Soviet and Japanese Aerospace Literature

Throughout 1990 the *AIAA Journal* will carry selected abstracts on leading research topics from the Soviet 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 Holography from the USSR and Japan.

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Soviet Aerospace Literature This month: *Holography*

A89-51041 Multifrequency anisotropic acoustooptic modulators based on TeO2 crystals (Mnogochastotnye anizotropnye akustooptic heskie moduliatory na kristallakh TeO2). A V. TRUBETSKOI and P M SHIPOV, *Avtometriia* (ISSN 0320-7102), May-June 1989, pp. 131-133 6 Refs

The development and testing of anisotropic acoustooptic modulators based on paratellurite (TeO2) crystals with multifrequency control. The acoustooptic modulators are designed for use in a high-speed holographic recorder of digital data on an optical disk. Results of an experimental investigation of the influence of nonlinear effects, associated with light diffraction by multiple acoustic waves with different frequencies, are discussed

A89-51037 High-speed digital data memory based on a stack of optical disks (Vysokoskorostnoi nakopitel' tsifrovykh dannykh na osnove paketa opticheskikh diskov). IU. V VOVK, L V VYDRIN, N. N V'IUKHINA, V. N. ZATOLOKIN, P E TVERDOKHLEB et al., *Avtometriia* (ISSN 0320-7102), May-June 1989, pp. 82-94. 8 Refs

A mockup of a memory device based on a stack of optical disks has been created for the study of read-write operations on digital data over a wide range of operating conditions A compact optical read-write head and electronic controllers implementing 4-level holographic phase coding have been developed and tested. The head writes at a rate of 64 Mb/s and reads at 8 Mb/s It is shown that the method of relative (difference) phase modulation reduces the effect of slow fluctuations of memory parameters on the reliability of data recording and relaxes requirements for the identity of parallel channels, thus facilitating multilevel data coding in a hologram.

A89-51036 Architecture of an information-retrieval system based on a large-capacity holographic memory (Arkhitektura informatsionnoi sistemy na osnove gologra ficheskoi pamiati bol'shoi emkosti). B. V. VANIUSHEV, N N. V'IUKHINA, I S GIBIN, A P LITVINTSEVA, T N MANTUSH et al., *Avtometriia* (ISSN 0320-7102), May-June 1989, pp. 74-82 10 Refs

The functional organization of an information-retrieval system based on holographic memory devices is examined In particular, attention is given to the general structure and composition of the large-capacity holographic memory, input and output devices, hardware implementation of the main subsystems, and software support One memory module is capable of storing up to 5000 pages of text or 67 monochrome graphic images (512x512 pixels) of 256 brightness levels (or 22 color screens) using the Hemming code Results of system tests and applications are discussed

A89-49267 Quasi-simple waves in Korteweg-De Vries hydrodynamics (Kvaziprostye volny v gidrodinamike Kortevega-de Friza). A V GUREVICH, A. L KRYLOV, and N G MAZUR, *Zhurnal Eksperimental'noi i Teoreticheskoi Fiziki* (ISSN 0044-4510), Vol 95, May 1989, pp 1674-1689 9 Refs

The formation and development of a dissipationless shock wave resulting from the 'overturning' of a nonlinear wave is studied using the modulation equation technique. The case when the wave propagates along an unperturbed medium and two Riemann variables suffice to describe a dissipationless shock wave is studied. Consideration is given to both a monotonously increasing and nonmonotonous (localized) initial perturbation In both cases, a common solution is found by linearizing the modulation equations via the holograph method.

A89-44683 A method for the multiple-channel recording of binary data on an optical disk (Metod mnogokanal'noi zapisi dvoichnykh dannykh na opticheskom diske). IU. V VOVK, L V VYDRIN, P E. TVERDOKHLEB, and IU A. SHCHEPETKIN, *Avtometriia* (ISSN 0320-7102), Mar.-Apr. 1989, pp. 77-87 15 Refs.

