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(FOUO 2/79)

1 OF 1

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JPRS L/8660

14 September 1979

USSR Report

ELECTRONICS AND ELECTRICAL ENGINEERING

(FOUO 2/79)



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JPRS L/8660

14 September 1979

USSR REPORT
ELECTRONICS AND ELECTRICAL ENGINEERING
(FOUO 2/79)

This serial publication contains articles, abstracts of articles and news items from USSR scientific and technical journals on the specific subjects reflected in the table of contents.

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Amplifiers

USSR

UDC 621.375.018.756(088.8)

A PULSE AMPLIFIER

USSR AUTHOR'S CERTIFICATE NO. 587598 filed 9/02/76 No 2322372 published 11/01/78 in Russian

GOLIUSOV, N. S., BEYADOVSKIY, M. G. and MOROZOV, B. A.

[From REFERATIVNYY ZHURNAL RADIOTEKHNIKA No 1, 1979 Abstract No. 1D119P]

[Text] A pulse amplifier is suggested, containing output, series-connected compound transistors (T) and an input T, the base of which is connected through a resistor (R) to the input of the device. In order to expand the frequency range, 2 n-p-n-type T and a p-n-p-type T are introduced, with the base of the last transistor connected through the R to the common point of a resistor divider, connected into the collector circuit of the input T. The emitter is connected to the supply bus, while the collector is connected to the input of the device through 2 series-connected R, the common point of which is connected to the base of the first n-p-n-type T, connected with common emitter. The collector of the last transistor is connected to the base of the first compound T and through a R -- to the base of the second n-p-n-type T, the collector junction of which is connected in parallel to the base-emitter junction of the input T. The first T of the second compound T is connected with a common emitter and made of p-n-p-type T, while its base is connected through a R to the common point of a resistor divider connected into the collector circuit of the input T.

USSR

UDC 621.383.292.8

A WIDEBAND AMPLIFIER OF WEAK PHOTOCURRENTS

Kiev VESTNIK KIEVSKOGO UNIVERSITETA, FIZIKA in Russian No 19, 1978 pp 50-52

KILIMNIK, A. A. and ROSHCINA, G. P.

[From REFERATIVNYY ZHURNAL, ELEKTRONIKA I YEYE PRIMENENIYE No 1, Jan 79 Abstract No 1A191]

[Text] A wideband amplifier of weak photocurrents developed by the authors is described, which can be used for recording the direct current from a photoelectron multiplier serving as the signal source. The voltage gain can be made equal to 1, 10, 10^2 , or 10^3 . This amplifier is characterized by a small null drift and a low noise level. The small package size makes it possible to mount the amplifier right next to the photoelectron multiplier. Figures 1; references 3.

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Antennas

UDC 534+534.231.2

ON THE OPERATION OF A HORIZONTAL LINEAR ANTENNA IN A WATER LAYER

Moscow AKUSTICHESKAYA ZHURNAL in Russian No 2, 1979 pp 227-233

[Article by V. A. Yeliseyevin]

[Text] The directional pattern of a linear acoustical antenna horizontally situated in a flat homogeneous water layer with completely reflecting boundaries is discussed. The length of the antenna is assumed to be comparable to or larger than the thickness of the layer. The sound field in the layer created by a nondirectional point source emitting a sinusoidal signal is presented in the form of a sum of normal waves. The results of calculation of the directivity characteristic of the antenna in the water layer are presented.

The propagation of sound in sea water is accompanied by reflection from the boundaries (the bottom and surface) and by hydroacoustic refraction occasioned by nonuniformity of the water layer. These phenomena inevitably affect the actual directivity pattern of a hydroacoustic antenna located in the water layer. The relevant calculations for antennas assumed to be of small size in comparison with the layer have been carried out for a ray approximation in a number of works, in particular reference 1.

Below we discuss the directivity pattern of a horizontal linear acoustical antenna in a water layer when the length of the antenna is comparable to or larger than the thickness of the water layer. For simplicity we assume that the layer is homogeneous and plane parallel with completely reflecting boundaries (surface completely soft, bottom absolutely rigid). The origin of the coordinate system (r, z) is on the bottom, the z axis is directed vertically upwards, the thickness of the layer is equal to h and the speed of sound in the layer is c .

The sound field in the layer is created by a nondirectional point source located at height Z_0 and emitting a tone signal. A linear antenna with constant sensitivity along its length L is located at height Z . In the calculations it is assumed that there is no absorption of sound in the water layer.

The signal u at the input of a linear antenna compensated by an angle β^* is proportional to

$$(1) \quad u = \int_{-L/2}^{+L/2} u_x(x) \exp(-jkx \sin \beta) dx,$$

where $u_x(x)$ is the sound pressure at a section of the antenna located a distance x from the center, and k is the wave number. The time multiplier $\exp(-j\omega t)$ is omitted here and in subsequent calculations.

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We will treat the field in the water layer in the form of a sum of normal waves [2, 3]

$$(2) \quad u_x(x) = \sum_{\ell=1}^{\infty} \frac{2\pi}{h} \cos(b_\ell Z_0) \cos(b_\ell Z) H_0^{(1)}(\xi_\ell r_x),$$

where ℓ is the number of the normal wave, $H_0^{(1)}(\xi_\ell r_x)$ is the Hunkel function of the first kind, zeroth order, r_x is the horizontal distance from the emitter to the x -th section of the antenna, and ξ_ℓ and b_ℓ are the horizontal and vertical components of the wave vector k of the ℓ -th normal wave:

$$(3) \quad \xi_\ell = \sqrt{k^2 - b_\ell^2} = \sqrt{k^2 - [(l - 1/2)\pi/h]^2}.$$

The normal waves with the lowest numbers for which the value of ξ_ℓ is real propagate through the layer without attenuation. The maximum number ℓ_{\max} for a normal wave propagating without attenuation is determined by the condition

$$(4) \quad \ell_{\max} \leq 2 \frac{h}{\lambda} + \frac{1}{2},$$

where λ is the wavelength of the emitted sound in free space. All normal waves with wave numbers larger than ℓ_{\max} are attenuated, and accordingly we limit our discussion to fields of nonattenuated normal waves, and the infinity symbol at the upper limit of the sum in equation (2) is replaced by the value $k = \ell_{\max}$.

For values $\xi_\ell r_x \gg 1$, the Hunkel function can be replaced by its asymptotic

$$(5) \quad H_0^{(1)}(\xi_\ell r_x) \approx \sqrt{\frac{2}{\pi \xi_\ell r_x}} \exp\left[j\left(\xi_\ell r_x - \frac{\pi}{4}\right)\right].$$

For an antenna in free space, the boundary R_{rp} between the near and distant zones is determined by the following condition [4]:

$$(6) \quad R_{rp} = 2A^2/\lambda,$$

where A is the antenna aperture (in this case $A = l$). Since each normal wave can be represented as a sum of two plane waves propagating at an angle to each other [2], condition (6) remains correct in the present case, that of sound propagating in a water layer.

Let the emitter be located in the distant zone of the antenna. Then, if r is the horizontal distance from the source to the center of the antenna and α is the angle of rotation of the antenna in the horizontal plane relative to the direction to the source, r_x in the exponential expression of equation (5) can be replaced by $r + x \sin \alpha$, and in the denominator under the root sign it can be replaced simply by r .

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The signal at the input of the linear antenna (1) may now be represented in the form

$$u_{in} = \frac{2\sqrt{2}\pi}{h\sqrt{r}} \exp\left(-j\frac{\pi}{4}\right) \int_{-L/2}^{+L/2} \sum_{i=1}^A \cos(b_i Z_0) \cos(b_i Z) \frac{1}{\sqrt{\xi_i}} \times \\ \times \exp\{j[\xi_i(r+x \sin \alpha) - kx \sin \beta]\} dx.$$

Changing the order of summation and integration and integrating, we obtain

$$u_{in} = \frac{2\sqrt{2}\pi L}{h\sqrt{r}} \exp\left(-j\frac{\pi}{4}\right) \sum_{i=1}^A \cos(b_i Z_0) \cos(b_i Z) \frac{1}{\sqrt{\xi_i}} \times \\ \times \exp(j\xi_i r) \frac{\sin[(L/2)(\xi_i \sin \alpha - k \sin \beta)]}{(L/2)(\xi_i \sin \alpha - k \sin \beta)}.$$

The signal intensity at the input of the linear antenna is given by the equation

$$(7) \quad uu' = \frac{8\pi L^2}{h^2 r} \left\{ \left[\sum_{i=1}^A D_i(\alpha, \beta) \cos(\xi_i r) \right]^2 + \left[\sum_{i=1}^A D_i(\alpha, \beta) \sin(\xi_i r) \right]^2 \right\} = \\ = \frac{8\pi L^2}{h^2 r} \left\{ \sum_{i=1}^A D_i^2(\alpha, \beta) + 2 \sum_{i=1}^{\lambda-1} \sum_{q=i+1}^A D_i(\alpha, \beta) D_q(\alpha, \beta) \cos[(\xi_i - \xi_q)r] \right\},$$

where

$$(8) \quad D_i(\alpha, \beta) = \frac{1}{\sqrt{\xi_i}} \cos(b_i Z_0) \cos(b_i Z) \frac{\sin[(L/2)(\xi_i \sin \alpha - k \sin \beta)]}{(L/2)(\xi_i \sin \alpha - k \sin \beta)}$$

We define the antenna response in the layer as the signal intensity at the antenna input, normalized for the maximum value, as a function of the angle of rotation of the antenna around its center and the angle β of compensation:

$$(9) \quad B(\alpha, \beta) = uu' / \max\{uu'\}.$$

We note that the parameters in this problem appear in the equation for $B(\alpha, \beta)$ for antenna sensitivity in the form of the relative quantities L/λ , $1/\lambda$, r/λ , Z_0/λ , Z/λ (the multiplier $8\pi L^2/h^2 r$ in equation (7) is abbreviated in the normalization).

We continue our discussion using the results of calculations made for a specific case. We consider an antenna with dimension $L = 10^2 \lambda$ and a water layer with a thickness $h = 10 \lambda$ (the size of the antenna 10 times as great as the thickness of the water layer). According to condition (4), in this case 20 normal waves can propagate without attenuation. We choose the horizontal

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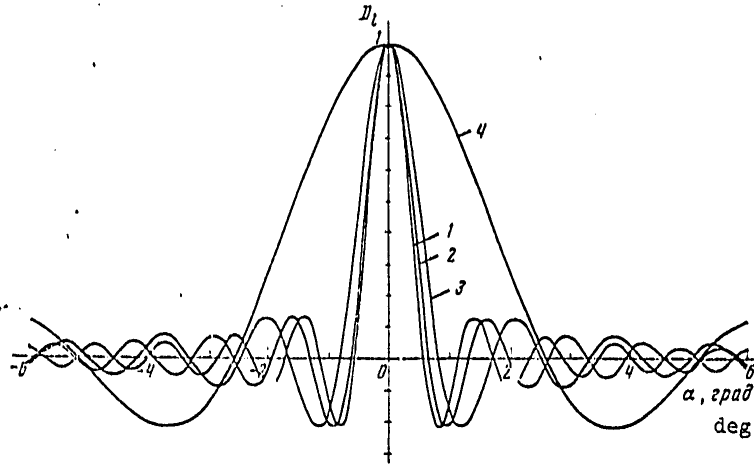


Fig. 1. Antenna directivity pattern in free space (curve 1) and directivity factor in a water layer for reception of the 10th, 15th and 20th normal waves (curves 2, 3, 4); $\beta = 0^\circ$.

direction between the emitter and the phase center of the antenna so as to satisfy condition (6), i.e. $r=2 \cdot 10^4 \lambda$, and we place both the antenna and the emitter in the center of the layer, i.e. $Z/h - Z_0/h = 0.5$.

We return to equation (8). The first three multipliers in the right-hand side, $\cos(b_i Z_0) \cos(b_i Z) / \sqrt{\xi_i}$, give the degree of excitation of the ℓ -th normal wave propagating in the water layer. The last of the multipliers,

$$\sin[(L/2)(\xi_\ell \sin \alpha - k \sin \beta)] / [(L/2)(\xi_\ell \sin \alpha - k \sin \beta)],$$

differs from the expression for the directivity pattern of the linear antenna in free space by the replacement of the wave number for k in free space (before $\sin \alpha$) by its horizontal component ξ_ℓ for the ℓ -th normal wave.

Thus it is logical to define the value $D_\ell(\alpha, \beta)$ as a non-normalized directionality factor of the horizontal linear antenna in a water layer during reception of the ℓ -th normal wave and the quantity $D_\ell^2(\alpha, \beta)$ as the corresponding energy directionality. Then the antenna response will consist of two parts: the sum of the energy directionality factors and the sum of the cross products of the directionality factors of all normal waves propagating in the layer. The first part corresponds to the energy addition of the normal waves at the point of reception (energy component of response) and the second gives the interference between waves of different wave numbers (interference component of response). Here the phase incursion [nabeg] between different normal waves during propagation is allowed for the by the multiplier $\cos[(\xi_\ell - \xi_\alpha)r]$.

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The directivity factor $D_\ell(\alpha, \beta)$ differs in two basic ways from the directivity factor of the same antenna in free space.

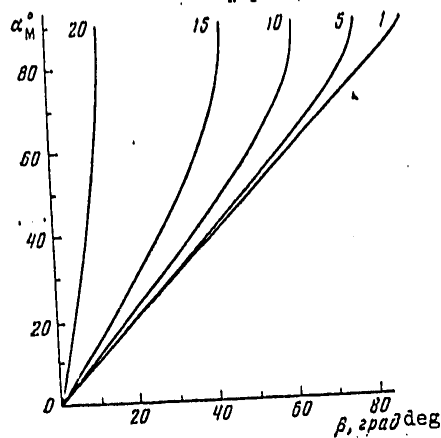


Fig. 2. Value of α_M as a function of the compensation angle β for normal waves of wave numbers $l = 1, 5, 10, 15, 20$.

If we define the horizontal component of the wave vector according to formula (3) as

$$\xi_l = \frac{2\pi}{\lambda} \sqrt{1 - (l^{-1}/2)^2 - (h/2\lambda)^2} = 2\pi/\lambda_l$$

we see that the corresponding wavelength λ_l is greater than the wavelength λ in free space and increases as the normal wave number l increases. This in turn decreases the wave dimensions of the antenna (the ratio L/λ_l) and thus expands the primary and side lobes of the directivity factor $D_\ell(\alpha, \beta)$ in comparison with the directionality in free space. This latter fact is clearly illustrated in Fig. 1, which presents the directionality patterns of the 10th, 15th and 20th normal waves, normalized for the maximum value (curves 2, 3, 4). For comparison, the directionality pattern of the antenna in free space is shown on the same graph (curve 1). The compensation angle is $\beta = 0^\circ$.

While introduction of the compensation angle β in free space leads to displacement of the pattern along the α axis by an amount equal to β , in the case of the antenna in the water layer the directivity factor D_ℓ is displaced by an angle different from angle α . In fact, it follows from equation (8) that the angle α_M of rotation of the antenna around its center corresponding to the maximum directivity factor D_ℓ can be found from the condition

$$\xi_l \sin \alpha_M - h \sin \beta = 0$$

or

$$\alpha_M = \arcsin[\sin \beta \sqrt{1 - (l^{-1}/2)^2 - (h/\lambda)^2}].$$

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It is clear that the relationship $\alpha_M \geq \beta$ always holds, with the equality sign applying when α_M and β are both zero. The difference between angles α_M and β increases as angle β and wave number ℓ are increased. Fig. 2. shows α_M as a function of β for normal waves of numbers $\ell = 1, 5, 10, 15$ and 20 . It can also be seen from Fig. 2 that starting with a certain normal wave number ℓ and a certain compensation angle β , the value of ℓ exceeds 90° . This means that normal waves with numbers greater than ℓ will not participate in determining antenna response.

