GIN, *Akademiia Nauk Turkmenskoi SSR, Izvestiia, Seriia Fiziko-Tekhnicheskikh, Khimicheskikh i Geologicheskikh Nauk* (ISSN 0002–3507), No. 2, 1990, pp. 25–28. 5 Refs.

The objective of the study reported here was to design and construct a photoelectric instrument for automating the recording of images of weak meteors from the screens of optoelectronic converters and TV monitors. Possible practical implementations of the instrument are briefly examined, and their relative advantages and disadvantages are discussed. A schematic diagram of the selected version of the photoelectric instrument is presented, and its performance characterized.

A90-39443 Solar illuminance measurement assurance (photometer design analysis). A. I. TRUBNIKOV, V. I. SAPRITSKII, S. I. ZACHEK, V. A. KLEVANTSOVA, S. N. MEKHONTSEV et al., *Proceedings of the Advanced optical instrumentation for remote sensing of the earth's surface from space Meeting,* Paris, France, Apr. 27, 28, 1989 (A90-39434 17–19). Bellingham, WA, Society of Photo-Optical Instrumentation Engineers, 1989, pp. 82–84.

This describes photometers for high-precision measurements of solar illuminance, which are built around the cellular-type silicon photodiodes. A natural-illuminance photometer consists of a housing incorporating a detector and a set of color filters correcting the spectral sensitivity to bring it near the relative spectral light efficiency, a digital voltmeter, and a device for setting the sight angle at 10 deg; the latter condition is essential for keeping the direct sun radiation measurement uniform with respect to the atmospheric solar halation. For signals of about 100 to 150 microA, the linearity deflection in these devices does not exceed 0.5 to 0.7 percent. The results of determinations of natural illuminance conversion factors for measurements in the period between 1985 and 1987 are presented.

A90-37758 Fluctuation characteristics of a 0.85-micron-wavelength all-fiber Sagnac interferometer (Fluktuatsionnye kharakteristiki tsel'novolokonnogo interferometra San'iaka na volnu 0.85 mkm). I. A. ANDRONOVA, D. D. GUSOVSKII, V. M. GELIKONOV, V. I. LEONOV, IU. A. MAMAEV et al., *Zhurnal Tekhnicheskoi Fiziki* (ISSN 0044–4642), Vol. 60, Feb. 1990, pp. 216–219. 15 Refs.

The performance of an all-fiber Sagnac interferometer based on a single-mode isotropic fiber was investigated experimentally with emphasis on its fluctuation characteristics and fluctuation sources. The effect of intensity fluctuations on the threshold sensitivity of the interferometer is discussed. With reference to the experimental results obtained, it is shown that the limiting sensitivity is largely determined by the noise of the radiation source. Details of the experimental procedure are described.

A90-34661 Role of dislocations in the degradation of metal-GaAs structures (Rol' dislokatsii v degradatsii struktur metall-GaAs). A. A. PTASHCHENKO and EM REN SIK, *Optoelektronika i Poluprovodnikovaia Tekhnika* (ISSN 0233–7577), No. 16, 1989, pp. 33–36. 10 Refs.

A study is made of the effect of uniaxial pressure, forward and reverse current transmission, and of the combined effect of these factors on the electrical and photoelectrical properties of metal-GaAs structures. It is found that the prolonged application of uniaxial pressure and direct current transmission produce defects in the surface layer of Au-GaAs, Sn-GaAs, and Au-GaAlAs structures, which significantly increases the excess current of the structures and reduces the minority carrier lifetimes. The annealing behavior of the defects is discussed.

A90-29046 A four-channel stellar photoelectric photometer for observations of bright stars (Chetyrekhkanal'nyi zvezdnyi elektrofotometr dlia izmereniia iarkikh zvezd). V. G. KORNILOV and A. V. KRYLOV, *Astronomicheskii Zhurnal* (ISSN 0004–6299), Vol. 67, Jan.–Feb. 1990, pp. 173–181. 13 Refs.