A method for the high-speed holographic recording of binary data on a disk medium is described, and the factors determining the recording density and rate limits are investigated Based on a statistical analysis of the reading of 400,000 holograms, it is shown that the data recording density in the case of amplitude coding and a relative data error of about 10 to the -6th is determined by the photographic medium scattering noises and has a limit of 10 to the 5th bit/sq mm. The method of multiple-phase relative phase modulation is proposed as a way of increasing the recording density, rate, and noise immunity

A89-13093 Reconstruction of the images of objects on the basis of one-dimensional radio holograms synthesized for small diffraction angles (Vosstanovlenie izobrazhenii ob'ektov po odnomernym radiogologrammam, sintezirovannym pri malykh uglakh difraktsii). V V CHAPURSKII, *Radiotekhnika i Elektronika* (ISSN 0033-8494), Vol 33, Aug. 1988, pp. 1747-1756 7 Refs.

The paper examines the synthesis of one-dimensional radio holograms and the reconstruction of images of extended objects during observation of the field in the range of small diffraction angles The object is aproximated by its shadow in the picture plane, while the field scattered by the object is determined in the Fraunhofer approximation The amplitude and phase properties of the radio-hologram components are analyzed, and conditions are formulated under which a two-dimensional image of the object shadow can be reconstructed

A89-42353 Diffractional integrated-optical elements (Difraktsionnye integral'no-opticheskie elementy). M MILER, V N MOROZOV, and A N PUTILIN, *Kvantovaia Elektronika* (Moscow) (ISSN 0368-7147), Vol 16, March 1989, pp 415-427 78 Refs

The operating conditions of grating integrated optical (IO) elements are analyzed Holographic methods for the production of the iO elements are of particular interest as well as some features of the reproduction of one-and two-dimensional objects Devices and schemes of optical information processing using grating elements are described

A89-37433 Median filtering algorithm for the processing of the results of holographic measurements of the near fields of antenna systems (Algoritm mediannoi fil'tratsii dlia obrabotki rezul'tatov golograficheskikh izmerenii blizhnikh polei antennykh sistem). M A VIL'KOTSKII and G P LICHKO, *Avtometriia* (ISSN 0320-7102), Jan.-Feb 1989, pp 24-30

The use of the classical median filter to the processing of the results of holographic measurements of the near fields of antenna systems is shown to introduce significant errors An improved median filtering algorithm is then proposed which is characterized by small spectral errors in the holographic measurements of the near fields of antenna systems

A89-35654 Prospects for the application of holographic interferometry to the study of the resonant vibrations of complex systems (O perspektivakh primeneniia metoda golograficheskoi interferometrii k issledovaniiu rezonansnykh kolebanii slozhnykh sistem). I F OBRAZTSOV and V A SMIRNOV, *Raschety na Prochnost'*, No 28, 1988, pp 134-151

Results of holographic interferometry studies of the behavior of plates, shells, and complex three-dimensional models of mechanical systems subjected to periodic dynamic loading are reported Examples are presented to demonstrate the possibility of the vibration of different parts of the same structure at different frequencies Photographs of holograms are presented

A89-35568 Characteristics of a synthetic-aperture radar during the observation of fluctuating objects (Kharakteristiki RLS s sintezirovannoi aperturoi pri nabliudenii fliuktuiruiushchikh ob'ektov). A L IL'IN, and A IA PASMUROV, *Radioelektronika* (ISSN 0021-3470), Vol 32 Feb 1989, pp 65-68

The present study demonstrates the feasibility of using the linear filtering method to analyze the imaging of partially coherent surface-distributed objects in a synthetic-aperture radar Conditions for choosing the main characteristics of the SAR in the synthesis process are established It is shown that the presence of temporal fluctuations of the signal in the observation channel leads to the appearance of multiplicative noise, and thus to a deterioration in the azimuth resolution of the SAR

A87-35940 Phase conjugation during vector self-diffraction by polarization holograms (Obrashchenie volnogo fronta pri vektornoi samodifraktsii na poliarizatsionnykh gologrammakh). A A BORSHCH N V KUKHTAREV, and V N SEMIOSHKO, *Akademiia Nauk SSSR, Izvestiia, Seriia Fizicheskaia* (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

A89-23636 The use of methods for the correction of spatial-temporal light modulators in optical spectrum analyzers (Ispol'zovanie metodov korrektsii prostranstvenno-vremennykh moduliatorov sveta v opticheskikh spektroanalizatorakh). V B BERKOVSKII, V N KURASHOV, D V PODANCHUK, and E K SHMAREV, *Kvantovaia Elektronika* (ISSN 0368-7155), No 34, 1988, pp 11-16 5 Refs