As follows from equations (7) through (9), antenna response $B(\alpha, \beta)$ for a given compensation angle β is ultimately determined by the form of the directivity factors $D_\ell(\alpha, \beta)$ and their position on the α axis.

With a zero angle of compensation ($\beta = 0$), the maxima of the energy directivity factors and of the cross products of the directivity waves propagating in the layer will occur when $\alpha = 0$. As was shown above, as the normal wave number increases, the breadth of the main and side lobes of the directivity factors increase and the positions of the minima are displaced. Accordingly, the antenna response will have a single main maximum (at $\alpha = 0$) and side lobes which are broader than in the case of a directivity pattern in free space. This is clearly visible in Fig. 3, which shows antenna response at a compensation angle $\beta = 0$ (curve 1) and also the result of energy addition of normal waves (curve 2) and the interference component of response (curve 3). For comparison, the energy directivity pattern of the antenna in free space (curve 4) is also shown.

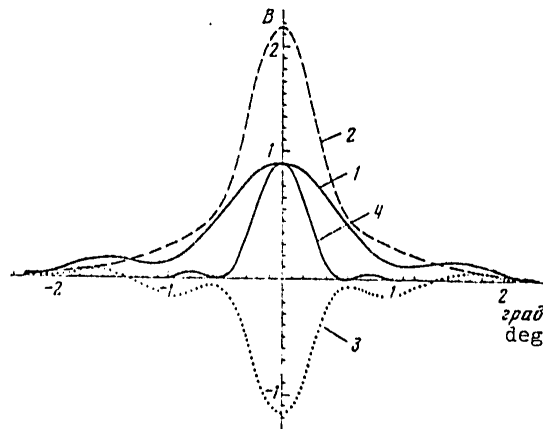


Fig. 3. Antenna response $B(\alpha, \beta)$ in a water layer (curve 1), its energy (curve 2) and interference (curve 3) components, and the directivity pattern of the same antenna in free space (curve 4); $\beta = 0^\circ$.

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For compensation angles different from zero, the maxima of the directivity factor corresponding to different normal wave numbers will occur at different values of α . This difference will increase as the compensation angle β increases. The antenna response at a given compensation angle will consist of a series of maxima corresponding to the normal waves of various numbers. The breadths of the maxima will increase as the normal wave number increases. The maxima corresponding to normal waves having the lowest few numbers may be combined into a single maximum, while the maxima corresponding to normal waves of higher numbers will be clearly distinguished. This is clearly visible in Fig. 4, which shows the antenna response and its energy and interference components for a compensation angle $\beta = 60^\circ$. The energy component of response will differ considerably from the overall response for the lowest normal wave numbers and will be closer to it for the higher numbers. The interference component will have large values and play a major role in determining response for the first few normal wave numbers, while for high wave numbers it will become insignificant.

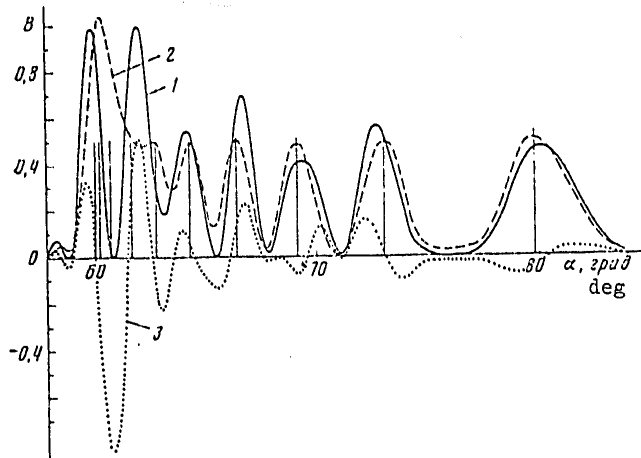


Fig. 4. Antenna response $B(\alpha, \beta)$ in water layer (curve 1) and its energy (curve 2) and interference (curve 3) components; $\beta = 60^\circ$.

Fig. 4 shows the non-normalized spectrum of normal waves (values of $D_k(\alpha, \beta)$ [$\alpha = \alpha_M$]) for the case in question in the form of a series of vertical lines. Their distribution along the α axis clearly confirms the points made above.

The multiplier $\cos[\xi_l - \xi_\alpha]r$ in the interference component of antenna response (7) is responsible for that fact that at angles α corresponding to low wave numbers and for nonzero compensation angles, there will be clearly delineated maxima on the curve for some distances r and clearly delineated minima for other distances r .

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As the size of the antenna increases with the other propagation conditions unchanged, the breadth of the main maximum in the directivity factor $D_{\ell}(\alpha, \beta)$ will decrease, and thus for nonzero compensation angles we should expect better resolution of the main maxima corresponding to various normal waves. The directivity characteristic of an antenna with a large number of maxima which is produced at a nonzero compensation angle makes it more difficult to determine the direction to the emitter and requires special processing of the signal at the antenna input.

We now replace the continuous linear antenna discussed above by a discrete equally-spaced linear antenna consisting of N nondirectional point sound detectors of identical sensitivity which are acoustically not coupled. The signal u_i at the input of each discrete antenna compensated by an angle β can be represented in the form

$$u_{\alpha} = \sum_{i=-(N-1)/2}^{(N-1)/2} u_i \exp(-jki d \sin \beta),$$

where u_i is the signal at the input of the i -th sound detector and d is the distance between two neighboring detectors. We assume that the number of elements N in the antenna is odd. Proceeding in a manner analogous to that described above, we obtain

$$u_{\alpha} = j \frac{2\sqrt{2}\pi}{h\sqrt{r}} \exp\left(-j\frac{\pi}{4}\right) \sum_{i=1}^k \frac{1}{\sqrt{\xi_i}} \cos(b_i Z_0) \cos(b_i Z) \times \\ \times \exp(j\xi_i r) \sum_{i=-(N-1)/2}^{(N-1)/2} \exp[jdi(\xi_i \sin \alpha - k \sin \beta)].$$

Taking account of the fact that the sum over i in the right side of the above equation is a geometric progression with denominator $\exp[jd(\xi_i \sin \alpha - k \sin \beta)]$, and carrying out the requisite conversions, we obtain an equation for the response of a linear discrete antenna $B_{\alpha}(\alpha, \beta) = u_{\alpha} u_{\alpha}^* / \max\{u_{\alpha}, u_{\alpha}^*\}$,

where

$$u_{\alpha} u_{\alpha}^* = \frac{8\pi N^2}{h^2 r^2} \left\{ \sum_{i=1}^k D_{\alpha i}(\alpha, \beta) + 2 \sum_{i=1}^{k-1} \sum_{q=i+1}^k D_{\alpha i}(\alpha, \beta) \times \right. \\ \left. \times D_{\alpha q}(\alpha, \beta) \cos[(\xi_i - \xi_q) r] \right\}$$

and

$$D_{\alpha i}(\alpha, \beta) = \frac{1}{\sqrt{\xi_i}} \cos(b_i Z_0) \cos(b_i Z) \frac{\sin[(N/2)d(\xi_i \sin \alpha - k \sin \beta)]}{N \sin[1/2 d(\xi_i \sin \alpha - k \sin \beta)]}$$

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is the non-normalized directivity factor of a discrete linear antenna in a water layer for reception of the l -th normal wave.

The response of the discrete linear antenna with a given spacing can differ from the response of a continuous linear antenna of the same length. However, according to reference 4 we may expect that the calculation results will coincide for a spacing $d \leq 0.5\lambda$. In fact, calculated responses for a discrete linear antenna with a spacing $d = 0.5\lambda$ of the same length as a continuous linear antenna and under the same propagation conditions led to identical results.

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Institute of Acoustics, USSR Academy of Sciences.

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CSO: 8144/1602

* The compensation angle is the angle through the directionality diagram of the antenna is rotated electrically relative to the normal to its length.

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INCREASING THE EFFECTIVENESS OF RADIO-RELAY ANTENNAS

KYRGSSR ILIMDER AKAD. KABARLARY, IZV. AN KIRG SSR in Russian No 4, 1978 pp 50-52

KAMAYEV, R. R.

[From REFERATIVNYY ZHURNAL RADIOTEKHNIKA No 1, 1979 Abstract No 1A188]

[Text] A study is made of pressing problems of improving the reliability of radio relay communication by increasing the effectiveness of antennas by the use of a passive reflecting relay unit which has dimensions equal to the dimensions of the first zone of Fresnel, and is located in the zone of formation of the wave in the immediate vicinity of the active relay station. Figures 4; references 3.

USS

UDC 621.396.677

CONVEX SCANNING ANTENNAS. PRINCIPLES OF THE THEORY AND DESIGN METHODS

VYPUKLYYE SKANIRUYUSHCHIYE ANTENNY. OSNOVY TEORII I METODY RASCHETA in Russian, Moscow, Sov. Radio Press 1978 301 pp.

VOSKRESENSKIY, D. I., PONOMAREV, L. I. and FILLIPOV, V. S.

[From REFERATIVNYY ZHURNAL RADIOTEKHNIKA No 1, 1979 Abstract No 1B18K]

[Text] Engineering methods are presented for calculation of a new class of electrically scanning antennas for microwave convex antenna arrays. The possibility is demonstrated of wide-angle, low-distortion scanning, wide-band operation and assurance of low side-lobe levels. The results are presented of calculation of the radiation pattern, and the efficiency and level of side lobes; the bandwidth properties of convex antennas; and structural systems and some experimental data. Figures 97; references 173.

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AN ELECTRONIC SWITCH FOR THE CONTROL OF A MILLIMETER BAND PASSIVE ANTENNA ARRAY

2-Y VSES. SIMPOZ. PO MILLIMETROV, I SUBMILLIMETROV. VOLNAM, KHAR'KOV, 1978
TEZ. DOKL. T.1 [2nd All-Union Symposium on Millimeter and Submillimeter Waves,
Khar'kov, 1978, Abstracts of Reports, Vol 1] in Russian, Khar'kov 1978 pp
179-180

STRUKOV, I. F. and RADCHENKO, V. A.

[From REFERATIVNYY ZHURNAL RADIOTEKHNIKA No 1, 1979 Abstract No 1B171 by G.
I. Sobolev]

[Text] A schematic diagram is presented of a high-speed electronic switch made of integrated microcircuits. The method of interrogation of the multiple-element antenna array, utilizing the threshold and modulation properties of the loads on passive scattering elements, allows simplification of the design of the switch. The switch accomplishes control of a 4096-element antenna array in 130 ms, with a time of control of one element of 32 μ s, and in 520 ms with a time of control of one element of 128 μ s. Figure 1; references 2.

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Communications, Networks;
Data Transmission and Processing

UDC 621.396.62:621.58:621.391.832.2

AMPLITUDE-PHASE CONVERSION

Moscow AMPLITUDNO-FAZOVAYA KONVERSIYA (Amplitude-Phase Conversion) in Russian 1979 signed to press 26 Dec 78 pp 2, 254-256

[Annotation and table of contents from book by Gorman Mikhaylevich Krylov et al, Izdatel'stvo "Svyaz," 2,800 copies, 256 pages]

[Text] The phenomena, which are combined under the name "amplitude-phase conversion" (AFK) and lead to the occurrence of amplitude-dependent phase shifts in radio equipment, are examined. The features of the passage of signals through circuits with AFK are analyzed. Layout decisions, which are conducive to the lessening of AFK in linear amplifiers, amplifiers with a control amplifier, frequency converters and equipment of the microwave band, are examined.

The book is intended for scientists, as well as engineering and technical personnel, who are engaged in the study and development of receiving and amplifying equipment.

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UDC 621.391.81

DETERMINATION OF THE POSSIBILITY OF USING DIGITAL FREQUENCY SYNTHESIS EQUIPMENT FOR THE FORMATION OF COMPLEX SIGNALS

RADIOTEKHNIKA. RESP. MEZHVED. NAUCH.-TEKHN. SB. in Russian No 47, 1978 pp 27-31

BOTSMAN, P. D.

[From REFERATIVNYY ZHURNAL RADIOTEKHNIKA No 1, 1979 Abstract No 1A94]

[Text] The possibility is demonstrated of constructing a universal shaper for a grid of multiposition signals of programmed structure with coherent rules of modulation, based on a digital frequency synthesis system. References 6.

USSR

UDC 621.391.82:621.396/397.2

THE ELECTROMAGNETIC SITUATION ON TRANSMISSION LINE PATHS AND STANDARDS FOR PROTECTION OF RADIO BROADCASTS AND TELEVISION RECEPTION

TR. NII RADIO in Russian No 3, 1978 pp 49-54

ABRAMSON, YU. M. and KAPITONOV, V. V.

[From REFERATIVNYY ZHURNAL RADIOTEKHNIKA No 1, 1979 Abstract No 1A354. Summary]

[Text] A study is made of the causes of development of radio interference along electric power transmission lines operating at various voltages in the frequency range from 0.15 to 1000 MHz. A probabilistic method is presented for calculation of the permissible noise level, based on the need to assure good quality reception of signals at a predetermined level of reliability. Results are presented from studies of the intensity of the radio interference field at measured distances from power transmission lines and the noise attenuation factors. It is shown that the amount of radio interference from a power transmission line is usually less than the standard required minimum. An estimate is given of the quality of reception of radio and TV broadcasts at various distances from power transmission lines, given the existing field intensities of the power transmission lines.

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UDC 621.396.43

STABILITY OF OPERATION OF LINE-OF-SIGHT RADIO RELAY LINKS IN THE 8 GHz
BAND

ELEKTROSVYAZ' in Russian No 9, 1978 pp 8-17

NADENENKO, L. V., SVYATOGOR, V. V. and KRIVOZHBOV, V. P.

[From REFERATIVNYY ZHURNAL RADIOTEKHNIKA No 1, 1979 Abstract No 1A191.
Summary]

[Text] Summary results are presented from studies of the statistical characteristics of signals in the 8 GHz range over radio relay links and experimental links, performed under the climatic conditions of the central European territory of the USSR and the middle Volga region. Experimental and calculated data are compared. Figures 10; tables 3; references 7.

USSR

UDC 621.396.94

A DEVICE FOR SYNCHRONIZATION OF NOISE-LIKE SIGNALS

USSR AUTHOR'S CERTIFICATE No 593322 filed 11/05/76 No 2359849 published
14/03/78 in Russian

GOR, L. A. and GAVRILIN, YE. A.

[From REFERATIVNYY ZHURNAL RADIOTEKHNIKA No 1, 1979 Abstract No 1A326P]

[Text] The invention is in the area of radio engineering and can be used in transmission systems utilizing pseudorandom sequences.

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UDC 621.396.669.8

SUPPRESSION OF PULSE NOISE BY INTERRUPTION OF THE RECEPTION CHANNEL AS APPLICABLE TO MARINE SHORTWAVE RADIO BROADCASTS

TR. TSNI MOR. FLOTA in Russian No 234, 1978 pp 107-112

CHERKASSKIY, YU. A.

[From REFERATIVNYY ZHURNAL RADIOTEKHNIKA No 1, 1979 Abstract No 1A359. Summary]

[Text] A study is made of problems of overcoming relatively infrequent atmospheric radio interference by interrupting the IF radio reception apparatus in marine channels used for discrete shortwave radio communication. A semiempirical method is used to produce an approximate estimate of the interference stability for reception of FM signals when atmospheric radio interference is present. It shows that switching off of the channel for the time of application of relatively rare, powerful noise bursts can decrease the mean probability of reception error by approximately an order of magnitude. Figure 1; references 6.

USSR

UDC 621.396.933

IMPROVING THE USE OF FREQUENCIES IN THE AIRMOBILE (R) SERVICE IN THE DECA-METER WAVE BAND

ELEKTROSVYAZ' in Russian No 8, 1978 pp 57-61

BADALOV, A. L. and YEGOROV, YE. I.

[From REFERATIVNYY ZHURNAL RADIOTEKHNIKA No 1, 1979 Abstract No 1A209. Summary]

[Text] Decisions of the World Administrative Radio Conference on the Air-mobile (R) Service are presented. In order to satisfy the need for additional radiotelephone communication channels, it is suggested that a transition be made, beginning 1 February 1983, to single-side band radiotelephone equipment. Figures 2; tables 1.