The development of a four-channel photoelectric photometer for WBVR observations of bright stars is described. The principal feature of the photometer is that the light between the four measuring channels is divided by semitransparent aluminum films. The efficiency of this photometer is higher than that of a photometer with a successive change of filters for stars brighter than 9–10 mag with a 0.5-m telescope. Consideration is given to the use of the photometer to obtain very accurate WBVR magnitudes of 15,000 stars during 1985–1988.

A88-21895 Quantum efficiency and photoactive components of heterojunction photocells with a high degree of nonconformity of lattice parameters (Kvantovaia effektivnost' fotoaktivnykh sostavliaiushchikh geterofotoeleme ntov s vysokoi stepen'iu nesootvetstviia parametrov reshetki). G. I. GODERDZISHVILI, R. V. KANTARIIA, and S. IU. PAVELETS, *Optoelektronika i Poluprovodnikovaia Tekhnika* (ISSN 0233–7577), No. 12, 1987, pp. 51–54. 7 Refs.

The spectral distribution of the quantum efficiency and collection efficiency of Cu(2-y)S-GaAs(0.6)P(0.4) photocells was studied experimentally as a function of the diffusion potential in the heterojunction (HJ) components. It is shown that the presence of a strong electric field at the surface of the photosensitive component GaAs(0.6)P(0.4) smooths out the effect of the high electron-state density at the HJ interface on the transfer of minority carriers. In the short-wavelength region, the reduction in quantum efficiency is determined by an increase in the probability of majority-carrier transfer into the transparent component of the photocell.

A90-34656 Characteristics of the theoretical description of nonequilibrium phenomena in layered optoelectronic structures (Osobennosti teoreticheskogo opisaniia neravnovesnykh iavlenii v sloistykh optoelektronnykh strukturakh). A. V. SACHENKO, *Optoelektronika i Poluprovodnikovaia Tekhnika* (ISSN 0233–7577), No. 15, 1989, pp. 16–26. 35 Refs.

The effect of currents passing through layered semiconductor structures on the redistribution of nonequilibrium charge carriers and nonequilibrium physical phenomena in these structures is analyzed theoretically. A classification is proposed for qualitatively different situations arising as a result of various degrees of the current-induced discontinuity of Fermi quasi-levels in electrons and holes.

A90-27210 A photoelectric guide for sunspot images (Fotogid dlia solnechnogo piatna). S. A. DRUZHININ, I. L. MASLOV, and A. A. PEVTSOV, *Issledovaniia po Geomagnetizmu, Aeronomii i Fizike Solntsa* (ISSN 0135–3748), No. 83, 1988, pp. 149–153.

A photoelectric guide designed to directly handle sunspot images is described. A quadrant photodiode (serving as the photodetector) is placed in the beam reflected from the Dove prism face. The actuators are two plane-parallel plates attached to low-inertia electromagnetic drives, ensuring a high frequency (up to 3 Hz) of control action in response to image motion. The guide is placed in front of the spectrograph entrance slit and can be used with any standard AZU–5 telescope.

A90-22807 Photoelectron emission of Y-Ba-Cu-O ceramics (Fotoelektronnaia emissiia Y-Ba-Cu-O-keramik). B. A. SORKIN and KH. KIAEMBRE, *Pis'ma v Zhurnal Tekhnicheskoi Fiziki* (ISSN 0320–0116), Vol. 15, Nov. 26, 1989, pp. 4–8. 12 Refs.

Spectra of the quantumn yield gamma(hnu) of photoelectron emission in the near-threshold spectral region hnu = 2.4–5.4 eV were investigated for YBa2Cu3O(7-delta) specimens with different conductivity and superconductivity characteristics. Three groups of specimens were studied and compared: metallodielectrics which become superconducting under cooling by liquid N2; (2) samples that do not exhibit superconductivity under liquid-N2 cooling and that possess semiconducting properties; and (3) dielectric Y2BaCuO5. The photoelectron yield is found to be smallest for the superconducting specimens and greatest for the dielectric specimen.

A90-17187 A photodiode with an adjustable spectral photoresponse characteristic (Fotodiod s upravliaemoi spektral'noi kharakteristikoi fotootklika). V. A. MANASSON, V. K. DUGAEV, and E. M. SHUSTER, *Pis'ma v Zhurnal Tekhnicheskoi Fiziki* (ISSN 0320–0116), Vol. 15, Sept. 26, 1989, pp. 53–55.