The paper examines the holographic correction of phase distortions of a magnetooptical spatial-temporal light modulator used in an optical spectrum analyzer of low-frequency signals Aberrations of optical elements are corrected on the basis of information transfer from the object beam to the reference beam An experimental model of a spectrum analyzer developed on the basis of this approach is described

A89-21698 Photorefractive properties of barium-strontium niobate crystals and their use in dynamic holography (Fotorefraktivnye svoistva kristallov niobata bariia-strontsiia i ikh primenenie v dinamicheskoi golografii). A V KNIAZ'KOV and IU S KUZ'MINOV, *Avtometriia* (ISSN 0320-7102), Sept.-Oct 1988, pp 19-26 38 Refs

The available literature on the photorefractive properties of barium-strontium niobate crystals for recording and converting optical information is reviewed In particular, the structural characteristics of the crystals are examined from the standpoint of possibilities for increasing their sensitivity to photorefraction over a wide range of wavelengths Emphasis is placed on the properties of phase conjugation and local photorefractive recording associated with the effects of holographic amplification and conversion of interacting optical waves The advantages afforded by strontium-barium niobate crystals for phase conjugation devices are examined

A89-32122 Correlation and spectral functions of one-dimensional radio holograms synthesized at small diffraction angles (Korreliatsionnye i spektral'nye funktsii odnomernykh radiogologramm, sintezirovannykh pri malykh uglakh difraktsii). B S SURIKOV, E A. KHASINA, and V V CHAPURSKII, *Radiotekhnika i Elektronika* (ISSN 0033-8494), Vol 34, Feb 1989, pp 409-419 5 Refs

The paper examines the structure of synthetic one-dimensional radio holograms of extended objects in the case when the scattered field is observed in the range of small diffraction angles Expressions are derived which relate the autocorrelation and spectral functions of the hologram with a complex profile function of the shadow contour of the object, dependent on the shape of the shadow and its position with respect to the line connecting the emission and reception points

A88-27195 Nonlinear processes in the formation of three-dimensional dynamic holographic gratings (Nelineinye protsessy pri formirovanii ob'emnykh dinamicheskikh golograficheskikh reshetok). V G GORSHKOV, IU K DANILEIKO, T P LEBEDEVA, and D A NESTEROV, *Kvantovaia Elektronika* (Moscow) (ISSN 0368 7147), Vol 14, Oct 1987, pp 2089-2097 14 Refs

Wave equations are solved to develop new concepts on the dynamics of the diffraction efficiency of a three-dimensional light-induced grating in media with a nonlinear index of refraction (or absorption) The effect of the radial distribution of the exciting beam intensity on the observed diffraction efficiency variation is considered The role of the nonlinear refraction of the beam as a whole as a significant factor in the spatial-temporal dynamics of the diffracted radiation in the far field is predicted and experimentally confirmed

A89-18352 Temporal compression of ultrashort frequency-modulated light signals by spectral holograms in media with hole burning (Vremennoe szhatie sverkhkorotkikh chastotno-modulirovannykh svetovykh signalov spektral'nymi gologrammami v sredakh s fotovyzhiganiem provalov). A REBANE, *Eesti NSV Teaduste Akadeemia, Toimetised, Fuusika-Matemaatika* (ISSN 0367-1429), Vol 37, No 3, 1988, pp 340-345 13 Refs

Experimental results are presented on the recording of spectral hole-burning holograms with an FM transfer characteristic Attention is given to the use of such holograms as linear spectral matching filters compensating the frequency modulation and realizing temporal compression of FM picosecond light signals

A88-46881 The long-lasting inverted photon echo and optical memory (Dolgozhivushchee obrashchennoe fotonnoe ekho i opticheskaia pamiat'). N N AKHMEDIEV, B S BORISOV, V A ZUIKOV, V. V SAMARTSEV, M F STEL'MAKH et al., *Akademiia Nauk SSSR, Izvestiia, Seriia Fizicheskaia* (ISSN 0367-6765), Vol 52, June 1988, pp. 1106-1112. 18 Refs

Experimental results are presented on the formation of the long-lasting inverted stimulated photon echo in the LaF3.Pr(3+) crystal The physics of this phenomenon is explained on the basis of a three-level model The feasibility of using this echo effect in the development of optical-memory systems is considered