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Components and Circuit Elements
Including Waveguides and Cavity Resonators

UDC 537-96:621.319.1

FERROELECTRICS IN MICROWAVE TECHNOLOGY

Moscow SEGNETOELEKTRIKI V TEKHNIKE SVCH (Ferroelectrics in Microwave Technology in Russian 1979 signed to press 18 Dec 78 pp 2, 270-271

[Annotation and table of contents from book by N. N. Antonov, I. M. Buzin, O. G. Vendik et al, Izdatel'stvo "Sovetskoye radio," 4,000 copies 271 pp]

[Text] The book is devoted to the problem of developing microwave devices based on ferroelectric materials, which make it possible to increase substantially the potentials of microwave equipment. The questions of the electrodynamics and technology of ferroelectric microwave devices are examined. The methods of analyzing and characterizing the phase-shifting circuits of a high level of power with very fast operation and low-noise parametric amplifiers with a wider dynamic range are cited.

The book is intended for specialists involved in the development and operation of microwave equipment; it will be useful to graduate students and upper class students of VUZ's of the appropriate specialties.

Tables 7; figures 190; references 371.

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UDC 531.787.913.087.92

PROPERTIES OF TENSORESISTORS MADE OF ARTIFICIALLY ANISOTROPIC SEMICONDUCTORS

Moscow ZA TEKHNICHESKII PROGRESS in Russian No 7, 1977 pp 27-30

ALIYEV, M. I., KASPIROVICH, G. YE., DZHAFAROV, Z. A., AGASIYEV, A. E. and VORONOV, V. F.

[From REFERATIVNYY ZHURNAL, ELEKTRONIKA I YEYE PRIMENENIYE No 1, Jan 79 Abstract No 1B475 by Yu. K. Ibayev]

[Text] The strain-measuring characteristics were investigated of tensoresistors based on the GaSb-GeGa_{1.3} semiconductor with artificial anisotropy. The average value of the strain sensitivity coefficient at temperature from -50 to +120°C was found to be 40±5. The temperature coefficient of resistance over the temperature range from -50 to +120°C was found to be 3·10⁻³/°C. The devices tested in this study withstood 10⁶ cycles under a per-unit strain of 10⁻³, retaining their tensoresistive characteristics accurately within 5 percent. Figures 1.

USSR

UDC 621.372.852.1(088.8)(47)

A PIEZOELECTRIC FILTER OF A COMPLEX PHASE-KEYED SIGNAL

USSR AUTHOR'S CERTIFICATE No. 604135 filed 22/03/76 No. 2340081 published 5/04/78 in Russian

KARINSKIY, S. S., KOMAROV, V. G. and RECHITSKIY, V. I.

[From REFERATIVNYY ZHURNAL RADIOTEKHNIKA No 1, 1979 Abstract No 1B237P]

[Text] The piezoelectric filter suggested for a complex phase-keyed signal contains a piezoelectric substrate and transmitting and receiving acoustical surface wave converters (C) on its surface. In order to increase the number of leads of the filter, the transmitting C is made of n sections, located in n parallel acoustical channels and displaced one relative to the other by a distance corresponding to the length of a discrete signal element. The receiving C are made in the form of a matrix of p columns and n rows with a spacing of the sections in-columns n times greater than the spacing of the sections of the transmitting C. The n section, forming n rows, are located in n parallel acoustical channels. All sections of the receiving C are electrically interconnected to allow a change in polarity of each of the n·p leads from the sections of the receiving C, where n = 1, 2, 3, etc. and p = 1, 2, 3, etc.

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Conferences

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UDC 621.371.39.012.11

THE SECOND ALL-UNION SYMPOSIUM ON MILLIMETER AND SUBMILLIMETER WAVES,
KHAR'KOV, 13-15 SEP 1978

II VSESOUZNYI SIMPOZIUM PO MILLIMETROVYM I SUBMILLIMETROVYM VOLNAM
KHAR'KOV 13-15 SENT 1978 in Russian Abstracts of Reports Volume 1, Khar'kov
1978 338 pp

[From REFERATIVNYI ZHURNAL RADIOTEKHNIKA No 1, 1979 Abstract No 1A24K by
A. V. Lazarev]

[Text] A study is made of works grouped in the following thematic areas:
electronic microwave instruments in the millimeter and submillimeter wave
bands; millimeter and submillimeter wave band transmission lines and mea-
suring general-purpose microwave equipment; electronic microwave systems in
the millimeter and submillimeter wave bands (including antennas, controlled
and passive devices and electronic microwave system elements); the electro-
dynamics of transmission lines and resonant systems, boundary problems of
the theory of diffraction and diffraction radiation of millimeter and sub-
millimeter waves.

USSR

UDC 621.396.001.83

INTERNATIONAL CONSULTATION COMMITTEE ON RADIO AND ITS ROLE IN THE STUDY OF
PROBLEMS OF RADIO-WAVE PROPAGATION AND THE DEVELOPMENT OF RECOMMENDATIONS
FOR PRACTICAL APPLICATION OF THE RESULTS OF STUDIES

12-AYA VSES. KONF. PO RASPROSTR. RADIOVOLN, TOMSK, 1978, CH 1, TEZ. DOKL.
[12th All-Union Conference on Propagation of Radio Waves, Tomsk, 1978, Part
1, Abstracts of Reports] in Russian, Moscow 1978 pp 23-25

BADALOV, A. L.

[From REFERATIVNYI ZHURNAL RADIOTEKHNIKA No 1, 1979 Abstract No 1A10 by
A. V. Lazarev]

[Text] The functions of the International Consultation Committee for Radio
(ICCR) consists in coordination of the efforts of interested countries on
the international scale in the area of most efficient utilization of the
radio-frequency spectrum and operation of systems of radio communications
so as to minimize mutual interference. The ICCR includes 13 research com-
missions, two of which are involved in problems of the propagation of radio
waves, which relate directly to the problem of efficient utilization of the

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radio-frequency spectrum. The ICCR has developed and recommended methods for determination of the propagation characteristics of radio waves under various conditions. An atlas of the world distribution and characteristics of atmospheric interference has been composed for a broad range of frequencies; world maps of the index of atmospheric refraction and its gradient at the earth's surface, as well as world maps of the distribution of critical frequencies for the F_2 layer have been composed.

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Converters, Inverters, Transducers

USSR

UDC 621.538.632

FILM GALLIUM-ARSENIDE HALL PICKUPS

Moscow PRIBORY I SISTEMY UPRAVLENIYA in Russian No 8, 1978 pp 35-36

PORTNOY, G. YA.

[From REFERATIVNYY ZHURNAL, ELEKTRONIKA I YEYE PRIMENENIYE No 1, Jan 79
Abstract No 1B470 by A. V. Yemel'yanov]

[Text] The design, the technology and the basic characteristics of GaAs-film Hall pickups (type KhAG-P) produced at the Istra Division of the All-Union Scientific-Research Institute of Electromechanics are reviewed. The advantages of these pickups over similar silicon pickups (DKhK-7, DKhK-14), germanium pickups (DKhG-0.5, DKhG-2) and InSb pickups (Kh6T) are pointed out. The possibility of using the GaAs pickups at cryogenic temperatures is also noted.

USSR

UDC 621.382

RADIATION PICKUPS BASED ON MULTILAYER STRUCTURES CONTROLLABLE BY THE TRANSVERSE THERMO-EMF

L'vov FIZICHESKAYA ELEKTRONIKA [Physical Electronics] in Russian No 16, 1978 pp 63-68

PIIAT, I. M. and ASHEULOV, A. A.

[From REFERATIVNYY ZHURNAL, ELEKTRONIKA I YEYE PRIMENENIYE No 1, Jan 79
Abstract No 1B478]

[Text] Considered is the feasibility of producing fundamentally new pickups for recording the energy of nonselective radiation. These pickups constitute multilayer bipolar structures, one of the layers being made of a material with a thermo-emf anisotropy. The transverse thermo-emf induced by incident radiation controls the bipolar structure. Ways are proposed to realize such pickups within various temperature ranges. Figures 2; references 14.

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UDC 621.382.082.4.082.7

PROSPECTS FOR USING ELECTRON BOMBARDMENT IN THE MANUFACTURE OF ACOUSTO-ELECTRONIC TRANSDUCERS

Leningrad POLUPROVODNIKOVYYE USTROYSTVA I TERMOPREOBRAZOVATELI [Semiconductor Devices and Thermal Converters] in Russian 1978 pp 81-83

VYSOTSKIY, YU. N. and VARLAMOVA, A. B.

[From REFERATIVNYY ZHURNAL, ELEKTRONIKA I YEYE PRIMENENIYE No 1, Jan 79 Abstract No 1B466 by Yu. K. Ibayev]

[Text] The radiative susceptibility of ZnO films for piezoelectric transducers was studied. After their spray deposition, these films were found to be 0.1-1.2 μm thick with a heterodisperse, droplet or fine crystalline structure. Bombardment with fast electrons of 5 MeV energy yielded structure specimens with ordering, as a result of diffusion of vacancies and dislocations over the volume of condensate, which should appreciably improve their electrical characteristics. As the film thickness increased, the film surface became much smoother. This suggests the feasibility of utilizing bombardment with fast electrons in the manufacture of piezoelectric transducers based on zinc oxide. Figures 1.

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Cryogenics and Superconductivity

USSR

UDC 621.59

A CRYOSTAT FOR THERMOSTATIC CONTROL OF ELECTRON DEVICES

Moscow PRIBORY I TEKHNIKA EKSPERIMENTA in Russian No 4, 1978 p 280

LEMISHEV, A. G. and MEDVEDESKAYA, E. A.

[From REFERATIVNYY ZHURNAL, ELEKTRONIKA I YEYE PRIMENENIYE No 1, Jan 79
Abstract No 1A268 by Yu. I. Povarov]

[Text] This cryostat is intended for thermostatic control of electron devices which generate appreciable amounts of heat during steady-state operation, in particular traveling-wave tubes and cyclotron-resonance masers of the millimeter and submillimeter range. It consists of two shielded nitrogen containers communicating through tubes. A helium container is mounted on top of the upper nitrogen container through a neck. The entire inside structure of the cryostat is suspended on tubes for letting nitrogen vapor in and out. Helium is poured into its container through an overflow tube whose outside end terminates into a jacket. Helium vapor is let out through a tube which also serves as a sleeve for all the wiring. The basic parameters of the cryostat are: height 950 mm, outside diameter 350 mm, volume of the helium container 8 liters, volume of the nitrogen containers 10 liters, mass 38 kg. The rate of helium evaporation is 80 liters/h during storage and 135 liters/h during operation. Time of continuous operation after one fill is longer than 40 h. Figures 1.

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Electromagnetic Wave Propagation;
Ionosphere, Troposphere; Electrodynamics

USSR

UDC 621.371(21)

SOME RESULTS OF THEORETICAL AND EXPERIMENTAL STUDIES OF THE CONDITIONS OF PROPAGATION OF MILLIMETER RADIO WAVES OVER THE SEA

2-Y VSES. SIMPOZ. PO MILLIMETROV. I SUBMILLIMETROV. VOLNAM, KHAR'KOV 1978
TEZ. DOKL. T. 2 [2nd All-Union Symposium on Millimeter and Submillimeter
Waves, Khar'kov 1978 Abstracts of Reports Vol 2] in Russian, Khar'kov 1978
pp 135-136

LOBKOVA, L. M., MISHAREVA, N. I., SALIVON, YU. A., BERKHINA, L. I.,
LUK'YANCHUK, A. G., STEL'MAKH, V. V., CHERAKASOV, YU. YE., NADOBENKO, A. I.,
POPOV, V. P., PANIN, A. M., KOSIRATI, YU. A. and DUSHENKO, A. V.

[From REFERATIVNYY ZHURNAL RADIOTEKHNIKA No 1, 1979 Abstract No 1B313 by
Ye. P. Chigin]

[Text] The results are presented of a theoretical study of the envelope of a received signal and an experimental study of fluctuations in amplitude and angles of arrival of millimeter waveband radiowaves, propagated over the surface of the sea over a distance of 9.6 km. The transmitter operated in a continuous mode, with radiation and receiving antenna patterns 5° wide. A study is made of the depth of fading of the signal. A method is developed for construction of a statistical model of the signal for communication systems to be used over water.

USSR

UDC 621.371:(21)

STUDY OF THE RADIO BRIGHTNESS CONTRASTS IN THE SHORTWAVE PORTION OF THE MILLIMETER WAVE BAND

2-Y VSES. SIMPOZ. PO MILLIMETROV. I SUBMILLIMETROV. VOLNAM, KHAR'KOV, 1978
TEZ. DOKL. T. 2 [2nd All-Union Symposium on Millimeter and Submillimeter
Waves, Khar'kov, 1978 Abstracts of Reports Vol 2] in Russian, Khar'kov 1978
pp 173-174

PARSHIKOV, A. A., POPOV, S. A. and ROZANOV, B. A.

[From REFERATIVNYY ZHURNAL RADIOTEKHNIKA No 1, 1979 Abstract No 1B315 by
Ye. P. Chigin]

[Text] It is reported that the radio telescope of the Moscow Higher Technical School imeni Bauman has performed measurements of the radio brightness contrast of various sectors of the terrain at 2.2 mm for various atmospheric

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conditions. The contrast of a flat metal plate measuring 1.3 x 1.3 m against various backgrounds was measured. The contrast varied from 0 K during precipitation at 1.3 mm/hr and fog with visibility 700 m to 20 K on a cloudless day with low relative humidity. Figures 2.

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Electron and Ion Devices

USSR

UDC 621.387.3

TYPE INS-1 INDICATOR: TECHNICAL REQUIREMENTS

GOST All-Union State Standard 23054-78

[From REFERATIVNYY ZHURNAL, ELEKTRONIKA I YEYE PRIMENENIYE No 1, Jan 79
Abstract No 1B497 by M. L. Martinson]

[Text] The basic dimensions and performance parameters of this glow-discharge indicator lamp are: height 30 mm, diameter 7 mm, firing voltage 65-90 V, sustaining voltage not higher than 55 V, anode current 0.2 mA, luminosity 50 cd/m². The mechanical loads it must withstand are: vibration within the 1-1000 Hz frequency range with an acceleration of 10 g, repetitive impact with an acceleration of 15 g, single impact with an acceleration of 150 g. Minimum operating time 5000 h.

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Electron Tubes; Electrovacuum Technology

USSR

UDC 621.385.6

ELECTRON GUNS FOR PRODUCING THIN-RIBBON ELECTRON BEAMS WITH HIGH CURRENT DENSITY IN MILLIMETER-WAVE BACKWARD-WAVE TUBES AND DIFFRACTION-RADIATION GENERATORS

Khar'kov VTOROY VSESOYUZNIY SIMPOZIYUM PO MILLIMETROVYM I SUBMILLIMETROVYM VOLNAM [Second All-Union Symposium on Millimeter and Submillimeter Waves] in Russian Vol 1, 1978 pp 81-82

ANTONOV, V. A., BOGACH, A. S., LOPATIN, I. V. and TISHCHENKO, A. S.

[From REFERATIVNIY ZHURNAL, ELEKTRONIKA I YEYE PRIMENENIYE No 1, Jan 79 Abstract No 1A75 by V. N. Makarov]

[Text] Examined are the features characterizing formation of thin-ribbon (0.01-0.1 mm thick) electron beams with a 50-150 A/cm² current density, in electron-optical systems, and constraining them by means of a magnetic field. Best results are obtained with an impregnated aluminate cathode without a focusing electrode near it. The design of an electron gun is described with which the output power of a backward-wave tube or a diffraction-radiation generator can be increased by a factor of 2 to 20.