A photodiode structure is described which contains surface defects in the form of attachment levels for the principal charge carriers. The introduction of such defects makes it possible to control the spectral characteristic of the photoresponse by means of a small gate voltage. Such structures can be used in devices where the short-wave component must be isolated from the entire spectral range of the photoresponse.

A90-14541 Formation of the self-sustained pump discharge of a CO2 laser at a voltage below the static breakdown voltage (Formirovanie samostoiatel'nogo razriada nakachki CO2lazera pri napriazhenii nizhe staticheskogo probivnogo). A. A. KUCHINSKII, V. A. RODICHKIN, V. A. SMIRNOV, and V. P. TOMASHEVICH, *Kvantovaia Elektronika* (ISSN 0368–7147), Vol. 16, Aug. 1989, pp. 1659–1663. 15 Refs.

Photoelectron emission from the cathode isshown to play a substantial role in the formation of the self-sustained pump discharge for a CO2 laser at a voltage below the static breakdown one. When the Mg cathode is used, the specific energy input to the discharge is shown to amount to 250 J/l atm in gas mixtures containing 30–50 percent of molecular gases. In this case, a specific output energy of 8–10 J/l was obtained with a laser efficiency of 8–9 percent.

A90-14484 Photocurrent in quantum well structures with optical orientation of free carrier (Fototok v strukturakh s kvantovymiiamami pri opticheskoi orientatsii svobodnykh nositelei). E. L. IVCHENKO, IU. B. LIANDA-GELLER, and G. E. PIKUS, *Pis'ma v Zhurnal Eksperimental'noi i Teoreticheskoi Fiziki* (ISSN 0370–274X), Vol. 50, Aug. 10, 1989, pp. 156–158.

The mechanism of photocurrent generation in quantum well structures is investigated analytically. It is shown, in particular, that in noncentrosymmetric media, spin relaxation and Larmor spin precession of optically oriented thermalized carriers induce a current that is proportional to spin polarization. A calculation of this effect is carried out for GaAs/AlGaAs semiconductor structures.

A88-53983 Photoelectric properties of silicon-on-sapphire photodetectors (Fotoelektricheskie svoistva KNS-fotopriemnikov). M. P. LISITSA, V. D. IGNATKOV, N. R. KULISH, B. K. SERDEGA, and O. S. FROLOV, *Optoelektronika i Poluprovodnikovaia Tekhnika* (ISSN 0233–7577), No. 13, 1988, pp. 39–43. 14 Refs.

Experimental results are presented on the spectral dependence of the current sensitivity, inertia, and dynamic range of silicon-on-sapphire photodetectrs with comb-type electrodes. At a wavelength of 694 nm, the current sensitivity and inertia are estimated at 0.24 A/W and 2x10 to the –6th s, respectively, in the power range 10 to the –7th –10 to the –2nd W. In the 10–100 W range, the current sensitivity and inertia are, respectively, 2x10 to the –5th A/W and 10 ns or less.

A90-14464 Phototransistor with an ITO-InGaAsP-InP-ITO structure (Fototranzistor so strukturoi ITO-InGaAsP-InP-ITO). A. I. MALIK, V. E. ANIKIN, L. V. DOLGINOV, and G. V. SHEPEKINA, *Pis'ma v Zhurnal Tekhnicheskoi Fiziki* (ISSN 0320-0116), Vol. 15, Aug. 26, 1989, pp. 11-13.

Experimental results are presented on collector-junction heterophototransistors with ITO-InGaAsP-InP-ITO structure. It is shown that these devices have an extended sensitivity range and may find application in photodetectors for measuring radiation from LEDs and laser diodes at high output currents in the 0.4-1.6micron wavelength range.

A89-51022 Impurity activation in CdTe single crystals under laser irradiation (Aktivatsiia primesi v monokristallakh CdTe pod deistviem lazernogo oblucheniia). A. BAIDULLAEVA, B. DZHUMAEV, N. E. KORSUNSKAIA, P. E. MOZOL', and G. GARIAGDYEV, *Ukrainskii Fizicheskii Zhurnal* (ISSN 0503-1265), Vol. 34, July 1989, pp. 1019-1024. 16 Refs.