A88-36065 A study of the selective properties of holographic structures formed by waveguide light beams (Issledovanie izbiratel'nykh svoistv golograficheskikh struktur, sformirovannykh volnovodnymi svetovymi puchkami). A V KAZAKEVICH, V F LAMEKIN, A V MIRONOS, and V L SMIRNOV, *Avtometriia* (ISSN 0320-7102), Jan.-Feb 1988, pp 88-92 8 Refs

Results of a study of the spatial-angular selectivity of holographic structures recorded in the photosensitive layer of a composite waveguide by waveguide beams are reported The waveguide used in the study was a five-mode diffuse glass waveguide produced by ion exchange in molten KNO3, with a 0 2-micron layer of photosensitive chalcogenide glass, As2S3, deposited on its surface The interaction of modes of different orders with the phase profile of the hologram is discussed

A88-30041 A laser with resonators coupled through a dynamic hologram (Lazer so sviazannymi cherez dinamicheskuiu gologrammu rezonatorami). V B GERASIMOV, A. V GOLIANOV, A P LUK'IANCHUK, V E OGLUZDIN, I L RUBTSOVA et al., *Kvantovaia Elektronika* (ISSN 0368-7147), Vol 14, Nov 1987, pp 2216-2218 9 Refs

The characteristics of stimulated emission from a laser with a phase-conjugating mirror (PCM) in the case of multibeam interaction are investigated It is shown that these characteristics are affected significantly by coupling between the resonator of this laser and the mirror-pumping laser resonator Soft oscillation is realized with a self-pumping PCM in this system with resonators coupled through a dynamic hologram

A87-53541 Application of acoustical holography to fault detection (Review) (Primenenie akusticheskoi golografii v defektoskopii /Obzor/). V G BADALIAN, *Defektoskopiia* (ISSN 0130-3082), No 7, 1987, pp 39-56 58 Refs

Recent studies related to the use of acoustical holography in the nondestructive testing of materials and structures are reviewed The discussion covers the principal schemes of acoustical holography, the resolution of the method, and specific applications of holographic systems The accuracy of determinations of the dimensions and orientation of defects using acoustical holography is evaluated

A88-29867 Multistability of the characteristics of optical systems containing dynamic holograms (Mul'tistabil'nost' kharakteristik opticheskikh sistem, soderzhashchikh dinamicheskie gologrammy). I L RUBTSOVA and A I KHIZHNIAK, *Ukrainskii Fizicheskii Zhurnal* (ISSN 0503-1265) Vol 33, Feb 1988, pp 204-207 6 Refs

The characteristics of an optical system which makes it possible to control laser emission characteristics in the steady-state operation mode are investigated theoretically The multistable mode of reflection and generation is shown to be possible in optical systems containing both static and dynamic holograms Consideration of the transverse structure of the laser beam is essential in such systems since this factor significantly smoothes hysteresis dependences

A88-50735 The temporal and energy characteristics of the radiation from a picosecond holographic distributed-feedback dye laser (Vremennye i energeticheskie kharakteristiki izlucheniia pikosekundnogo golograficheskogo ROS-lazera na krasiteliakh). A N RUBINOV, B A BUSHUK, A L BERESTOV, and S A RYZHECHKIN, *Kvantovaia Elektronika* (ISSN 0368-7147), Vol 15, May 1988, pp 946-948

The temporal and energy characteristics of a holographic distributed-feedback dye laser excited by a single second-harmonic ultrashort pulse of a neodymium laser utilizing YAG and glass are studied It is shown that the increase in the emitted pulse duration and the deterioration in the reproducibility of the temporal characteristics under lasing-wavelength retuning to the edges of the amplification spectrum are governed by a rise in the superfluorescence level

A88-44025 Photorefractive sensitivity of polymer films containing bacteriorhodopsin (Fotorefraktivnaia chuvstvitel'nost' polimernykh plenok, soderzhashchikh bakteriorodopsin). N G ABDULAEV, IU O BARMENKOV, S IU ZAITSEV, V V ZOSIMOV, V P ZUBOV et al , Zhurnal Tekhnicheskoi Fizik· (ISSN 0044-4642), Vol 58, April 1988, pp 833-836 11 Refs

Results of an experimental study of the diffraction efficiency of photorefractive films containing bacteriorhodopsin, a promising medium for the recording of dynamic holograms, are reported It is shown that the principal factor limiting the diffraction efficiency of films containing bacteriorhodopsin is the saturation of the working transition in the photorefractive medium Maximum diffraction efficiency in such films is achieved by maintaining their temperature at about 10 C The recording time constant can be reduced by the additional illumination of the film in the blue spectral region

A88-43144 Active synthesis of the wave front of the object field using intensity holograms (Aktivnyi sintez volnovogo fronta predmetnogo polia s pomoshch'iu gologramm intensivnosti). A V ANUFRIEV, A L VOL'POV, IU A ZIMIN, and A I TOLMACHEV, *Avtometriia* (ISSN 0320-7102), March-Apr 1988, pp 54-59 8 Refs.