USSR

UDC 621.385.6

ELECTRONIC TUNING OF THE FREQUENCY IN A LENS MAGNETRON TETRODE

Khar'kov VTOROY VSESOYUZNIY SIMPOZIUM PO MILLIMETROVYM I SUBMILLIMETROVYM VOLNAM [Second All-Union Symposium on Millimeter and Submillimeter Waves] in Russian Vol 1, 1978 p 4

LEVIN, G. YA., LOGVINENKO, A. I. and TEREKHIN, S. N.

[From REFERATIVNIY ZHURNAL, ELEKTRONIKA I YEYE PRIMENENIYE No 1, Jan 79 Abstract No 1A87]

[Text] During the nineteen seventies at the Institute of Radioelectronics (Academy of Sciences of the Ukrainian SSR) there was proposed a principle of controlling the parameters of an electron cloud in surface-wave magnetrons by means of electrostatic lenses. On the basis of this principle lens magnetron tetrodes were subsequently constructed for operation within the 8-mm wavelength band. The problems are examined of electronically tuning the frequency and changing the high-frequency power of oscillations by variation of the control voltage across the lenses. The problems of optimizing the operation of a lens magnetron tetrode are considered, namely of

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minimizing the drop of high-frequency power over the tuning range. The feasibility of electronic frequency tuning without substantial power variation is demonstrated. The amplitude-frequency characteristics are presented of an 8-mm low-voltage lens magnetron tetrode operating at the 5-W power level with an efficiency ranging from approximately 5 to 10 percent and with the frequency electronically tunable through approximately 100 MHz at a less than 9 percent power drop.

USSR

UDC 621.385.6

SHORT-MILLIMETER-WAVE AND SUBMILLIMETER-WAVE OROTRON FREQUENCY CONVERTERS

Khar'kov VTOROY VSESOYUZNYI SIMPOZIYUM PO MILLIMETROVYM I SUBMILLIMETROVYM VOLNAM [Second All-Union Symposium on Millimeter and Submillimeter Waves] in Russian Vol 1, 1978 pp 29-30

RUSIN, F. S., KOSTROMIN, V. P., KUSHCH, V. S., SINENKO, L. A. and TEREKHOV, A. I.

[From REFERATIVNYI ZHURNAL, ELEKTRONIKA I YEYE PRIMENENIYE No 1, Jan 79 Abstract No 1A125 by E. M. Guttsayt]

[Text] Several mock-up models of orotron frequency converters were studied, with the operating current approximately 60 mA at an anode voltage of 3.5 kV in a magnetic field 2.5 kOe strong. With the fundamental frequency equal to 10 GHz, these models could deliver an output power of the order of 10 mW at the 6-9th harmonics, and frequency multipliers could deliver 1 mW to 50 μ W at output frequencies from 140 to 450 GHz, respectively. The transconductance of electronic frequency tuning in an orotron was found to be 30-70 kHz/V and the transconductance of electronic biasing was found to be 300-400 kHz/A. The feasibility of synchronizing an orotron by means of a quartz oscillator with a high phase stability has been demonstrated. Measurements of the spectrum of a stabilized orotron revealed spectral lines not wider than 7 Hz at the fundamental frequency of 10 GHz as well as at the 6-9th harmonics. References 1.

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UDC 621.385.6

THEORY OF A REFLECTING DIFFRACTION-RADIATION GENERATOR

Khar'kov VTOROY VSESOYUZNYIY SIMPOZIYUM PO MILLIMETROVYM I SUBMILLIMETROVYM VOLNAM [Second All-Union Symposium on Millimeter and Submillimeter Waves] in Russian Vol 1, 1978 p 66

BALAKLITSKIY, I. M., VOROB'YEV, G. S., POSPELOV, L. A. and TSVYK, A. I.

[From REFERATIVNYIY ZHURNAL, ELEKTRONIKA I YEYE PRIMENENIYE No 1, Jan 79 Abstract No 1A124]

[Text] The steady-state performance of a diffraction-radiation generator with reflection of electrons is analyzed on the basis of a consistent nonlinear theory. Analytical expressions are derived for calculating the generated power, the starting current and the electronically tunable frequency range. The results are analyzed qualitatively. It is found that the multiplicity of interaction between electrons and the high-frequency field in the resonator cavity of such a diffraction-radiation generator makes possible an appreciable lowering of the starting current, as well as tuning the generated frequency by variation of the reflector voltage. The theoretical results are compared with experimental investigations of the basic characteristics of a reflector-type diffraction-radiation generator.

USSR

UDC 621.385.6

THEORETICAL STUDY OF TRANSIENT AND STEADY-STATE PHENOMENA IN DIFFRACTION-RADIATION GENERATORS

Khar'kov VTOROY VSESOYUZNYIY SIMPOZIYUM PO MILLIMETROVYM I SUBMILLIMETROVYM VOLNAM [Second All-Union Symposium on Millimeter and Submillimeter Waves] in Russian Vol 1, 1978 pp 60-61

LUKIN, K. A. and SHESTOPALOV, V. P.

[From REFERATIVNYIY ZHURNAL, ELEKTRONIKA I YEYE PRIMENENIYE No 1, Jan 79 Abstract No 1A129 by E. M. Guttsayt]

[Text] The excitation of a diffraction-radiation generator (GDI) by a rectangular voltage pulse is analyzed by the author's own nonlinear transient theory. Factors are considered which determine the rise time and the fall time of an emission pulse generated by the GDI. The feasibility of controlling the slopes and the shapes of both leading and trailing pulse edges is

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also examined. The analysis of steady-state operating modes of such a diffraction-radiation generator includes cutoff of self-excited oscillations and emission hysteresis. The dependence of the efficiency on the deviation of electron velocity from the synchronous velocity is shown for the case of a generator current 50 percent higher than the starting current. The existence of an optimum size of the field spot, corresponding to maximum generator efficiency, and the possibility of correctly accounting for the effect of space charge are also indicated. References 3.

USSR

UDC 621.385.6

EXPERIMENTAL STUDY OF NOISE OF A THIN-RIBBON ELECTRON BEAM TRANSMITTED ABOVE A PERIODIC STRUCTURE

Khar'kov VTOROY VSESOYUZNYI SIMPOZIYUM PO MILLIMETROVYM I SUBMILLIMETROVYM VOLNAM [Second All-Union Symposium on Millimeter and Submillimeter Waves] in Russian Vol 1, 1978 pp 77-78

MAYSTRENKO, YU. V.

[From REFERATIVNYI ZHURNAL, ELEKTRONIKA I YEYE PRIMENENIYE No 1, Jan 79
Abstract No 1A136 by E. M. Guttsayt]

[Text] An experimental study was made of noise due to ribbon-thin electron beams $0.2 \times 5 \text{ mm}^2$ in cross section transmitted above a 40 mm long retarding comb structure. An electron beam was produced by a diode gun with a L-cathode and focused by an electromagnet with a magnetic induction up to 0.7 T, the operating current varied from 80 to 150 mA at accelerating voltages from 2 to 3 kV. The noise within the 1-500 kHz frequency range, due to such an electron beam, was measured in the cathode and collector circuit. The results of these measurements have revealed that at frequencies below 20 kHz the beam fluctuations are inversely proportional to the frequency and can be characterized as flicker, while at frequencies above 20 kHz they are linear and can be characterized as shot-like. It is also noted that the intensity of noise in the collector circuit, due to such electron beams, increases with slower current attenuation, with higher residual gas pressure (above $3 \cdot 10^{-5}$ mm Hg) and with lower magnetic induction (especially below 0.3-0.4 T). The correlation of noise appearing in the collector and cathode circuit due to electron beams is also analyzed. References 2.

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UDC 621.385.019(083.74)

OSCILLATOR TUBES RATED ABOVE 25 W WITH POWER DISSIPATION AT THE PLATE

GOST [All-Union State Standard] 21106.3-76

[From REFERATIVNYY ZHURNAL, ELEKTRONIKA I YEYE PRIMENENIYE No 1, Jan 79
Abstract No 1A72 S by Zh. M. Nadel']

[Text] This USSR Standard pertaining to oscillator tubes rated above 25 W with power dissipation at the plate and intended for operation at frequencies up to 1000 MHz establishes a method of testing them for electrical strength under quiescent conditions. It also covers general requirements, equipment and preparation for testing, as well as the test procedure.

USSR

UDC 621.385.032

A CONTAINER FOR LONG-TERM STORAGE OF A VACUUM DEVICE

USSR Patent Class B 65 D 85/42 No 601197, disclosed 2 Aug 76 (No 2391776)
published 11 May 78

GOLANT, M. B. and RULEVA, N. N.

[From REFERATIVNYY ZHURNAL, ELEKTRONIKA I YEYE PRIMENENIYE No 1, Jan 79
Abstract No 1A147 by Ye. N. Gordyeyev]

[Text] A container is proposed for storage of vacuum devices, which consists of an evacuated glass flask and a case holding such a device inside. This flask has a widening inside which is located a spiral spring pressing with its outermost turn against the glass and fastened with its innermost turn to the case. Such a widening of the glass flask with a spiral spring inside prevents axial movement of the case with the device and thus ensures adequate axial as well as radial damping. The container provides long-term protection for vacuum devices against inleakage and reliable shock absorption in transport.

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UDC 621.385.64

A RELATIVISTIC MAGNETRON WITH MICROSECOND VOLTAGE PULSES

Moscow PIS'MAY V ZHURNAL TEKHNIЧЕСКОY FIZIKI in Russian No 14, 1978 pp 823-826

DIDENKO, A. N., SULAKSHIN, A. S., FOMENKO, G. P., TSVETKOV, V. I., SHTEYN, YU. G. and YUSHKOV, YU. G.

[From REFERATIVNYY ZHURNAL, ELEKTRONIKA I YEYE PRIMENENIYE No 1, Jan 79 Abstract No 1A81 by E. M. Guttsayt]

[Text] A relativistic pulse magnetron with a cold cathode was studied. The device delivered a power of 0.8 GW at the $\lambda = 12.5$ cm wavelength in pulses of approximately 0.3 μ s duration, with an anode voltage of 450 kV and a magnetic induction of 0.4 T. Its maximum efficiency was 30 percent. The spectrum of oscillation modes is shown obtained without any or with only one axial variation of the field. The operating mode was found to be the II-mode, characterized by the shortest wavelength in the absence of any axial field variation. The separation between oscillation modes is shown to be 6 percent. Curves have been plotted depicting the dependence of the anode voltage and of the anode current on the magnetic induction. As the latter increases from 0.2 to 0.6 T, the anode current drops from 8 to 5 kA and the anode voltage rises from 200 to 500 kV. Shown are also curves depicting the dependence of the output power on the magnetic induction in resonator systems closed either on one side or on both sides. It has been demonstrated that pulse magnetrons with resonators closed on one side deliver one order of magnitude more power than those with resonators either closed or open on both sides. Figures 3; references 8.

USSR

UDC 621.385.64

MILLIMETER AND SUBMILLIMETER MICROWAVE SURFACE-WAVE MAGNETRONS

Khar'kov VTOROY VSESOYUZNYY SIMPOZIYUM PO MILLIMETROVYM I SUBMILLIMETROVYM VOLNAM [Second All-Union Symposium on Millimeter and Submillimeter Waves] in Russian Vol 1, 1978 p 3

LEVIN, G. YA.

[From REFERATIVNYY ZHURNAL, ELEKTRONIKA I YEYE PRIMENENIYE No 1, Jan 79 Abstract No 1A89 by E. M. Guttsayt]

[Text] A series of problems is touched upon which deserve consideration in the study of low-voltage surface-wave magnetrons, namely: feasibility of increasing the efficiency and output power; special features of starting

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characteristics and extrapolar radiation; methods of noise reduction; feasibility of extending the cathode life, increasing the stability of oscillations; control of the amplitude and the frequency of oscillations; and the outlook for shortening wavelength constructing submillimeter-wave magnetrons.

USSR

UDC 621.385.633

A RELATIVISTIC MILLIMETER-WAVE CARCINOTRON

Moscow PIS'MA V ZHURNAL TEKHNIЧЕСКОY FIZIKI in Russian No 4, 1978 pp 817-820

IVANOV, V. S., KOVALEV, N. F., KREMENTSOV, S. I. and RATZER, M. D.

[From REFERATIVNYY ZHURNAL, ELEKTRONIKA I YEYE PRIMENENIYE No 1, Jan 79
Abstract No 1A118 by E. M. Guttsayt]

[Text] A relativistic backward-wave tube oscillating at wavelength within the 8 ± 1 mm band was studied. The linear electron beam was made to interact with the negative fundamental space component of the wave, the latter propagating through a rectangular waveguide with antiphase corrugated wide walls. The electron gun with a tungsten-wire cathode and a cylindrical stainless-steel anode 7 mm in diameter produced a beam with a current density of the order of 10^4 A/cm². This electron beam was 2.6 mm in diameter and amounted to 300-500 A. For focusing a pulse solenoid was used producing a magnetic induction of approximately 1 T. The power termination of the backward-wave tube was bent through a 90° angle, with mica-vacuum sealing and an output horn. The purpose of bending the termination was to divert electrons and products of cathode evaporation from the mica window. The output power was measured with a receiver horn and a cryogenic semiconductor-type detector. It was of the order of 10^7 W, at a pulse duration of 15-20 ns and an efficiency of approximately 3 percent. References 4.

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UDC 621.385.735

EVAPORATION OF M-CATHODES ON VARIOUS BASES

Kiev VESTNIK KIEVSKOGO UNIVERSITETA, FIZIKA in Russian No 19, 1978 pp 61-66

LUSHKIN, A. YE.

[From REFERATIVNYY ZHURNAL, ELEKTRONIKA I YEYE PRIMENENIYE No 1, Jan 79
Abstract No 1A152 by F. S. Vaynshteyn]

[Text] With regard to coatings of M-cathodes on various bases, a study was made concerning the evaporation kinetics and the composition of evaporation products. As bases served cups 5 mm in diameter made of passivated grade NO nickel (0.01 wt. percent carbon+magnesium and <0.003 wt. percent other impurities), activated grade NIKA nickel (0.005 wt. percent calcium), or grade NO nickel doped with Ba⁺ and C⁺ ions at a 20 keV energy level. The maximum dose of implanted barium was approximately 10 μ liters/cm². The study was performed by mass-spectrometry with the aid of unsealed-glass mass analyzers, under a vacuum of the order of 10⁻⁸ mm Hg. The experimental data have revealed free barium, free strontium, barium oxide and barium hydroxide at sufficiently high nickel temperatures, and in many cases (especially on passivated cathode bases) also molecular oxygen. The quantitative balance between barium + strontium on the one hand and barium oxide on the other was found to depend on the degree of base activation. In order to produce an M-cathode with excellent emission characteristics, it is necessary to ensure a high concentration of metal on the oxide surface. The excellent emission characteristics are due to the relatively small fraction of free metal strongly bonded to the lattice of the oxides. The remaining metal easily evaporates during the first heating stage. References 14.

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UDC 621.386.624:621.3.032.2(088.8)

A COLLECTOR FOR AN O-TYPE MICROWAVE ELECTRON DEVICE

USSR Patent Class H 01 J 23/027 No 571845 disclosed 3 May 76 (No 2355485)
published 7 Oct 77

GINZBURG, V. YE., KURILO, V. P., KUCHUGURNYY, V. I., LEBEDINSKIY, S. V. and
MAL'TSEVA, I. A.

[From REFERATIVNYY ZHURNAL, ELEKTRONIKA I YEYE PRIMENENIYE No 1, Jan 79
Abstract No 1A123. Summary]

[Text] A collector for an O-type microwave electron device is proposed referring to Patent No 271661. For increasing the efficiency at peak power output from the device (by increasing the current flow to this collector), the precollector on the side adjacent to the asymmetric element is made convex in the direction of electron motion and has holes facilitating the passage of electrons, with the convex part of the collector surrounded by a metallic ring fastened to the end of the asymmetric element.