The effect of an impurity (In or Cl) on the electrical, photoelectrical, and photoluminescent properties of CdTe single crystals irradiated by nanosecond pulses of a ruby laser was investigated experimentally. It is found that the changes in these properties observed below the melting point are largely due to two factors: evaporation of Cd from the solid phase, which also leads to the formation of a Te film, and activation of the impurity. The effect of impurity activation has not been observed in other II-VI semiconductors.

A89-50883 Quantum features in the noise spectrum of radiation that has passed through a nonequilibrium gaseous medium (Kvantovye osobennosti v spektre shumov izluchenniia, proshedshego neravnovesnuiu gazovuiu sredu). D. V. KUPRIIANOV and I. M. SOKOLOV, *Zhurnal Eksperimental'noi i Teoreticheskoi Fiziki* (ISSN 0044-4510), Vol. 95, June 1989, pp. 1980-1987. 16 Refs.

The statistical properties of radiation that has passed through a nonequilibrium gaseous medium in the transparency band are considered. It is shown that the photocurrent noise spectrum in the vicinity of omega(0) and 2 omega(0), where omega(0) is the Zeeman splitting frequency, has the shape of a dispersion curve and that the shot noise is partially suppressed. The dependence of the sub-Poisson statistical effects on the geometry of the experiment is studied and the possibility of recording them is discussed.

A89-49295 High-speed p-i-n GaAs/AlGaAs photodetector operator in the gate mode (Bystrodeistvuiushchii p-i-n GaAs/AlGaAs fotopriemnik, rabotaiushchii v ventil'nom rezhime). D. M. BUTUSOV, G. G. GOTSADZE, V. P. LARIONOV, B. S. RYVKIN, E. M. TANKLEVSKAIA et al., *Pis'ma v ZhurnalTekhnicheskoi Fiziki* (ISSN 0320-0116), Vol. 15, May 12, 1989, pp. 88-93. 7 Refs.

Results are reported on the fabrication and testing of a high-speed p-i-n photodetector based on the GaAsa/AlGaAs heterostructure operating in the gate mode. Oscillograms of photocurrent and response pulses are presented. The sensitivity of the photodetector was estimated to be 0.2-0.3 A/W.

A89-35775 Photoinduced conversion of radiation polarization in integrated optics components based on LiNbO3. PETR G. KAZANSKII, *IEEE Journal of Quantum Electronics* (ISSN 0018-9197), Vol. 25, April 1989, pp. 736-741. 17 Refs.

Two photoinduced effects in LiNbO3 optical waveguides (unidirectional waveguide mode conversion from ordinary to extraordinary polarization and radiation coupling out with polarization plane rotation) are discussed. The circular photovoltaic tensor component in LiNbO3 is determined experimentally, and a photovoltaic mechanism to explain photoinduced radiation coupling out of waveguides is proposed. The impact of the effects discovered on the performance of phase modulators is discussed.

A89-27252 Diffraction constraints on the spatial resolution limit and long-wave boundary of monolithic IR detectors with weak absorption (Difraktsionnye ogranicheniia na predel'noe prostranstvennoe razreshenie i dlinnovolnovuiu granitsu monolitnykh IK priemnikov so slabym pogloshcheniem). A. V. ZATOVSKII, V. G. IVANOV, E. T. ROGOVSKAIA, and G. I. SALISTRA, *Zhurnal Tekhnicheskoi Fiziki* (ISSN 0044-4642), Vol. 58, Oct. 1988, pp. 1871-1877. 9 Refs.

For a class of monolithic matrix IC photodetectors with coordinate addressing, the radiation field within the matrix is investigated and a limiting ratio between the photocell density and the wavelength is determined for which spatial resolution of optical signals is possible. First, an analytical expression for the asymptotic estimation of a correction to the Kirchhoff approximation is obtained which is equally valid for all values of the optical parameter kl. The radiation field in a semiconductor plate is then determined, and the value of kl is calculated.