The paper is concerned with the image construction problem for objects observed through a distorting medium in the case where the scales of changes in the object field and distortions coincide A method is proposed whereby the wave from of the object field is synthesized by sequentially illuminating the object by three coherent sources, individually and in pairs, and recording intensity holograms The synthesized wave front is shown to be insensitive to field distortions at the reception stage The accuracy of the measurements of the amplitude and phase of the wave front is estimated

A88-43081 Waveguide holograms in data transmission, storage, and processing systems (Volnovodnye gologrammy v sistemakh peredachi, khraneniia i obrabotki informatsii). A S BABLUMIAN, V N MOROZOV, A N PUTILIN, and T D SHERMERGOR, Injection lasers in data transmission and processing systems (A88-43076 17-36) Moscow, *Izdatel'stvo Nauka*, 1987, pp 164-190. 44 Refs.

The characteristics of the recording and reconstruction of waveguide holograms of two-dimensional objects are investigated The two-beam operation of input coupling gratings is examined Particular attention is given to the characteristics of two-layer waveguide structures based on As2S3 and light-sensitive waveguide layers of dichromated gelatin The performance of waveguide holograms in integrated-optics correlators for data coding is discussed

A88-43080 Semiconductor injection lasers in optical data processing (Poluprovodnikovye inzhektsionnye lazery v opticheskoi obrabotke informatsii). A I ZOLOTAREV, S P KALASHNIKOV, V A KONDRAT'EV, and V N MOROZOV, Injection lasers in data transmission and processing systems (A88-43076 17-36). Moscow, *Izdatel'stvo Nauka*, 1987, pp 90-163. 98 Refs

The paper is concerned with the effect of the coherence of injection laser emission on the recording and retrieval of information from Fourier holograms, correlation processing of optical signals in matched optical filtering schemes, and interaction with acoustic waves in crystals Optimal relationships are established between the parameters of injection lasers, optical data recording-retrieval schemes, and Fourier hologram capacity Test data are presented for new infrachromatic photographic materials for holographic data recording in the emission band 800-900 nm The characteristics of the diffraction of partially coherent IR emission by ordinary acoustic waves in lead molybdate and paratellurite crystals are examined Optimal relationships are determined for the design of ultrasonic cells for injection laser control

A88-40805 Spectrally nonselective bichromized-gelatin holographic mirrors (Spektral'no neselektivnye golograficheskie zerkala na bikhromirovannom zhelatine). SH. D KAKICHASHVILI, Z. V. VARDOSANIDZE, and D. V. LESELIDZE, *Pis'ma v Zhurnal Tekhnicheskoi Fiziki* (ISSN 0320-0116), Vol. 14, April 12, 1988, pp. 602-606. 8 Refs.

Experimental results are presented on a process for fabricating bichromized-gelatin holographic mirrors with spectrally nonselective characteristics in a wide wavelength range The nonselectivity was conditioned by a large number of layers of varying optical thickness in the multilayer hologram structure It is noted that, by regulating absorption in the recording material, it is possible to vary the thicknesswise distribution of the total interference pattern and hence the modulation depth.

A88-21731 A polarization hologram with a 100-percent diffraction efficiency (A polarization cineform) (Poliarizatsionnaia gologramma 100). I D. SHATALIN, V I. KAKICHASHVILI, and SH. D KAKICHASHVILI, *Pis'ma v Zhurnal Tekhnicheskoi Fiziki* (ISSN 0320-0016), Vol. 13, Sept 12, 1987, pp. 1051-1055. 11 Refs.