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General Production Technology

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UDC 621.396.6.002.72:621.757(088.8)

A DEVICE FOR PACKAGING OF CYLINDRICAL ELECTRONIC PARTS WITH AXIAL LEADS
IN PACKAGING FILM

USSR AUTHOR'S CERTIFICATE No 588571 filed 26/12/73 No 1980554 published
24/01/78 in Russian

SHEVINOV, P. A., DREMUKH, G. M., STEPANENKOV, N. L. and PIGOLITSIN, V. S.

[From REFERATIVNYY ZHURNAL RADIOTEKNIKA No 1, 1979 Abstract No 1V533P]

[Text] A device is suggested for packaging of cylindrical electronic parts with axial leads in packaging film, including an accumulator for storage of the parts, mechanisms for shaping of the film, feeding of the film and closure of apertures in the film designed to hold the parts with a roller closing mechanism, a device for placement of the parts, including transporting disks and guide plates, and a drive mechanism with a gear-type transmission.

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Instruments, Measuring Devices And Testers;
Methods of Measuring

USSR

UDC 621.317.7.029.6

BASIC REQUIREMENTS FOR MICROWAVE RADIO ELEMENTS FOR MEASUREMENT APPARATUS

2-Y VSES. SIMPOZ. PO MILLIMETROV. I SUBMILLIMETROV. VOLNAM. KHAR'KOV, 1978
TEZ. DOKL. T. 1 [2nd All-Union Symposium on Millimeter and Submillimeter
Waves, Khar'kov 1978 Abstracts of Reports Vol 1] in Russian, Khar'kov 1978
pp 117-118

GERSHUN, V. I., GERMAN, YU. A., RUMYANTSEV, A. I. and STARIKOV, V. D.

[From REFERATIVNYY ZHURNAL RADIOTEKHNIKA No 1, 1979 Abstract No 1A371 by
Ye. L. Borisova]

[Text] A table is presented in which the basic types and parameters of
microwave radio elements used for performance of the main tasks in radio
measurement equipment operating in the microwave range are indicated. The
most general requirements for radio elements are formulated.

USSR

UDC 621.317.1.029.6

MEASUREMENT OF RADIO-FREQUENCY EMISSION OF THE UNDERLYING SURFACE IN THE
TWO-MILLIMETER AND THREE-MILLIMETER ATMOSPHERIC TRANSPARENCY WINDOWS IN
HORIZONTAL AND VERTICAL POLARIZATIONS

2-Y VSES. SIMPOZ. PO MILLIMETROV. I SUBMILLIMETROV. VOLNAM, KHAR'KOV 1978
TEZ. DOKL. T. 2 [2nd All-Union Symposium on Millimeter and Submillimeter
Waves, Khar'kov 1978 Abstracts of Reports Vol 2] in Russian, Khar'kov 1978
p 172

GANIN, YE. V., KUZNETSOV, I. V., KRASNANSKIY, A. D., KRYUKOV, G. M.,
KULIKOV, YU. YU., LEBSKIY, YU. V., MAL'TSEV, V. A., SANDLER, B. M., SIZ'MINA,
I. K., FEDOSEYEV, L. I., SHVETSOV, A. A. and YUROKIN, V. V.

[From REFERATIVNYY ZHURNAL RADIOTEKHNIKA No 1, 1979 Abstract No 1A381 by
A. V. Kuznetsova]

[Text] The results are presented of experimental studies performed in the
spring of 1977 in the central belt of Russia. The fluctuation sensitivity
of the superheterodyne radiometer was ~0.3 K at 2.09 mm and 0.2 K at 3.34 mm.
Values of brightness temperature of the surface of the earth covered with
snow, dry grass, forest and brush, plowed fields, as well as artificial
coverings such as asphalt, concrete, etc., are presented.

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UDC 621.317.7:621.391.822

A SOLID-STATE RADIOMETER OPERATING AT 8 MM WAVELENGTH

2-Y VSES. SIMPOZ. PO MILLIMETROV. I SUBMILLIMETROV. VOLNAM, KHAR'KOV, 1978
TEZ. DOKL. T. 1 [2nd All-Union Symposium on Millimeter and Submillimeter
Waves, Khar'kov 1978 Abstracts of Reports Vol 1] in Russian, Khar'kov 1978
pp 216-217

KOSOV, A. S., NEMLIKHER, YU. A., RUKAVITSYN, A. F., SKULACHEV, D. P. and
STRUKOV, I. A.

[From REFERATIVNYY ZHURNAL RADIOTEKHNIKA No 1, 1979 Abstract No 1A483 by
A. V. Kuznetsova]

[Text] A structural diagram is presented of a millimeter wave band modulation radiometer, in which modulation of the microwave signal is achieved by means of a ferrite switch based on a Y-circulator with mean losses in the transmission band of ~ 0.7 dB decoupling of the arms of >18 dB, modulating frequency 300 Hz. The radiometer is calculated using the signal of a semiconductor noise generator made with a Gunn diode. The fluctuation sensitivity of the radiometer is 0.08 K, with a time constant of the output filter of 1 s.

USSR

UDC 621.317.757(088.8)

A SPECTRAL ANALYZER

USSR AUTHOR'S CERTIFICATE No 595682 filed 12/07/76 No 2379872 published
28/03/78 in Russian

TSURSKIY, D. A., PERETYAGIN, I. V. and ZAKIROV, V. KH.

[From REFERATIVNYY ZHURNAL RADIOTEKHNIKA No 1, 1979 Abstract No 1A430P]

[Text] A spectral analyzer is proposed, in which, in order to increase the accuracy of analysis, sequential connection of the strobing device, first filter, first detector and difference element is used, as well as series connection of the second filter and second detector. The input of the second filter is connected to the second output of the strobing device, while the output of the second detector is connected to the second input of a difference element, and also a series-connected circuit consisting of a control unit and a test signal generator, the output of which is connected to the

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input of a preselector, the second output of the control unit being connected to the input of a heterodyne with linear FM, the third output of the control unit being connected to the input of the strobing unit, while the second input of the strobing unit is connected to the input of an indicator, the output of which is connected to the input of the control unit, the second input of the control unit being connected to the output of the difference element.

USSR

UDC 621.317.757(088.8)(47+57)

A SPECTRAL ANALYZER

USSR AUTHOR'S CERTIFICATE No 600466 filed 15/01/75 No 2097208 published 11/04/78 in Russian

KRYUCHKOV, O. K., CHVERTKIN, YU. L. and ANTIPOV, A. T.

[From REFERATIVNYY ZHURNAL RADIOTEKHNIKA No 1, 1979 Abstract No 1A419P]

[Text] The spectral analyzer contains m parallel channels with filter, detector, integrator and a device for separation of the maximum signal in each channel, a scan generator, multiswitch, control device and CRT. In order to increase the time resolution, the device contains $n-1$ cells for separation of the maximum signal in each of the channels, $n-1$ series-connected frequency dividers and a brightness modulator. The outputs of all $m \cdot n$ cells for separation of the maximum signal are connected through the multiswitch to the signal input of the CRT, the output of the brightness modulator is connected to the input which controls the brightness of the CRT beam, the output of the frequency divider with number K is connected to the input for control of "write without compare" of stage $(K+1)$ and the "write with compare" of stage $(K+2)$ of the array of cells for separation of the maximum signal, the input for control of "write with compare" of the second stage, the input for control of "write without compare" of the first stage and the input of the first frequency divider are connected to the first output of the control device, the second output of the control device is connected to the input which synchronizes the multiswitch and the input of the brightness modulator counter, while the overflow output of this counter is connected to the input which starts the scan generator.

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UDC 621.317.757(088.8)(47+57)

A SPECTRAL ANALYZER

USSR AUTHOR'S CERTIFICATE No 567144 filed 6/01/75 No 2093067 published 15/08/77 in Russian

BATT, D. G., BLATOV, V. V. and NOVOZHILOV, YE. F.

[From REFERATIVNYY ZHURNAL RADIOTEKNIKA No 1, 1979 Abstract No 1A431P]

[Text] A spectral analyzer is suggested in which, in order to increase accuracy, a wideband filter, n flip-flops, a second decoder, a second counter, an anticoincidence element, a slave generator producing pulses of adjustable length and n tuning elements have been introduced. The wideband filter is connected between the input of the mixer and the input of an analyzer, to which the first input of the anticoincidence element is also connected. The second input of the anticoincidence element is connected to the output of the slave generator, one input of which is connected to the output of the second counter, the input is connected to a threshold element, while the other input is connected through the n tuning elements to the outputs of the second decoder, the reading input of which and the blocking input of a sawtooth voltage generator are connected to a second counter, while the n other inputs of the second decoder are connected to the n outputs of the flip-flops, the signal inputs of which are connected to the outputs of the first decoder, while the clear inputs are connected to the output of the slave generator.

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Microelectronics

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UDC 621.382.33-181.48

A BIPOLAR DYNAMIC ELEMENT FOR LARGE-CAPACITY MEMORY

Moscow SBORNIK NAUCHNYKH TRUDOV PO PROBLEMAH MIKROELEKTRONIKI [Scientific Transactions on Problems in Microelectronics, Collection of Articles] in Russian, Moscow Institute of Electronic Engineering No 34, 1977 pp 109-111

BEREZKIN, V. A., VOLODIN, YE. B., GERSH, B. M. and UDOVIK, A. P.

[From REFERATIVNYY ZHURNAL, ELEKTRONIKA I YEYE PRIMENENIYE No 1, Jan 79 Abstract No 1B313. Summary]

[Text] Variants of bipolar dynamic elements are examined suitable for memories with data storage in the form of charges on the depletion-layer capacitances of p-n junctions. The prospects for producing integrated-circuit memories on the basis of such devices are clarified.

USSR

UDC 621.382.33-181.48

INJECTION-FEED INTEGRATED CIRCUITS

Moscow ITOGI NAUKI I TEKHNIKI VINITI. SERIYA ELEKTRONIKA I YEYE PRIMENENIYE [Results of Science and Technology. All-Union Institute of Scientific and Technical Information. Series Electronics and Its Application] in Russian Vol 10, 1979 pp 208-243

KREMLEV, V. YA.

[From REFERATIVNYY ZHURNAL, ELEKTRONIKA I YEYE PRIMENENIYE No 1, Jan 79 Abstract No 1B314]

[Text] A brief analysis is given of the main bipolar IC structure topological variants with injection feed. A survey is also given of structure-topological means to achieve a high packaging density in modern integrated circuits and also to increase their speed. Particular attention is paid to the method of functional integration. All known designs of functionally integrated components with injection feed are systematically examined and classified. The present state of the art is reviewed and the latest developments in functional integration are described. The fundamental principles underlying the synthesis of this new class of injection-feed circuits for injection-FE (field effect) logic are also outlined.

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UDC 621.383.292.8.008.8

A THERMOELECTRIC MICROCOOLER

USSR Patent Class F 25 21/02 H 01 J 43/04 No 603812 disclosed 10 May 77
(No 2474101) published 3 Apr 78

POLETAYEV, A. V. and SHMURAK, S. Z., Institute of Solid-State Physics,
USSR Academy of Sciences

[From REFERATIVNYY ZHURNAL, ELEKTRONIKA I YEYE PRIMENENIYE No 1, Jan 79
Abstract No 1A188 P]

[Text] A thermoelectric microcooler is described which includes a thermally insulating jacket. Inside the latter, coaxially, is placed a cylindrical metal can containing a photoelectron multiplier, this can having a center hole in one of its bases and connected to the thermoelectric battery. For a higher measurement accuracy, the thermoelectric battery is located away from the end with a center hole at a distance 1.1-2 times larger than the radius of the can base. Along the axis of the center hole is placed a hermetic hollow bulb with a vacuum space.

USSR

UDC 621.396.6-181.48(088.8)

A TEST UNIT FOR INSPECTING THE PARAMETERS OF INTEGRATED MICROCIRCUITS

USSR Patent Class G 01 K 31/28 No 570856 disclosed 29 Apr 76 (No2351714)
published 13 Sep 77

DUBOVIS, V. M., ANTONOV, YU. I. and CHERNYSHOV, YU. N.

[From REFERATIVNYY ZHURNAL, ELEKTRONIKA I YEYE PRIMENENIYE No 1, Jan 79
Abstract No 1B315]

[Text] The test unit for inspecting the parameters of integrated microcircuits includes an amplifier with the input connected to voltage dividers between the IM outputs and a common busbar, as well as a feedback divider between the amplifier output and the common busbar, and a temperature stabilizing resistor. In order to prevent a commutation of circuits in the inspected IC, the unit further includes two additional voltage dividers and two resistors of operational amplifiers, with the noninverting input of the first one connected to the feedback divider and the noninverting input of the second one connected through the temperature stabilizing resistor to the common busbar, while the inverting inputs of both operational amplifiers are connected to the corresponding inputs of the tested IC and through resistors to the outputs of these operational amplifiers. One input of the

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third operational amplifier is connected to one of the additional voltage dividers between the outputs of the first and the third operational amplifiers. The second input of the third operational amplifier is connected to the second additional voltage divider between the output of the second operational amplifier and the common busbar.

USSR

UDC 621.396.69-181.48(088.8)

A DIELECTRIC COMPOSITION FOR INSULATION BETWEEN LAYERS

USSR AUTHOR'S CERTIFICATE NO 574776 filed 10/06/76 No 2371057 published 3/10/77 in Russian

PURONENE, Z. M., KRASOV, V. G., KOLDASHOV, N. D. and TURCHINA, G. V.

[From REFERATIVNYY ZHURNAL RADIOTEKHNIKA No 1, 1979 Abstract No 1V511P]

[Text] A dielectric composition is suggested for insulation between layers, used in the technology of large hybrid thick-film microcircuits. The composition includes a sital cement and aluminum oxide as a filler. In order to improve the electrophysical properties, the composition contains silicon oxide, manganese oxide and chromium oxide, with the following relationships of components, wt. percent: aluminum oxide 16-24; silicon oxide 0.05-0.3; manganese oxide 0.03-0.2; chromium oxide 0.1-0.3; sital cement--remainder.

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UDC 621.396.69-181.48(088.8)

A CONTACT DEVICE

USSR AUTHOR'S CERTIFICATE No. 576880 filed 5/01/76 No. 2308/30 published 16/01/78 in Russian

LERMAN, Z. M., MAMAYEV, G. A., RYZHKO, O. V. and SUSHENTSOV, V. I.

[From REFERATIVNYY ZHURNAL RADIOTEKHNIKA No 1, 1979 Abstract No. 1V513P]

[Text] A contact device is suggested, primarily for connection of integrated microcircuits with flexible leads to band lines, containing a base with parallel plates and a drive mechanism with an eccentric wheel for connection of the microcircuit. In order to increase the reliability of contacting and simplify the loading of the microcircuit, the device is equipped with straightening and contacting elements and boots, each of which is placed on the base so that it can rotate and interact with the eccentric drive mechanism and is equipped with an elastic dielectric plate to press the leads of the microcircuit against the contact elements. Slots are made in one of the guide plates for the microcircuit leads, while the straightening and contacting elements are located in the other plate.

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Photoelectric Effect

USSR

UDC 621.383.4

RECORDING THE RESPONSE OF INFRARED AND SUBMILLIMETER-WAVE RECEIVERS IN A MICROWAVE OFFSET CIRCUIT

Khar'kov VTOROY VSESOYUZNYIY SIMPOZIUM PO MILLIMETROVYM I SUBMILLIMETROVYM VOLNAM [Second All-Union Symposium on Millimeter and Submillimeter Waves] in Russian Vol 2, 1978 pp 194-195

PIROGOV, YU. A.