A88-55274 Star-scintillation measurement using a photoelectric device (Ob izmerenii mertsaniia zvezd s pomoshch'iu fotoelektricheskogo pribora). A. EDM. GUR'IANOV and IU. V. KHAN, *Akademiia Nauk Turkmenskoi SSR, Izvestiia, Seriia Fiziko-Tekhnicheskikh, Khimicheskikh i Geologicheskikh Nauk* (ISSN 0002-3707), No. 4, 1988, pp. 29-34.

It is established that a photoelectric device normally used to measure the quality of star images can be used for scintillation measurements. Formulas and reduction coefficients are presented which make it possible to determine scintillation variance using the device.

A89-22161 Adaptive methods of light-beam formation under conditions of the speckle modulation of a scattered field (Adaptivnye metody formirovaniia svetovykh puchkov v usloviiakh spekl-moduliatsii rasseiannogo polia). M. A. VORONTSOV, I. A. KUDRIASHOV, and V. I. SHMAL'GAUZEN, *Kvantovaia Elektronika* (ISSN 0368-7147), Vol. 15, Sept. 1988, pp. 1925-1930. 9 Refs.

Statistical criteria of radiation focusingonto a rough reflector have been studied experimentally. It is shown that these criteria can be used effectively for the compensation of static, dynamic and nonlinear phase distortions. The statistical criteria of focusing were used in experiments with a 15-channel adaptive system with a flexible mirror.

A89-19764 Structure and photoelectric properties of Stepanov-grown polycrystalline shaped silicon (O stroenii i fotoelektricheskikh svoistvakh polikristallicheskogo profilirovannogo kremniia, poluchennogo sposobom Stepanova). M. D. VERA, M. B. ZAKS, V. V. KASATKIN, M. D. LIUBALIN, D. V. TARKHIN et al., *Akademiia Nauk SSSR, Izvestiia, Seriia Fizicheskaia* (ISSN 0367-6765), Vol. 52, Oct. 1988, pp. 1959-1965. 13 Refs.

The real structure of Stepanov-grown polycrystalline silicon in the form of hexagonal shapes is investigated experimentally using the method of light figures under laser illumination, X-ray topography, and laser scanning microscopy. The relationship between the photocurrent of the p-n transition in silicon ribbons grown by this method and the characteristic structural defects (e.g., residual stresses, dislocations, twins, and grain boundaries) is examined.

A88-52751 A photoelectric differential method of measuring solar rotation (Fotoelektricheskii differentsial'nyi metod izmereniia vrashcheniia solntsa). V. M. GRIGOR'EV and R. M. IL'GAMOV, *Kinematika i Fizika Nebesnykh Tel* (ISSN 0233-7665), Vol. 4, JulyAug. 1988, pp. 3-9. 7 Refs.

A method for determining the rotational velocity of the solar surface is presented. It is an extension of the differential technique for measuring the line-of-sight (LOS) velocity of the motion of the solar plasma. The method is based on measurements of the difference between the LOS velocities of two solar disk elements which lie symmetrically with respect to the central meridian projection at the same heliographical latitude. This difference is converted into rotational velocity at a given heliographical latitude.

A88-44921 The characteristics of PbS-based radiation detectors for astronomical applications (Kharakteristiki priemnikov izlucheniia na osnove PbS v usloviiakh astronomicheskogo primeneniia). B. E. ZHILIAEV and L. B. MASLEEV, *Kinematika i Fizika Nebesnykh Tel* (ISSN 0233-7665), Vol. 4, May-June 1988, pp. 76-80. 5 Refs.

The basic characteristics of PbS-based IRphotodetectors are studied under laboratory conditions. Consideration is given to the temperature dependence of the dark resistance, the intrinsic time constant, the volt-watt and threshold sensitivity, and the frequency dependence in the 20-400 Hz range. The detectors are studied upon cooling to -60 C in a vacuum volume with an input aperture of 1:15 which is typical for Cassegrain foci of telescopes.

A88-39545 Investigation of the fulfillment of the proportionality law for PRIZ space-time light modulators (Issledovanie vypolneniia zakona vzaimozamestimosti dlia PVMS PRIZ). A. M. BLIZNETSOV, IU. I. KUZ'MIN, and A. V. KHOMENKO, *Zhurnal Tekhnicheskoi Fiziki* (ISSN 0044-4642), Vol. 58, March 1988, pp. 618-621. 6 Refs.