A theoretical analysis of the recording of a polarization hologram in a two-dimensional medium with a powerful photoanisotropic response is presented. Image reconstruction without the formation of zeroth and other diffraction orders has been shown experimentally, indicating that the polarization hologram considered here is a type of cineform. Results are presented on the diffraction efficiencies of polarization holograms recorded at a wavelength of 4416 A and reconstructed at 4416, 4880, 5145, and 6328 A

A88-21705 Recording of holographic relief gratings in thin absorbing films (Zapis'golograficheskih rel'efnykh reshetok v tonkikh pogloshchaiushchikh plenkakh). M. D. GRODZINSKAIA, I. I. PESHKO, E N SAL'KOVA, and A. I. KHIZHNIAK, *Kvantovaia Elektronika* (ISSN 0368-7155), No. 32, 1987, pp. 67-75.

The thermal recording of holographic gratings in thin absorbing metallic and semiconductor films deposited on a transparent substrate is studied theoretically and experimentally. Gratings are recorded by Nd glass-laser radiation with microsecond, nanosecond, and picosecond pulse durations. An analysis is made of the time period for which the effect of heat transfer into the glass substrate on the recording characteristics in absorbing films is negligible. Optimal recording conditions are established for pulse durations ranging from 10 to the -5th to 10 to the -11th sec

A88-13658 Holographic recording by continuous emission in a suspension of purple (Halobacterium membranes Golograficheskaia zapis' nepreryvnym izlucheniem v suspenzii purpurnykh membran galobakterii). V. IU BAZHENOV, M. S. SOSKIN, and V. B. TARANENKO, *Pis'ma v Zhurnal Tekhnicheskoi Fiziki* (ISSN 0320-0016), Vol. 13, Aug. 12, 1987, pp 918-922.

An experiment is reported in which dynamic holograms were recorded by the continuous emission of a He-Ne laser in a water suspension of purple Halobacterium membranes. In a concentrated purple membrane suspension, a new recording effect is observed whereby the diffraction efficiency is more than an order of magnitude greater than that achieved during photochrome purple-membrane recording The nature of the dependence of the holographic grating parameters on the grating period suggests the possibility of a photoinduced increase of the mobility of purple membranes.

A88-10736 Resolving power of reversed radio-holograms during the recording of a forward-scattered field (Razreshaiushchaia sposobnost' obrashchennykh radiogologramm pri registratsii rasseiannogo "vpered" polia). A P REUTOV and V. V CHAPURSKII, *Radiotekhnika* (ISSN 0033-8486), June 1987, pp. 78-83 5 Refs

The resolving power for the reconstruction of the profile function of a moving object on the basis of a one-dimensional reversed radio-hologram is evaluated. Consideration is given to the recording of the scattered field for small diffraction angles; the size and shape of the shadow aperture of the object are taken into account along with the radiation-pattern width of the receiving and transmitting antennas. It is concluded that the resolving power depends on the aperture size and shape, determining the time of existence of the holographic signal at a level exceeding the threshold level

A87-50823 Method for the measurement of the velocity field of the particle phase according to the spatial spectrum of images of a two-phase flow reconstructed from holograms (Metod izmereniia polia skorostei dispersnoi fazy po prostranstvennomu spektru vosstanovlennykh s gologramm izobrazhenii dvukhfaznogo potoka). O. N ERTANOVA, IU V ZUEV, I. A. LEPESHINSKII, and V A. RESHETNIKOV, *Akademiia Nauk SSSR, Izvestiia, Mekhanika Zhidkosti i Gaza* (ISSN 0568-5281), May-June 1987, pp 182-184

The paper describes a method for measuring the velocity field of the particle (solid or liquid) phase of a two-phase flow from two-exposure holograms based on the photographic recording of the image reconstructed from the hologram and the computer analysis of the spatial spectrum of the phototransparency obtained. It is specifically the photo graphic recording step which makes it possible to measure the velocity field of two-phase flows with a complex spatial structure The effectiveness of the method was confirmed experimentally for the case of a subsonic water-air jet issuing from a nozzle for the following parameters: an initial jet diameter of 20 mm, mean gas and liquid phase velocities of 3-50 m/s, and a particle concentration of up to 100,000/cu cm

A88-11359 Radio-holographic determination of the longitudinal size of ionospheric irregularities (Opredelenie prodol'nykh razmerov ionosfernykh neodnorodnostei s pomoshch'iu radiogolografich-eskogo metoda). E D.TERESHCHENKO and V. G. UTKIN, *Geomagnetizm i Aeronomiia* (ISSN 0016-7940), Vol 27, July-Aug 1987, pp. 572-575 5 Refs