[From REFERATIVNYIY ZHURNAL, ELEKTRONIKA I YEYE PRIMENENIYE No 1, Jan 79 Abstract No 1B381 by N. N. Volkov]

[Text] A contactless photoresistor circuit is proposed which records infrared and submillimeter-wave radiation, without contact noise in the photosensitive element, much faster than conventional photoresistor circuits. The photosensitive element is placed inside a microwave waveguide or resonator cavity. As the conductance of the photoresistor changes, so does the reflection coefficient with respect to microwaves at the photosensitive element. Such a circuit with a germanium photoresistor at the $\lambda = 8$ mm wavelength is described with which a threshold sensitivity to noise emission power as high as 10^{-12} W/Hz^{1/2} has been attained. The design of a microwave detector head for operation with InSb photoresistors at the $\lambda = 3$ cm wavelength is also shown. In this case the threshold sensitivity to noise emission power is $2 \cdot 10^{-12}$ W/Hz^{1/2}, at a noise factor of 10 dB, in the response channel of the microwave amplifier. Figures 3; references 2.

USSR

UDC 621.383.4

AN IMPURITY PHOTORESISTOR IN AN INTERFEROMETER TUNED TO THE WAVELENGTH OF INCIDENT RADIATION

Moscow RADIOTEKHNIKA I ELEKTRONIKA in Russian Vol 23 No 10, 1978 pp 2189-2193

ANTONOV, V. V., VOYTSEKHOVSKIY, A. V., DUNAYEVSKIY, G. YE. and PETROV, A. S.

[From REFERATIVNYIY ZHURNAL, ELEKTRONIKA I YEYE PRIMENENIYE No 1, Jan 79 Abstract No 1B382]

[Text] The threshold characteristics of impurity photoresistors with microwave offset are calculated for the case where an underabsorbing device of this kind has been placed inside an optical interferometer tuned to the wavelength of the incident radiation. It is shown that almost complete absorption

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of the detectable incident radiation can be attained by matching the reflection coefficient at the semitranslucent interferometer mirror. The spectral characteristic and the radiation pattern of this kind of photoresistor are analyzed. Because of the selectivity of an optical interferometer, the spectral characteristic of the receiver comprises a series of narrow discrete spectral lines. The calculated radiation pattern reveals a strong dependence of the aperture angle on the absorption coefficient with respect to incident radiation in the photoresistor material.

USSR

UDC 621.383.52

FUNCTIONAL RELATION BETWEEN PHOTODETECTOR PERFORMANCE PARAMETERS AND THEIR OPERATING CONDITIONS

L'vov FIZICHESKAYA ELEKTRONIKA [Physical Electronics] in Russian No 16, 1978 pp 59-63

STEAPNOVA, G. A., BARANOV, V. A., GIMATUTDINOVA, G. I. and YUMAKULOVA, F. F.

[From REFERATIVNYY ZHURNAL, ELEKTRONIKA I YEYE PRIMENENIYE No 1, Jan 79 Abstract No 1B391 by M. B. Ushakova]

[Text] The results of a study are presented pertaining to the dependence of basic photodetector performance parameters (integral and threshold sensitivity, noise) on the operating conditions characteristic of automated systems with photoelectron devices. Empirical expressions are derived which describe the effect of background light ($T_{color} = 2850$ K, illuminance ≤ 50 lux; ≤ 1 lux), of the radiation modulation frequency ($f = 200 \div 10,000$ Hz, $\Delta f = 50$ Hz), and of the ambient temperature ($-50 \div +50^\circ\text{C}$) on the basic performance parameters. The study was based on industrial silicon photodetectors (FD-9K, FD-10K) and germanium photoreceivers (FD-10G). Tables 1; references 4.

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UDC 621.383.52:015.51

FEASIBILITY OF BUILDING A PULSE AVALANCHE PHOTODETECTOR WITH A STABLE INTRINSIC GAIN ON A METAL-DIELECTRIC-SEMICONDUCTOR STRUCTURE

Moscow KVANTOVAYA ELEKTRONIKA in Russian Vol 5 No 9, 1978 pp 1918-1923

KRAVCHENKO, A. B., PLOTNIKOV, A. F. and SHUBIN, V. E.

[From REFERATIVNYY ZHURNAL, ELEKTRONIKA I YEYE ORIMENENIYE No 1, Jan 79 Abstract No 1B399]

[Text] A theoretical and experimental study was made of the pulse avalanche dynamics in a metal-dielectric-semiconductor (MOS) structure. It has been shown that avalanche due to a linear rise of voltage is a quasi-equilibrium process. A complete correspondence is noted between experimental data and the theoretical model. The fundamental differences between avalanche dynamics in an MOS structure and in a p-n junction are established. Also established is the feasibility of utilizing this effect in the design of new type optoelectronic photorecording systems. Figures 5; references 15.

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Pulse Techniques

USSR

UDC 621.373.52(088.8)

AN INFRARED FREQUENCY PULSE GENERATOR

USSR AUTHOR'S CERTIFICATE No. 580629 filed 24/04/72 No. 1776042 published 11/11/77

MIKHAULOVSKIY, V. S.

[From REFERATIVNYY ZHURNAL RADIOTEKHNIKA No 1, 1979 Abstract No 1G343P]

[Text] An infrared frequency pulse generator is suggested, containing three time-fixing stages consisting of a current-fixing and discharge transistors with different types of conductivity, connected in a regenerative circuit, plus an accumulating condenser in the collector circuit of the current-fixing transistor, shunted series-connected stabilatron and resistor, connected to the base of the discharge transistor. In order to expand the functional capabilities, the time-fixing stages are connected in a loop diode circuit, which is connected to the collector of the discharge transistor of the preceding time-fixing stage and to the connection between the condenser and the stabilatron of the following time-fixing stage. Reference 1.

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Quantum Electronics

UDC 621.396

HOLOGRAPHY IN ANTENNA ENGINEERING

Moscow GOLOGRAFIYA V MIKROVOLNOVOY TEKHNIKE (Holography in Microwave Engineering) in Russian 1979 signed to press 6 Dec 78 pp 2, 319-320

[Annotation and table of contents from book by Lev Davidovich Bakhrekh Aleksandr Petrovich Kurochkin, Izdatel'stvo "Sovetskoye radio," 8,000 copies, 320 pages]

[Text] A wide range of problems connected with the use of holographic methods in antenna engineering and applied electrodynamics is examined.

Experimental material is cited, which illustrates the schemes and method of solving problems of antenna engineering and reveals the potentials of holographic methods in the designing and testing of antenna systems.

The book is intended for specialists dealing with applied electrodynamics, antennas and radio holography. It will be useful to students interested in these questions.

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Radars, Radio Navigators Aides,
Direction Finding; Gyros

UDC 629.7.054'842.001

THEORY OF RADAR ALTIMETRY

Moscow TEORETICHESKIYE OSNOVY RADIOVYSOTOMETRII (Theoretical Principles of Radar Altimetry) in Russian 1979 signed to press 10 Nov 79 pp 2, 319-320

[Annotation and table of contents from book by Aleksey Petrovich Zhukovskiy Yevgeniy Ivanovich Onopriyenko Valeriy Ivanovich Chizhov, Izdatel'stvo. "Sovetskoye radio," 4,300 copies, 320 pages]

[Text] The principles of the theory of onboard radar altimeters and vertical speed indicators of aircraft are set forth. The principles of construction of radar altimeters and the means of deriving information on altitude and vertical speed are examined.

The peculiarities of the operation of radar altimeters, which are connected with the random nature of a signal reflected from a statistically uneven surface, are analyzed. Questions of the accuracy of radar altimeters are studied by the methods of statistical analysis and synthesis. The composite evaluations, the fluctuation and dynamic errors, their interrelation with the statistical characteristics of the reflecting surface and the trajectory of the movement of the aircraft using various types of probe signals and means of deriving information are specified. The methods of calculating the errors of radar altimeters of various types are set forth.

The book is intended for scientists and graduate students of the radio engineering departments of VUZ's.

Tables 14; figures 125; references 133.

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A DEVICE FOR STABILIZATION OF THE MEAN FREQUENCY OF NOISE EXCURSIONS ABOVE A THRESHOLD LEVEL

USSR AUTHOR'S CERTIFICATE No. 603127 filed 3/05/76 No. 2359318 published 24/03/78 in Russian

ANDREYEV, F. M., SHISHOV, N. N. and BYCHIKHIN, YU. Z.

[From REFERATIVNYY ZHURNAL RADIOTEKHNIKA No 1, 1979 Abstract No. 1G11P]

[Text] A device for stabilization of the mean frequency of noise excursions above a threshold level.

USSR UDC 621.372.332.3:621.319.837.42

EXPERIMENTAL STUDY OF THE RELIABILITY OF RESOLUTION OF RADAR SIGNALS

TR. TSNII MOR. FLOTA in Russian No 234, 1978 pp 16-24

DEMIN, I. D.

[From REFERATIVNYY ZHURNAL RADIOTEKHNIKA No 1, 1979 Abstract No 1G9]

[Text] The results are studied of experimental studies of the variation in parameters of resolution of ship radars with reliability of the separate observation of signals under field conditions. Figures 3; tables 1; references 7.

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UDC 621.391.84:621.391.883.2

USE OF THE METHOD OF ESSENTIAL SELECTION IN CALCULATION OF THE CHARACTERISTICS OF DETECTION OF FLUCTUATING SIGNALS AGAINST A BACKGROUND OF CORRELATED NOISE

TR. TSNII MOR. FLOTA in Russian No 234, 1978 pp 11-16

KOMISSAROV, G. F.

[From REFERATIVNYY ZHURNAL RADIOTEKHNIKA No 1, 1979 Abstract No 1A64. Summary]

[Text] A study is made of the application of the method of essential sampling in appraising the effectiveness of algorithms for detection of radar signals against a background of correlated noise. The detection characteristics of fluctuating signals against a background of Markov Rayleigh noise are presented for two detection algorithms. Figures 3; references 4.

USSR

UDC 621.396.96:621.371

MODELING OF RADAR REFLECTIONS FROM THE SURFACE OF THE EARTH

MODELIROVANIYE RADIOLOKATSIONIYKH OTRAZHENIY OT ZEMNOY POVERKHNOSTI in Russian, Leningrad State University Press 148 pp

ORLOV, R. A., and TORGASHIN, B. D.

[From REFERATIVNYY ZHURNAL RADIOTEKHNIKA No 1, 1979 Abstract No 1G8K. Summary]

[Text] This book is dedicated to problems of modeling of radar reflections from the surface of the earth. A review is presented of theoretical studies on modeling of radar reflections, a classification of methods of modeling is presented and an analysis given of the statistical regularities of the morphologic structure of vegetation. Based on the requirements formulated, a generalized electrodynamic model of the earth's surface is presented and the energetic, correlation and spectral characteristics of scattering are determined. Considerable attention is given to the production of simple calculation expressions not requiring the use of special computer equipment. The book is intended for engineering-technical and scientific workers involved in the development and use of electronic devices, but also may be useful to graduate students and upper-level students in radio engineering higher educational institutions.

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A DEVICE FOR SEPARATION OF THE CENTRAL PULSE OF A TRAIN

USSR AUTHOR'S CERTIFICATE No. 56819 filed 18/10/74 No. 2069353 published 18/01/78 in Russian

POLYAKOV, V. I. and FEDININ, V. V.

[From REFERATIVNYY ZHURNAL RADIOTEKHNIKA No 1, 1979 Abstract No. 1G13P]

[Text] A device for separation of the central pulse of a train.

USSR UDC 621.396.965.8(088.8)(47+57)

A TRACKING FILTER

USSR AUTHOR'S CERTIFICATE No. 614529 filed 7/03/74 No. 2003167 published 9/06/78 in Russian

VOLKOV, V. K., SMIRNOV, N. N. and CHISTOV, YU. G.

[From REFERATIVNYY ZHURNAL RADIOTEKHNIKA No 1, 1979 Abstract No. 1G19P]

[Text] A tracking filter which contains a retunable filter is described.

USSR UDC 621.396.96:681.32(088.8)(47+57)

A DEVICE FOR PROCESSING OF QUANTIZED SIGNALS

USSR AUTHOR'S CERTIFICATE No. 590758 filed 21/04/76 No. 2354267 published 4/03/78 in Russian

SAVCHENKO, K. P.

[From REFERATIVNYY ZHURNAL RADIOTEKHNIKA No 1, 1979 Abstract No. 1G20P]

[Text] A device for processing of quantized signals.

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UDC 621.396.932.1

DOPPLER FILTRATION IN SHORTWAVE DIRECTION FINDING. ANALOG-DIGITAL PROCESSING OF A MODULATED SIGNAL

IN-T ZEMN. MAGNETIZMA, IONOSFERY I RASPROSTR. RADIOVOLN AN SSR. PREPR. in Russian No 18, 1978 16 pp. il. (English abstract)

AFRAYMOVICH, E. L. and PANCHENKO, V. A.

[From REFERATIVNYY ZHURNAL RADIOTEKHNIKA No 1, 1979 Abstract No. 1G82]

[Text] An analog-digital method of cross-spectral analysis of LF processes is described.

USSR

UDC 621.396.933:527.8

PROCESSING OF INFORMATION IN OPTICAL DIRECTION-FINDING SYSTEMS

OBRABOTKA INFORMATSIN V OPTICHESKIKH SISTEMAKH PELENGATSII in Russian, Moscow, Mashinostroyeniye Press 1978 164 pp

LEVSHIN, V. L.

[From REFERATIVNYY ZHURNAL RADIOTEKHNIKA No 1, 1979 Abstract No. 1G81K. Summary]

[Text] This book analyzes problems of the theory of information processing in the optical and electronic part of optical-electronic direction-finding systems, performing the task of locating a small object against a spatially heterogeneous background. Optimization algorithms are synthesized considering the finite resolving capacity of the system and the presence of noise in the radiation receiver.

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UDC 621.396.962(088.8)(47+57)

A DEVICE FOR DETECTION OF ERRORS IN SYSTEMS FOR TRANSMISSION OF TELEMETRY INFORMATION WITH A REVERSE COMMUNICATION CHANNEL

USSR AUTHOR'S CERTIFICATE No. 582572 filed 21/06/76 No. 2373818 published 22/12/77 in Russian

MOROZOV, V. M. and ROMANCHENKO, S. D.

[From REFERATIVNYY ZHURNAL RADIOTEKHNIKA No 1, 1979 Abstract No. 1G67P]

[Text] A device for detection of errors in systems for transmission of telemetry information with a reverse communication channel contains a receiver and series-connected prediction filter, subtraction unit, computing unit and control unit.

USSR

UDC 621.396.965.8(088.8)(47+57)

A MULTICHANNEL PHASE DIGITAL TRACKING SYSTEM

USSR AUTHOR'S CERTIFICATE No. 593188 filed 24/05/76 No. 2364711 published 3/04/78 in Russian

BUYEVICH, V. K., POLONNINKOV, R. I., POLUSHKIN, A. I., SKOROKHODOV, YE. M. and TOLMANOV, A. K.

[From REFERATIVNYY ZHURNAL RADIOTEKHNIKA No 1, 1979 Abstract No. 1G14P]

[Text] A multichannel phase digital tracking system.

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Receivers and Transmitters

USSR

UDC 621.371:551.510.52

APPARATUS FOR STUDY OF THE FLUCTUATING CHARACTERISTICS OF MILLIMETER WAVES

2-Y VSES. SIMPOZ. PO MILLIMETROV. I SUBMILLIMETROV. VOLNAM, KHAR'KOV 1978
TEZ. DOKL. T. 2 [2nd All-Union Symposium on Millimeter and Submillimeter
Waves, Khar'kov, 1978, Abstracts of Reports, Vol 2] in Russian, Khar'kov,
1978 pp 175-176

FETISOV, I. N. and ZRAZHEVSKIY, A. YU.

[From REFERATIVNYY ZHURNAL RADIOTEKHNIKA No 1, 1979 Abstract No. 1B345 by
S. N. Gerasimov]

[Text] A receiver is suggested for simultaneous recording of the intensity of a signal, and the vertical and horizontal components of the angle of arrival under all weather conditions over the transmission path, including precipitation. The vertical component of the angle of arrival is measured using a difference method involving a special modulator disk. The horizontal component is measured using a phase method, based on the change in the phase shift in the LF signal which arises upon horizontal displacement of the pattern. The angle-measurement channels have a linear characteristic within limits of 100-200" s. An angle of arrival of >1" was measured with an error of ~20 percent. A structural diagram of the receiver and a diagram of the placement apertures on the modulator disk are presented. Figures 2; references 3.