Under certain conditions an increase in the intensity of the recording light in space-time light modulator systems leads to a proportional decrease in the exposure time. This paper presents experimental results on the response of a PRIZ space-time light modulator in the recording light intensity range from 0.00003 to 0.3 W/sq cm. A model is proposed which explains observed deviations from the proportionality law.

A88-39543 Electrically controllable data recording on photorefractive crystals (Elektricheski upravliaemaia zapis' informatsii na fotorefraktivnye kristally). V. M. PETROV, A. V. KHOMENKO, and M. V. KRASIN'KOVA, *Zhurnal Tekhnicheskoi Fiziki* (ISSN 0044-4642), Vol. 58, March 1988, pp. 596-600.

The paper demonstrates the feasibility of electrically controllable data recording on photorefractive crystals of Bi12SiO20 type. An analysis is made of the structures of PRIZ-type space-time light modulators designed for the electrically controllable recording of single-channel and multichannel electrical signals. The new functional capabilities of the proposed modulator structures are stressed.

A88-33830 Improvement of techniques for photoelectric observations of stars in geodetic astronomy (K voprosu sovershenstvovaniia metodiki fotoelektricheskikh nabliudenii zvezd v geodezicheskoi astronomii). V. N. BARANOV and R. A. ALEKSANKINA, *Geodeziia i Aerofotos'emka* (ISSN 0536-101X), No. 5, 1987, pp. 53-62. 8 Refs.

The paper examines the effect of the parameters of the photoelectric instrumentation and of the environment on the accuracy of the results obtained. Changes in the scattering circles for stars of different spectral types are assessed quantitatively. A method is proposed for determining time delay with allowance for changes in the diameters of star images. The proposed approach makes it possible to reduce random observation errors and to improve the accuracy with which systematic errors are taken into account.

A88-36157 Simulation of the effect of the orientation of column-crystals on their size distribution as measured by a photoelectric particle-size meter (Modelirovanie vliianiia orientatsii kristallov-stolbikov na spektr ikh razmerov, izmeriaemyi fotoelektricheskim priborom IRCh). E. T. IVANOVA and A. L. KOSAREV, *The physics of clouds, fogs and active modifications* (A88-36151 14-47). Moscow, Gidrometeoizdat, 1987, pp. 98-107. 8 Refs.

The interpretation of data on cirrus clouds obtained with an airborne photoelectric particle-size meter is examined. Numerical simulation results are presented on the size distribution of column crystals in such clouds.

A88-33837 Thin-film multipass AlGaAs photocells with bilateral photosensitivity (Tonkoplenochnye mnogoprokhodnye AlGaAs-fotoelementy s dvustoronnei fotochustvitel'nost'iu). ZH. I. ALFEROV, V. M. ANDREEV, K. I. VAKAREL'SKA, IU. M. ZADIRANOV, V. R. LARIONOV et al., *Pis'ma v Zhurnal Tekhnicheskoi Fiziki* (ISSN 0320-0116), Vol. 14, Feb. 12, 1988, pp. 193-197. 8 Refs.

The paper presents experimental reasults on thin-film solar cells based on n-Al (0.8) Ga (0.2) As-p-GaAs-p-GaAs-p-Al (0.8) Ga (0.2) As. Owing to the creation of a rear potential barrier and the use of multipass effects, it was possible to achieve high bilateral photosensitivity with a minimum thickness of the active region (GaAs) of about 0.6 micron for a total structure thickness of about 1.5 microns.

A88-28325 'Violet' pAlGaAs-pGaAs-nGaAs photocells with hyperthin (30-300 A) wideband layers ('Fioletovye' pAlGaAs-pGaAs-nGaAs-fotoelementy so sverkhtonkimi /30-300 A/ shirokozonnymi sloiami). ZH. I. ALFERNOV, V. M. ANDREEV, A. A. VODNEV, V. R. LARIONOV, A. V. NIKITIN et al., *Pis'ma v Zhurnal Tekhnicheskoi Fiziki* (ISSN 0320-0116), Vol. 14, Jan. 12, 1988, pp. 76-79. 6 Refs.