Analytical expressions describing the hologram and the holographically reconstructed field are obtained for a model of an irregularity which has the form of a layer with a constant density in the direction of radio-wave incidence and which varies in the transverse direction according to the Gaussian law It is shown that if the characteristic size of the scatterer is such that the geometrical-optic approximation can be used to describe the field propagation process within the irregularity, then the longitudinal size of the scatterer can be determined from the holographic reconstruction

A87-43553 A holographic grazing-diffraction selector-telescope (Gologra ficheskii selektor-teleskop skol'ziashchei difraktsii). M. V. VASNETSOV, I G SOKOLOVA, M. S SOSKIN, and V. B. TARANENKO, *Kvantovaia Elektronika* (ISSN 0368-7147), Vol 14, March 1987, pp 597-602 14 Refs

The holographic recording of phase-volume gratings on dichromated gelatin films designed for operation in a grazing-incidence scheme is studied Some features of grazing diffraction by phase-volume gratings are discussed The achieved diffraction efficiency amounts to about 30 percent at an 88-deg angle of incidence

A87-35977 Selective holography (Analytical review) (Selektivnaia golografiia /Analiticheskii obzor/). E N. VORONIN, *Radioelektronika* (ISSN 0021-3470), Vol 30, Feb. 1987, pp 16-32. 33 Refs

The theoretical principles and practical applications of selective microwave and acoustical holography are reviewed. Particular consideration is given to the formalization of the recording process using M-position coherent detectors, the principle of contrast material; the formation of reconstruction algorithms, microwave tomography, adaptive vision systems, and antenna measurements.

A87-41796 Use of a parabolic equation to solve the problem of image reconstruction by heterodyne holography (Ispol'zovanie parabolicheskogo uravneniia dlia resheniia zadachi vosstanovleniia izobrazheniia metodom geterodinnoi golografii). A. N. MANSUROV and G A SHADRIN, *Radiotekhnika i Elektronika* (ISSN 0033-8494), Vol. 32, April 1987, pp 881-883

It is shown that two-step image reconstruction using heterodyne holography can be described by a convolution integral which is similar to the Kirchhoff diffraction integral in the Fresnel approximation Image reconstruction in this case can therefore be viewed as the result of linear filtering carried out in the signal conversion process with its own impulse and frequency response.

A87-50867 The use of multilayer structures for recording thin phase holograms (Ispol'zovanie mnogosloinykh struktur dlia zapisi tonkikh fazovykh gologramm). D I MIROVITSKII, N V ROSTOVTSEVA, and O B SEROV, *Avtometriia* (ISSN 0320-7102), May-June 1987, pp 92-100 8 Refs.

Phase diagrams recorded on thin spatially separated photosensitive layers are investigated theoretically and experimentally It is shown that such multilayer structures are characterized by high spectral and angular selectivity and that their diffraction efficiency is close to that of three-dimensional holograms However, the use of holograms with the number of layers exceeding four is not recommended since the increased diffraction efficiency is offset by increasing absorption and multiple layer reflection

A88-13677 Extension of holography to multifrequency fields (Rasshirenie golografii na mnogochastotnye polia). N B BARANOVA and B IA. ZEL'DOVICH, *Pis'ma v Zhurnal Eksperimental'noi i Teoreticheskoi Fiziki* (ISSN 0370-274X), Vol 45, June 25, 1987, pp 562-565. 10 Refs.

Experiments are described which demonstrate the possibility of extending holographic processes to the cases of (1) recording of the interference patterns of mutually coherent fields of several different frequencies and (2) recording of the perturbations of higher-order optical susceptibilities These processes are examined in relation to second harmonic generation in waveguides

A89-35559 Applications of tomography in microwave technology (Review) (Primeneniia tomografii v mikrovolnovoi tekhnike /Obzor/). D I VOSKRESENSKII, E N VORONIN, and R P KAMINSKII, *Radioelektronika* (ISSN 0021-3470), Vol 32, Feb 1989, pp. 4-18 50 Refs

Techniques of classical and computer tomography are examined with reference to the solution of a large class of inverse radio and acoustic sounding problems Applications of tomography to the introscopy of radio-transparent and acoustically transparent structures are discussed Attention is also given to nontraditional applications of tomography, i.e., selective radio-acoustic imaging, superhigh-resolution radiohydrolocation, and radio astronomy