USSR

UDC 621.376.3(088.8)

A DEVICE FOR RECEPTION OF FREQUENCY-KEYED SIGNALS

USSR AUTHOR'S CERTIFICATE No. 603139 filed 16/07/76 No. 2390812 published
22/03/78 in Russian

SAZONOV, V. D. and KHRISTOV, V. D.

[From REFERATIVNYY ZHURNAL RADIOTEKHNIKA No 1, 1979 Abstract No. 1D12P]

[Text] In this device for reception of frequency-keyed signals as in USSR Author's Certificate No. 339013, in order to increase the interference stability, a unit has been added which blocks the output of information, plus a unit for analysis for the reliability of the change in operating frequencies. One input of this last unit is connected to the output of a pulse

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generator, the other to the output of the unit for analysis of the nature of change of operating frequencies. The output of the unit for analysis of the reliability of the change in operating frequencies is connected to the control input of the unit for blocking the output of information, the signal input of which is connected to the output of the unit for formation of the output pulses.

USSR

UDC 621.396.61:621.396.2(088.8)

A DEVICE FOR TRANSMISSION OF SIGNALS WITH DELTA MODULATION

USSR AUTHOR'S CERTIFICATE No. 577695 filed 7/01/76 No. 2311989 published 16/11/77 in Russian

GLADCHENKO, V. V., BOGINSKIY, L. P. and DOLGALEV, S. D.

[From REFERATIVNYY ZHURNAL RADIOTEKHNIKA No 1, 1979 Abstract No. 1D273P]

[Text] A device is suggested for transmission of signals with delta modulation, containing a subtraction unit, the output of which is connected to the input of a binary modulator, connected through an integrator to the first input of the subtraction unit. The device also includes a series-connected circuit consisting of a synchronizer, frequency divider and strobing unit, the first output of which is connected through the corresponding valve [Ventil'] to the second and third inputs of the subtraction unit and to the second input of the integrator. The output of the first valve is connected to the other input of the second valve, while the output of the integrator is connected to the other input of the third valve. In order to increase the reliability of information transmitted, the device includes an inverting element, a flip-flop and series connected frequency multiplier and "AND" element, the other input of which is connected to the input of the inverting element, and the output of the flip-flop. The first input of the flip-flop is connected to the second output of the strobing unit, while the second input of the flip-flop is connected to the input of the binary modulator. The second and third outputs of the synchronizer are connected to the input of the frequency multiplier and the second input of the inverting element, the output of which is connected to the output of the "AND" element and to the second input of the binary modulator.

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UDC 621.396.62:621.391.8(088.8)

A DEVICE FOR PROCESSING OF COMPLEX SIGNALS

USSR AUTHOR'S CERTIFICATE No. 607346 filed 25/04/74 No. 2923416 published 26/04/78 in Russian

SMIRNOV, N. I., ZALICHEV, N. N., SUDOVTSEV, V. A. and SUDAKOV, YU. B.,
Moscow Electronic Engineering Institute of Communications

[From REFERATIVNYY ZHURNAL RADIOTEKHNIKA No 1, 1979 Abstract No. 1D4P]

[Text] A device is suggested for processing of a complex signal, containing two band filters connected at the input, the output of one of which is connected to the input of a correlator. In order to assure invariance relative to the moment of arrival of the signal and its initial phase, an amplitude-phase converter is connected between the output of the second band pass filter and the other input of the correlator.

USSR

UDC 621.396.626(088.8)

A DEVICE FOR SPACE-DIVERSITY RECEPTION OF WIDEBAND SIGNALS

USSR AUTHOR'S CERTIFICATE No. 611304 filed 27/09/76 No. 2408681 published 22/05/78 in Russian

GLADKOV, V. P.

[From REFERATIVNYY ZHURNAL RADIOTEKHNIKA No 1, 1979 Abstract No. 1D9P]

[Text] The device suggested contains in each of the separated circuits a series connected antenna, amplifier and conversion section and delay element, the output of which is connected to the inputs of two channels. Each of the two channels consists of a series-connected matched filter and correlator. The outputs of the matched filters are connected to the inputs of a reference signal adder common to all circuits. The output of the adder is connected to the input of a recirculator. The second inputs of the correlators are connected, while the outputs are connected to the inputs of a subtraction unit common to all circuits. The output is series connected to the input of a decision unit. In order to increase the interference stability, each separate unit includes a series-connected circuit consisting of an additional delay element and a strobing unit, the second input of which is connected to the output of the recirculator. The output of the

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strobing unit is connected to the second inputs of the correlators. A synchronizing signal is fed to the input of the additional delay elements.

USSR

UDC 621.396.626(088.8)

A DEVICE FOR SPACE-DIVERSITY RECEPTION WITH COHERENT ADDITION OF SIGNALS

USSR AUTHOR'S CERTIFICATE No. 601830 filed 16/01/76 No. 2313994 published 11/05/78 in Russian

SHASHIN, YU. V., LOBANOV, V. I., SHUTOV, G. A., KRASUTSKIY, N. M., SERYY, V. P. and PUDENKOV, A. P.

[From REFERATIVNYY ZHURNAL RADIOTEKHNIKA No 1, 1979 Abstract No. 1D10P]

[Text] A device is prepared which contains in each branch, series-connected standardized-level amplifiers, a first convertor (C), a narrow-band filter and a second C. The other input of the last convertor is connected to the output of the level-setting amplifier. The outputs of the second C are connected through a circuit, common for all of the branches, consisting of an adder, band pass filter and amplifier-limiter, connected in series to the second inputs of the first C. In order to increase interference stability and decrease the threshold of operation when communication is started, each branch contains a regulated amplifier connected to the output of the second C, with a square-law detector connected between the control input and the output narrow-band filter of the amplifier. An output adder is connected to the output regulated amplifiers of all branches.

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Semiconductors and Dielectrics

USSR

UDC 537.311.33

ELECTRICALLY ACTIVE SEMICONDUCTORS AND THEIR USE FOR MICROWAVE OSCILLATORS AND FREQUENCY CONVERTERS

Moscow RADIOTEKHNIKA I ELEKTRONIKA in Russian Vol 23 No 9, 1978 pp 1915-1925

KALASHNIKOV, S. G., KAGAN, M. S. and KUKUSHKIN, V. V.

[From REFERATIVNYY ZHURNAL, ELEKTRONIKA I YEYE PRIMENENIYE No 1, Jan 79 Abstract No 1B182]

[Text] Some results are presented of research done at the Institute of Radio Engineering (USSR Academy of Sciences) which pertain to new uses of semiconductors with hot electrons for microwave oscillators and frequency converters. Under consideration are "active" semiconductors with a negative dynamic volume conductivity but electrically stable in the absence of external oscillatory circuits. Centimeter-wave and millimeter-wave oscillators, frequency converters and frequency multipliers have been realized experimentally, with the aid of active elements based on gallium arsenide.

USSR

UDC 537.311.33

GENERATION OF ELECTROMOTIVE FORCES IN SEMICONDUCTORS BY FIELDS OF THERMAL PULSES WITH LARGE TEMPERATURE GRADIENTS

Leningrad FIZIKA I TEKHNIKA POLUPROVODNIKOV in Russian Vol 12 No 8, 1978 pp 1524-1529

ABROSIMOV, V. M., YEGOROV, B. N., LIDORENKO, N. S. and KARANDASHEV, V. A.

[From REFERATIVNYY ZHURNAL, ELEKTRONIKA I YEYE PRIMENENIYE No 1, Jan 79 Abstract No 1B186]

[Text] An experimental study was made of emf generation in semiconductors with and without a potential barrier, by fields of thermal pulses with large temperature gradients, following absorption of laser radiation pulses. It has been established that the maximum emf in semiconductors with a potential barrier can reach 0.2-0.4 V at a density of incident energy equal to 0.03 J/cm^2 . At densities of incident energy within the range under consideration, the emf in semiconductors with a potential barrier was found to exceed the emf in semiconductors without a potential barrier by two orders

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of magnitude. It has also been demonstrated that the maximum emf generated by a thermal pulse is 100 times higher than the emf generated in a steady thermal field with the same temperature drop.

USSR

UDC 537.311.33

PHYSICAL PHENOMENA IN FERRITE-SEMICONDUCTOR STRUCTURES FROM THE STANDPOINT OF APPLICATION IN MICROWAVE MICROELECTRONICS

Moscow MIKROELEKTRONIKA in Russian Vol 7 No 5, 1978 pp 430-443

BESPYATYKH, YU. I., VASHKOVSKIY, A. V., ZUBKOV, V. I. and KIL'DISHEV, V. N.

[From REFERATIVNYY ZHURNAL, ELEKTRONIKA I YEYE PRIMENENIYE No 1, Jan 79
Abstract No 1B190. Summary]

[Text] Physical phenomena in ferrite-semiconductor structures are analyzed which have to do with interaction between natural oscillations or waves of magnetization in the ferrite and charge carriers in the semiconductor. This interaction is manifested in changes in the magnetization resonance spectrum, in the appearance of a direct emf upon excitation of natural oscillations of magnetization, in the appearance of an alternating emf upon enhancement of charge carriers by magnetostatic waves, and in the Cerenkov effect when charge carriers drift under the influence of an electric field. All these effects can be utilized in the design of microwave delay lines with characteristics different than those of ferrite delay lines, in the design of microwave amplifiers, in the design of selective microwave probes for measurement of power or other quantities, and in the design of information processing devices. Furthermore, ferrite-semiconductor structures can also be used in conventional nonreciprocal devices, filters and power limiters. Figures 4; tables 1; references 47.

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UDC 537.311.33

P-N JUNCTIONS BASED ON CADMIUM TELLURIDE

Kishinev TEORETICHESKOYE I EKSPERIMENTAL'NOYE ISSLEDOVANIYE SLOZHNYKH POLUPROVODNIKOVYKH SOYEDINENIY [Theoretical and Experimental Study of Complex Semiconductor Compounds] in Russian 1978 pp 130-133

KRETSU, I. V., NAGRADOVA, I. A., TAMAZLYKAR', I. YE. and TSUKANOV, M. I.

[From REFERATIVNYY ZHURNAL, ELEKTRONIKA I YEYE PRIMENENIYE No 1, Jan 79 Abstract No 1B202. Summary]

[Text] A method is proposed for producing p-n junctions on the basis of electron cadmium telluride by dissolution and recrystallization in bismuth. The current-voltage characteristics of such junctions were measured at the temperature of 300 K. The method was employed for producing, on a low-resistance base, structures with high direct-current densities. Figures 3; references 4.

USSR

UDC 537.311.33:546.681'19

SOME SPECIAL FEATURES OF THE IMPURITY PHOTOCONDUCTION SPECTRUM OF SEMICONDUCTORS WITH A NONHOMOGENEOUS DISTRIBUTION OF IMPURITIES

Moscow IZVESTIYA AKADEMII NAUK SSSR, SERIYA FIZICHESKAYA in Russian Vol 42 No 6, 1978 pp 1213-1219

BERMAN, L. V., KAL'FA, A. A. and KOGAN, SH. M.

[From REFERATIVNYY ZHURNAL, ELEKTRONIKA I YEYE PRIMENENIYE No 1, Jan 79 Abstract No 1B17 by V. F. Dorfman]

[Text] The spectrum of optical absorption by ionized donor molecules in semiconductors with strong compensation is calculated in the approximation of a hydrogen-like impurity. A comparison of the theoretical curves with experimental data pertaining to epitaxial GaAs suggests that the degree of impurity compensation in films can be qualitatively estimated from the photoconduction spectrum and its changes with rising temperature or upon intensification. Special features which should characterize a helium-like impurity and the conditions for observability of its brightest spectral line are examined. The model is one of isolated spherical inclusions with a random distribution and an enhanced impurity concentration. It is shown that "dirty" inclusions hardly influence the photoconduction spectrum but appreciably deform the lines in the absorption spectrum. This effect is significant even in only slightly nonhomogeneous materials, and it must be accounted for in photoelectric and optical spectroscopy of semiconductors. Figures 2; references 17.

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UDC 621.315.592

PRODUCTION OF AMORPHOUS THIN FILMS FOR SWITCHES WITH MEMORY

Moscow SBORNIK NAUCHNYKH TRUDOV PO PROBLEMAK MIKROELEKTRONIKI [Scientific Transactions on Problems in Microelectronics, Collection of Articles] in Russian, Moscow Institute of Electronic Engineering No 34, 1977 pp 24-30

GREASOV, A. F., UKRAINSKIY, YU. M. and USOV, N. N.

[From REFERATIVNYY ZHURNAL, ELEKTRONIKA I YEYE PRIMENENIYE No 1, Jan 79 Abstract No 1B144]

[Text] Thermal and plasma high-frequency sputtering of the raw material are compared with respect to reproducibility of parameters which characterize switching devices with memory on the basis of chalcogenous $Ge_{15}Te_{81}As_4$ glass, as well as for the purpose of finding the optimum sputtering process parameters. References 7.

USSR

UDC 621.373.51

A STUDY OF THE GENERATION OF MICROWAVE OSCILLATIONS AT FREQUENCIES SIGNIFICANTLY GREATER THAN THE DRIFT FREQUENCY BY A GUNN DIODE

2-Y VSES. SIMPOZ. PO MILLIMETROV. I SUBMILLIMETROV. VOLNAM, KHAR'KOV, 1978 TEZ. DOKL. T. 2 [2nd All-Union Symposium on Millimeter and Submillimeter Waves, Khar'kov, 1978, Abstracts of Reports, Vol. 2] in Russian, Khar'kov 1978 p 44

ALTUKHOV, I. V., KAGAN, M. S., KALASHNIKOV, S. G. and KUKUSHKIN, V. V.

[From REFERATIVNYY ZHURNAL RADIOTEKHNIKA No 1, 1979 Abstract No 1D175 by A. V. Lazarev]

[Text] A report is presented on excitation of oscillations, the frequency of which falls within the millimeter wave band is significantly greater than the frequency of oscillations in the domain mode and is not a multiple of this frequency, in a resonant circuit containing a Gunn diode. These oscillations are not identified with known modes of the Gunn diode. Their development may be explained by the fact that the domains moving in the diode have negative HF resistance.

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UDC 621.373.51

A GUNN GENERATOR OPERATING IN THE 60-80 GHz RANGE

2-Y VSES. SIMPOZ. PO MILLIMETROV. I SUBMILLIMETROV. VOLNAM, KHAR'KOV, 1978
TEZ. DOKL. T. 2 [2nd All-Union Symposium on Millimeter and Submillimeter
Waves, Khar'kov, 1978 Abstracts of Reports Vol. 2] in Russian, Khar'kov 1978
pp 16-17

VASIL'EV, N. A., KOSOV, A. S. and STRUKOV, I. A.

[From REFERATIVNYY ZHURNAL RADIOTEKHNIKA No 1, 1979 Abstract No 1D177 by
A. V. Lazarev]

[Text] The design is described of a Gunn generator operating in the 60-80
GHz range with an output power of up to 40 mW and an efficiency of ~1 per-
cent. The basis of the design is profiling of a resonator, through which
the bias is fed to the diode. By changing the diameter of the radial por-
tion, the active portion of the load can be transformed.

USSR

UDC 621.382.002

CHARACTERISTICS OF LASER-BEAM SCRIBING

Moscow SBORNIK NAUCHNYKH TRUDOV PO PROBLEMAK MIKROELEKTRONIKI [Scientific
Transactions on Problems in Microelectronics, Collection of Articles] in
Russian, Moscow Institute of Electronic Engineering No 34, 1977 pp 77-84

BOCHKIN, O. I., NIKIFOROVA, S. N. and PARKHACHEVA, YE. V.