Experimental results are presented on photocells with hyperthin (30-300 A) wideband layers of Al(x)Ga(1-x)As (x = 0.7-0.9) solid solutions. It is shown that the photoresponse in the violet region can be increased by reducing the thickness of the wideband 'window' of this solid solution to values less than 100 A, while preserving a high photoresponse in the remaining part of the spectrum at 0.45-0.9 micron.

A88-21891 Synthesis of topologies of multicomponent code photoresistors using Group II B—VI A materials (Sintez topologii mnogoelementnykhkodovykh A2 B6 fotorezistorov). V. B. BOGDANOVICH, A. L. PALAMARCHUK, and S. V. SVECHNIKOV, *Optoelektronika i Poluprovodnikovaia Tekhnika* (ISSN 0233-7577), No. 12, 1987, pp. 1-6. 5 Refs.

Structural principles for the topology design of multicomponent photoresistors using Group II B—VI A materials, e.g, CdS(x)Se(1-x), have been developed. The basic relationships and limiting values of the geometric dimensions of the components are determined. Basic variants of simple code and combined topologies are examined, and the domains of their effective application are defined.

A87-49733 Low-temperature optical bistability of photocurrent in gallium arsenide (Nizkotemperaturnaia opticheskaia bistabil'nost' fototoka v arsenide galliia). O. A. RIABUSHKIN and V. I. SERGEEV, *Pis'ma v Zhurnal Tekhnicheskoi Fiziki* (ISSN 0320-0016), Vol. 13, June 12, 1987, pp. 653-656. 7 Refs.

A photocurrent hysteresis dependenton light intensity, with the photon energy (h/2pi)(omega) less than Eg, has been observed in a GaAs film at helium temperature. The width of the hysteresis is controlled by an electrical voltage applied to the film. The experimental results are explained in terms of a low-temperature impurity-induced breakdown. Details of the experimental procedure and results are reported.

A88-28250 Optimization of the parameters of a solar photoelectric system exposed to cosmic rays (Optimizatsiia parametrov solnechnoi fotoelektricheskoi ustanovki, podverzhennoi vozdeistviiu kosmicheskoi radiatsii). O. F. ZAITSEV, *Geliotekhnika* (ISSN 0130-0997), No. 6, 1987, pp. 23-28. 7 Refs.

A model and an algorithm are developed for the optimization of the performance characteristics of concentration-type solar photoelectric systems consisting of planar solar arrays, concentrator reflecting films, and supporting structures. The model and the algorithm make it possible to accurately predict the parameters of concentration-type photoelectric systems at the design stage. It is shown that, under conditions of considerable radiation-induced damage, the performance of such systems can be improved by using low-potential concentration systems and discrete reservation of output power.

A88-26707 The application of double-orthogonal functions in the theory behind the photoelectric method of star observations (Primenenie funktsii s dvoinoi ortogonal'nost'iu v teorii fotoelektricheskogo metoda nabliudenii zvezd). V. N. BARANOV, *Geodeziia i Aerofotos'emka* (ISSN 0536-101X), No. 4, 1987, pp. 37-48. 6 Refs.

The determination of the systematic errors of photoelectric star observations necessitates the structural analysis of the optical images of the observed stars. In connection with this error determination, the present paper proposes the use of eigenfunctions of the Fourier-Bessel transform for the analysis of linear instruments and the definition of the simplest relationships between the signal and its transform. Formulas are obtained expressing the eigenfunctions by Zernike polynomials, and the expansion of the aberration function in a generalized Fourier series is described. The determination of star-image diameters in the presence of objective chromatism is considered as an example.

A88-18096 Characteristics of the integral-adaptive self-scanning mode in multielement photodetectors (K svoistvam integral'noadaptivnogo rezhima samoskanirovaniia v mnogoelementnykh fotopriemnikakh). B. G. PODLASKIN, *Zhurnal Tekhnicheskoi Fiziki* (ISSN 0044-4642), Vol. 57, Aug. 1987, pp. 1610-1616. 7 Refs.