A89-18369 Image quality enhancement for a holographic system with a circular receiving aperture (Ob uluchshenii kachestva izobrazhenii golograficheskoi sistemy s priemnoi aperturoi v vide okruzhnosti). A. CH BELIACHITS, P. D KUKHARCHIK, and V G. SEMENCHIK, *Radiotekhnika i Elektronika* (ISSN 0033-8494), Vol 33, Oct 1988, pp. 2174-2177

The paper examines the feasibility of improving the quality of reconstructed images for a holographic system with a circular receiving aperture by shifting the illuminating antenna along the circle. The main characteristics of this system are presented, and a comparison is made with another type of holographic system

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Japanese Aerospace Literature This month: *Holography*

A88-38958 Turbulent structure near the stagnation point of an axisymmetric impinging jet. KUNIO HIJIKATA and JYUNJI MIMATU, *Proceedings of the 6th Symposium on Turbulent Shear Flows,* Toulouse, France, Sept. 7-9, 1987, (A88-38951 15-34) University Park, PA, Pennsylvania State University, 1987, pp 2-2-1 to 2-2-6. 8 Refs.

A visualization of the pressure field on a plate impinged by an axisymmetric turbulent air jet was carried out The displacement of silicon rubber sheet which has settled on the impinged plate by the pressure of the jet was measured by a holographic interferometer. The fringes corresponded to instantaneous isobaric lines, or the contours of fluctuating pressure, on the plate In order to know the physical meaning of the pressure fluctuation pattern, the cross-correlation between the fluctuations of the pressure on the impinged plate and the velocity in the jet was measured The movement and destruction of the large eddy affecting the wall pressure were traced from a map of the contours of the correlations. It was clarified that spot and arc-shaped patterns in the visualization were generated by the eddy impingement and the induced velocity fluctuation due to the impingement, respectively.

A88-48206 A differential interference contrast system incorporating a Murty interferometer and holographic correction. K. MATSUDA, M. NAMIKI, and T H BARNES, *Optics and Lasers in Engineering* (ISSN 0143-8166), Vol 9, No 1, 1988, pp. 35-46 6 Refs.

A differential interference contrast method for observing the phase gradients in objects with phase variations of less than 1/4 of a wavelength is described which incorporates a Murty-type interferometer consisting of a plane parallel glass plate The basic system is modified using a holographic element both to compensate for lens aberrations and to modulate the output fringes to allow their easy detection Film thickness measurements obtained with the present system are found to agree well with previous results

A87-53167 Diagnosis of under-snow radar images by three-dimensional displaying technique in holographic imaging radar. YOSHINAO AOKI, YUJI SAKAMOTO, and YOSHINARI TAKAHASHI, *IGARSS '87 - International Geoscience and Remote Sensing Symposium,* Ann Arbor, MI, May 18-21, 1987, Digest Vol 1 (A87-53101 24-43) New York, Institute of Electrical and Electronics Engineers, Inc , 1987, pp 571-576 Research supported by the Suhara Memorial Foundation and MOESC 9 Refs

A technique to diagnose images obtained by under-snow radar is proposed, where three-dimensional radar images are displayed on a two-dimensional CRT scope of computer by the gray-level coding technique The radar discussed in this paper is a holographic imaging radar and the azimuth information of objects is obtained by the ordinary holographic technique, whereas the depth information is obtained by frequency-sweep technique. An experiment was conducted with the microwaves from 8 GHz to 10 GHz frequency to visualize radar images of objects such as a container filled with anti-freeze water, metallic cans and a mannequin covered with silver papers which were buried under piled snow in winter Discussion on the diagnosis of the numerically reconstructed radar images was done by changing the points of view of the screen on the CRT scope The experimental results show the proposed technique is promising to construct a practical system of under-snow radar

A88-30273 Advances in the laser speckle strain gauge. ICHIROU YAMAGUCHI, *Optical Engineering* (ISSN 0091-3286), Vol. 27, March 1988, pp 214-218 13 Refs

Basic principles and advances of the laser speckle strain gage are described. The gage optoelectronically detects speckle displacements caused by deformation of a diffuse surface and separates strain by means of a differential optical system The method is noncontacting and automatic Several problems for practical application of the gage are presented, together with proposals for solving them