[From REFERATIVNYY ZHURNAL, ELEKTRONIKA I YEYE PRIMENENIYE No 1, Jan 79
Abstract No 1B650 by V. V. Kopitsyn]

[Text] The process of cutting silicon wafers with a YAG-laser beam is ex-
amined. A scratch line deeper than 50 μm can be cut in one pass, entirely
sufficient for splitting up to 300 μm thick wafers into chips 1.5 μm or
larger in size. The cutting speed must be chosen according to the required
scratch depth and the latter, for all practical purposes, depends neither
on the grade of silicon nor on the presence of metallic, dielectric, or
other coatings. It is desirable to protect the wafer surface with a latex
film against contamination during laser-beam cutting and then to remove this

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film mechanically after the operation. A scratch must be made at least 30 μm away from IC components on a chip; no deterioration of their characteristics should then occur. Figures 2; references 6.

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AUTOMATION FEASIBILITY STUDY OF THE DEPOSITION PROCESS PARAMETERS INVOLVING PHOTORESISTIVE FILMS ON FLEXIBLE TAPES

Leningrad POLUPROVODNIKOVYYE USTROYSTVA I TERMOPREOBRAZOVATELI [Semiconductor Devices and Thermal Converters] in Russian 1978 pp 73-77

KRASIL'SHCHIKOV, M. YA., LYSENKO, L. A. and MAMAYEV, G. I.

[From REFERATIVNYY ZHURNAL, ELEKTRONIKA I YEYE PRIMENENIYE No 1, Jan 79 Abstract No 1B574 by V. I. Brodskiy]

[Text] A method has been developed for deposition of photoresistive films from the vapor phase on 200-mm long and 30-mm wide grade FDI-AP polyamide tape. Such a tape was placed in a chemical beaker containing grade FN-11 photoresist. The film thickness was measured with a model MII-4 microinterferometer. The quality of specimens was determined under a model MMU-3 microscope ($\times 300$ magnification) after etching. Here the dependence of the built up film thickness and of the thickness nonuniformity on the kinematic viscosity of the photoresist and on the velocity of the tape passing through the beaker during the deposition process is shown. It has been established that the thickness of the photoresist film does not appreciably depend on the tape sloping angle and, with the viscosity correctly matched, remains within the required range of 1.5-2.0 μm . The thickness nonuniformity does depend on the tape sloping angle and becomes minimum (under 20 percent) at angles from 18 to 30°, which is satisfactory for production of microcircuits on carrier tape. Figures 2; references 3.

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TECHNOLOGICAL PROBLEMS WITH BULKY TERMINALS FOR SEMICONDUCTOR DEVICES

Leningrad POLUPROVODNIKOVYYE PRIBORY I TERMOPREOBRAZOVATELI [Semiconductor Devices and Thermal Converters] in Russian 1978 pp 86-90

SARAYEV, O. N., KHODAK, I. YA., SHEKHANOVA, M. A. and ZAKHARYAN, G. O.

[From REFERATIVNYY ZHURNAL, ELEKTRONIKA I YEYE PRIMENENIYE No 1, Jan 79 Abstract No 1B649 by V. I. Brodskiy]

[Text] Problems in producing bulky terminals in hybrid circuit integration are considered. The external appearance of bulky terminals is shown, after a semiconductor device has been connected to the circuit board by soldering with a U-turn. It is also shown that contact tabs can be tinned by electrochemical deposition and a small height variation (up to 4 μm) between terminals from hybrid IC component thus attained. The strength of such soldered joints was checked on a commutator circuit board holding up components with 14 bulky terminals 200 μm in diameter. Specimens were also tested mechanically in shear, the results revealing a dependence of the mechanical strength of soldered joints with U-turns on the size of this U-turn as well as on the height and size nonuniformity of solder beads in an assembly of hybrid IC components. Figures 2; references 3.

USSR

UDC 621.382.002

PROPERTIES OF EPOXIDE-SILICONE ORGANIC ADHESIVES AND THEIR APPLICATION IN SEMICONDUCTOR DEVICES

Moscow GELIOTEKHNIKA in Russian No 3, 1978 pp 59-61

BAYBAKOVA, N. N., GRIBELYUK, I. I. and DORMIDONTOV, A. A.

[From REFERATIVNYY ZHURNAL, ELEKTRONIKA I YEYE PRIMENENIYE No 1, Jan 79 Abstract No 1B638. Summary]

[Text] The physicomachanical properties of epoxide-silicone organic adhesive grades K-300-61 and VT-25-200 were studied, as well as their resistance to organic solvents, water and grade PMS-100 polymethyl-siloxane fluid. The grade K-300-61 adhesive has been found to be suitable for bonding silicon wafers into stacks subject to mechanical treatment and heat treatment at 250°C.

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AN EFFECTIVE TECHNOLOGY FOR MOS-LSI N-CHANNEL DEVICES WITH SILICON GATES

Moscow SBORNIK NAUCHNYKH TRUDOV PO PROBLEMAM MIKROELEKTRONIKI [Scientific Transactions on Problems in Microelectronics, Collection of Articles] in Russian, Moscow Institute of Electronic Engineering No 34, 1977 pp 36-39

GAFAROV, P. M., SAPRONOV, V. I., SOLOMONENKO, V. I. and FILIPENKO, V. O.

[From REFERATIVNYY ZHURNAL, ELEKTRONIKA I YEYE PRIMENENIYE No 1, Jan 79 Abstract No 1B663. Summary]

[Text] A technology has been developed for MOS transistors with n-channels and polycrystalline-Si gates. Application of this self-matching technology and use of high-resistivity substrate material will make it feasible to produce high-speed devices compatible with TTL circuits in terms of logic levels. The very reliable separation between levels as well as the processes of precision oxidation, diffusion, epitaxial growth and photolithography contribute to the feasibility of producing LSI circuits with a high degree of integration (of the order of 20,000 components per chip).

USSR

UDC 621.382.002

TECHNOLOGICAL FEATURES OF A COMPOUND STRUCTURE WITH A FIELD-EFFECT TRANSISTOR CONTROLLABLE BY A SCHOTTKY BARRIER

Moscow SBORNIK NAUCHNYKH TRUDOV PO PROBLEMAM MIKROELEKTRONIKI [Scientific Transactions on Problems in Microelectronics, Collection of Articles] in Russian, Moscow Institute of Electronic Engineering No 34, 1977 pp 47-55

ADAMOV, YU. F. and GOLUBEV, A. P.

[From REFERATIVNYY ZHURNAL, ELEKTRONIKA I YEYE PRIMENENIYE No 1, Jan 79 Abstract No 1B662. Summary]

[Text] A structure is described which contains a bipolar n-p-n transistor and a field-effect transistor controllable by a Schottky barrier, also a p-type conduction channel. The results of experimental studies are analyzed pertaining to some of the technological processes which affect the characteristics of bipolar and field-effect transistors. It is shown that ion-plasma sputtering of tungsten affects the gain of a bipolar transistor in a microcircuit configuration.

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STRUCTURES BASED ON LAMELLAR GaAs CRYSTALS WITH AN S-FORM CURRENT-VOLTAGE CHARACTERISTIC

Moscow POLUPROVODNIKOVA TEKHNIKA I MIKROELEKTRONIKA [Semiconductor Technology and Microelectronics, Republic-wide Interdepartmental Collection of Articles] in Russian No 28, 1978 pp 53-56

VAYNBERG, V. V. and VARSHAVA, S. S.

[From REFERATIVNYY ZHURNAL, ELEKTRONIKA I YEYE PRIMENENIYE No 1, Jan 79 Abstract No 1B271. Summary]

[Text] The nonhomogeneity of lamellar crystals was studied by the method of first measuring the potential distribution over an oblique microsection and then the electrical conductivity during layerwise grinding. Overcompensated layers with a high resistivity ρ (of the order of 10^5 - 10^6 Ohm.cm) were found to exist. Subsequently (p^+ - $p(i^-)$ - n^+) structures with S-form current-voltage characteristics were produced. These structures were studied and the temperature dependence of their main parameters found to be linear. Experimental data are now compared with theoretical calculations according to the model of superlong semiconductor diodes on overcompensated semiconductors. The length of the diffusion path for minority carriers in the base region of a semiconductor S-diode as well as the ratio of base length to diffusion path length are then evaluated. Figures 2; references 6.

USSR

UDC 621.382.2.011.222

CALCULATING THE THERMAL PERFORMANCE OF GUNN-EFFECT DIODES

Kishinev K RASCHETU TEPLOVYKH REZHIMOV DIODOV GANNA in Russian, Kishinev Polytechnic Institute, 1978 18 pp (manuscript deposited at the Central Scientific Research-Institute of Technical and Economic Studies of Instrument Making, Means of Automation and Management Systems 16 Jun 78, No 963 Dep.)

GEORGIU, V. G. and ZAKHAROV, A. A.

[From REFERATIVNYY ZHURNAL, ELEKTRONIKA I YEYE PRIMENENIYE No 1, Jan 79 Abstract No 1B236 Dep by the authors]

[Text] A method of calculating the thermal steady-state and transient performance of Gunn-effect semiconductor diodes is analyzed in detail. It is shown how the results of these calculations can be used for optimizing the design of semiconductor diodes and for measuring the temperature of such devices during operation. References 11.

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INTEGRATED TRANSISTORS WITH METALLIC COLLECTORS

Moscow SBORNIK NAUCHNYKH TRUDOV PO PROBLEMAM MIKROELEKTRONIKI [Scientific Transactions on Problems in Microelectronics, Collection of Articles] in Russian, Moscow Institute of Electronic Engineering, No 34, 1977 pp 40-46

ADAMOV, YU. F., MOSHKIN, V. I. and FETISOVA, S. N.

[From REFERATIVNYY ZHURNAL,, ELEKTRONIKA I YEYE PRIMENENIYE No 1, Jan 79 Abstract No 1B661]

[Text] Results of calculations and experimental studies are shown pertaining to n-p-n transistors with metallic collectors, the latter having been produced by ion implantation in the base region.

USSR

UDC 621.382.2:539.213

A NEW KIND OF SWITCHING IN AMORPHOUS THIN FILMS OF ALUMINUM OXIDE

Kiev UKRAINSKIY FIZICHESKIY ZHURNAL in Russian Vol 23 No 7, 1978 pp 1213-1216

FEDCHUK, A. P. and SALTYSKAYA, T. F.

[From REFERATIVNYY ZHURNAL, ELEKTRONIKA I YEYE PRIMENENIYE No 1, Jan 79 Abstract No 1B262. Summary]

[Text] In a study of the current-voltage characteristics of metal-dielectric-metal structures on the base of aluminum oxide a new kind of switching has been discovered which cannot be described by the thermal model. The characteristics of this switching mode have been found to be affected by the presence of doping H^+ , K^+ , Co^{++} and Cd^{++} ions. For an explanation of the abrupt rise in conductivity during switching, a model is now proposed according to which the barrier at the contact becomes more transmittant under the influence of cations drifting along an externally applied electric field. On the basis of such a model, the switching inertia is determined by the kind of motion of impurity cations in the amorphous thin film. Figures 2; references 8.

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DEVICES BASED ON AMORPHOUS SEMICONDUCTORS

Moscow USPEKHI FIZICHESKIKH NAUK in Russian Vol 125 No 4, 1978 pp 707-730

ADLER, D.

[From REFERATIVNYY ZHURNAL, ELEKTRONIKA I YEYE PRIMENENIYE No 1, Jan 79
Abstract No 1B267 by V. K. Nikiforov]

[Text] This survey summarizes the results of 15 years of research aimed at constructing a theory of amorphous semiconductors and practical application of the effects found to occur in them. It is emphasized that not the periodicity of their structure but the chemical nature and the electron structure of their constituent atoms provide the key to understanding the properties of amorphous solids. From this standpoint, then, are examined the periodic table of the elements, the energy characteristics of various states in atoms (principally s- and p-states), the modes of bonding and hybridization, as well as their role in formation of the nearest order and a band structure in a solid. It is shown how the kind of bonds affects the formation of a complex band structure in amorphous semiconductors and solids. The phenomena of a mobility limit, tailing of the states density, a mobility gap and localization of heteropolar states in amorphous semiconductors are explained, and the causes of their occurrence are interpreted on the basis of the "active centers" model. Prominence is given to achievements in realization and development of methods by which amorphous silicon can be doped for use in several unique novel devices such as a solar battery with a 6 percent efficiency. Attention is also paid here to the economic aspects and to the fact that producing amorphous semiconductors costs less than producing crystalline ones. Known theories of switching are analyzed and the fact is underlined that, while plain switching is an electronic process, switching with memory is a result of transition of a material from amorphous to crystalline state. Data are presented on devices already built on amorphous semiconductors (type "6lat/Ovonits" memory with a capacity of 1024 bits. and others), extra-large information recording systems with electron and laser beams, and information display systems. Figures 11; references 5.

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UDC 621.396.6-181.48

PARAMETRIC METHOD OF COMPENSATING THE EFFECTS OF RADIATION ON SEMICONDUCTOR SWITCHING DEVICES

Alma Ata VESTNIK AKADEMII NAUK KAZAKHSKOY SSR in Russian No 7, 1978 pp 74-75

TUYAKBAYEV, A. A.

[From REFERATIVNYY ZHURNAL, ELEKTRONIKA I YEYE PRINENENIYE No 1, Jan 79
Abstract No 1B319 by D. I. Rubinshteyn]

[Text] A method of compensating the effect of radiation on transistor switches is described. Its gist is to compensate the decrease of the base-current transfer ratio due to irradiation of the transistor by a simultaneous increase of the collector load resistance. Application of this method throughout the entire range of incident integral radiation fluxes will optimize the energy characteristics of integrated circuits and increase their radiation resistance.

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Theory

USSR

UDC 621.371

FREQUENCY TRANSFORMATION IN PARAELECTRICS

2-OY VSES. SIMPOZ. PO MILLIMETROV. I SUBMILLIMETROV. VOLNAM. KHAR'KOV
1978 in Russian Abstracts of Reports Volume 2, Khar'kov 1978 pp 38-39

GRABOVSKIY, YU. YE., KOSHEVAYA, S. V. and OMEL'CHENKO, M. YU.

[From REFERATIVNYY ZHURNAL RADIOTEKHNIKA No 1, 1979 Abstract No 1A37 by
L. S. Subbotin]

[Text] In the case of nonlinear, 4-wave interaction of traveling electromagnetic waves in a paraelectric, located in a permanent electric field, the phenomena of parametric amplification and frequency conversion occur simultaneously. Therefore, these phenomena cannot be separately analyzed, and they can be calculated only by the use of computers. The results presented from such calculations were obtained for crystals of strontium titanate, cooled to liquid-nitrogen temperatures, at a pumping frequency of 50 GHz, for a signal with a frequency of 5 GHz. In order to suppress the upper side band, additional electrodynamic attenuation is introduced at 130 dB·cm, and the signal is parametrically amplified by 29 dB. At the same time, effective transformation to LF is achieved, using the energy of the pumping wave. Figures 2; references 1.

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Publications

AIR TRAFFIC CONTROL COMMUNICATIONS, RADIO-RADAR SUPPORT SERVICES

Moscow SPRAVOCHNIK PO SVYAZI I RADIOTEKHNICHESKOMU OBESPECHENIYU POLETOV
(Manual on Communications and Radiotechnical Support of Flight Operations)
in Russian 1979 signed to press 29 Sept 78 pp 2, 285-286

[Annotation and table of contents from book by Yu. I. Dukhon, N. N.
Il'yinskiy, and G. I. Laushev, Voenizdat, 17,500 copies, 286 pages]

[Text] This manual contains material on organizing air traffic control
communications and radio-radar support services, methods of performing
these services, characteristics and fundamentals of operation of communica-
tions and radio-radar support services equipment.

This manual can be utilized by officers, warrant officers and noncom-
missioned officers of aviation unit communications and radio-radar support
services, as well as civil aviation specialists involved in utilization
and operation of communications and radio-radar support facilities.

It can also be of use to commanders, staff officers and military air traffic
controllers in their practical activities pertaining to organization of con-
trol of aircraft in the air and air operations safety.

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