The possibility of achieving self-scanning in multielement photodetectors adaptive to input illumination distributions and changes is examined. The self-scanning mode is based on the continuous comparison of the integral photocurrent values from different areas of the photodetector and accumulation of a difference signal. As a result, an aperture with adaptive parameters is formed, and a constant S/N ratio is maintained for the full scanning range. The self-scanning mode could be used in the vision circuits of automatic control and industrial robot systems.

A87-41798 Spectral characteristics of the photoemission of thin silver films treated by cesium and oxygen (Ob osobennostiakh spektral'noi kharakteristiki fotoemissii iz tonkikh plenok serebra, obrabotannykh tseziem i kislorodom). A. P. BALASHOVA and A. E. SHABEL'NIKOVA, *Radiotekhnika i Elektronika* (ISSN 0033-8494), Vol. 32, April 1987, pp. 895-898. 6 Refs.

A constant describing optical absorption inthe system Ag-Cs-O on glass and indium phosphide substrates in thespectral range 0.75-0.9 micron is determined on the basis of photoemission measurements as a function of the silver film thickness. It is found that the absorption vs thickness curve has a maximum corresponding to a film thickness of about 100 A in the case of a glass substrate and 40-70 A in the case of an indium phosphide substrate. It is also found that the maximum absorption of a silver film on an indium phosphide substrate is significantly lower than that of a silver film on a glass substrate.

Japanese Aerospace Literature This month: *Photoelectric Technologies*

A90-43393 Optoelectronic synaptic connection circuit with variable analogue weights. H. YONEZU, T. HIMENO, K. KANAMORI, K. PAK, and Y. TAKANO, *Electronics Letters* (ISSN 0013-5194), Vol. 26, June 21, 1990, pp. 910-912. Research supported by MOESC. 5 Refs.

A basic optoelectronic circuit of an artificial synaptic connection was fabricated in which analogue weights were varied electrically. Circuit simplicity and low current level operation, necessary for a large scale OEIC, were realized.

A87-38063 Photoluminescence and absorption of a zirconium fluorideglass and ZrF4. YASUTAKE OHISHI, SHIGEKI SAKAGUCHI, and SHIRO TAKAHASHI, *American Ceramic Society, Communications* (ISSN 0002-7820), Vol. 70, April 1987, pp. C-81 to C-83.

The glass containing reduced zirconium exhibits a photoemissioon band at 480 nm and an excitation band from 230 to 370 nm. Reduced zirconium tetrafluoride has broad absorption at 400 nm. Reduction of zirconium tetrafluoride occurs through fluorine or oxygen impurity elimination. When fluorine ion deficiency occurs, emission and excitation bands appear at 440 and 350 nm, respectively. When oxygen deficiency occurs, emission and excitation bands appear at 480 and 300 nm, respectively.

A89-43912 Photoemission study of single crystal Bi2Sr2CaCu2O8. TAKASHI TAKAHASHI, HIROYOSHI MATSUYAMA, HIROSHI KATAYAMA-YOSHIDA, YUTAKA OKABE, SHOICHI HOSOYA et al., *Advances in superconductivity; Proceedings of the First International Symposium on Superconductivity* (ISS '88), Nagoya, Japan, Aug. 28-31, 1988 (A89-43901 19-76). Tokyo and New York, SpringerVerlag, 1989, pp. 175-180. Research supported by the Nippon Sheet Glass Foundation for Materials Science. 8 Refs.

Photoemission measurements with synchrotron radiation have been performed on single crystal Bi2Sr2CaCu2O8. Two energy bands with dispersion of 0.2-0.5 eV were observed in the vicinity of the Fermi level and one of them crosses the Fermi level midway between the center and boundary of the Brillouin zone, giving a clear evidence for existence of a Fermi surface. The Fermi-edge peak exhibits a pronounced enhancement at photon energy of the O 2s core threshold, meaning a dominant O 2p nature of the Fermi-edge states. These results indicate existence of the Fermi-liquid states with dominant O 2p nature in the high-Tc superconductor. The superconductivity could be driven by formation of Cooper-pairs of the O 2p holes in the Fermi-liquid states, probably through the spin or charge fluctuation.