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22 May 1981

USSR Report

ELECTRONICS AND ELECTRICAL ENGINEERING

(FOUO 6/81)

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USSR REPORT

ELECTRONICS AND ELECTRICAL ENGINEERING

(FOUO 6/81)

CONTENTS

ANTENNAS

UDC 621.317.088:621.317.342

SUPPRESSION OF RADIATION OF A PARABOLIC HORN ANTENNA ON THE E_{01} WAVE

Moscow ELEKTROSVYAZ' in Russian No 1, Jan 81 pp 58-61

[Article by A. A. Metrikin and V. G. Petrova, manuscript received 26 March 1980]

[Text] Introduction. Parabolic horn antennas (RPA) are used widely on radio relay lines (RRL) in the ranges of 4 and 6 GHz [1,2]. Circular waveguides with the diameter 2a = 70 mm are used as feeders. The fundamental wave is H_{11}. In the range of 4 GHz ($2.85 \leqslant ka \leqslant 2.49$, $k = 2\pi/\lambda$), along with the fundamental wave H_{11}, an E_{01} having a different group velocity of propagation propagates in the waveguide. In the range of 6 GHz ($4.11 \leqslant ka \leqslant 4.55$), E_{01}, E_{11}, H_{21}, H_{01} waves also propagate in a 70 mm-diameter waveguide.

The greatest influence on the operation of RRL within the range of 6 GHz is exerted by E_{01} and E_{11} waves which have a longitudinal component of the electric field ($E_z \neq 0$). The mechanism of the formation of parallel flows due to parasitic waves is examined in [2]. Let us only mention that during the formation of parallel flows the main RRL parameter -- nonuniformity of the group delay time changes and, as a result of this, there occurs a nonlinear transition noise in the telephone channels.

The excitation of parasitic waves E_{01}, E_{11} and others is caused both by nonuniformities of the waveguide channel (steps, ellipticity, bends of the channel), and by inaccurate orientation of the RPA during the reception or transmission of energy, i.e., when the RPA is turned away from the main direction of energy reception.

Below are given the results of experimental studies on the operation effectiveness of an absorber of the parasitic wave E_{01} inscalled in a circular waveguide. The effectiveness of suppression is evaluated by the decrease in the energy level of the E_{01} wave in the RPA.

Experimental Conditions. Studies were conducted on an RPA-2P-2 antenna (Figure 1) in the reception mode. The antenna was installed on a tower 20 meters high. The transmitting antenna was excited on an H_{11} wave with horizontal or vertical polarization of the field. For receiving the E_{01} wave, a E01-wave exciter (Figure 2) was connected to the waveguide. The exciter is a coaxial transition with an oscillator oriented along the axis of the waveguide where the field E_z of the E_{01} wave is maximal. The connection of the exciter with the RPA is shown in Figure 1b.

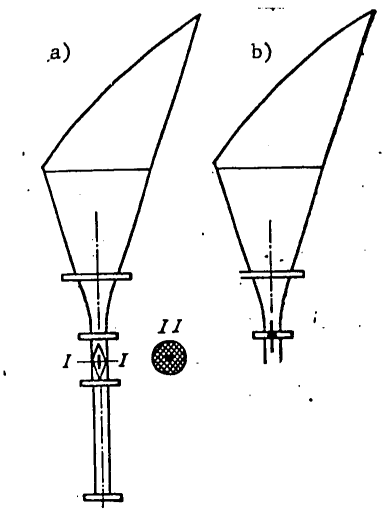

Figure 1

A glass rod with an oxide film was used as an absorber of the E_{01} wave over the range of 4 GHz. The length of the rod was 200 mm, its diameter was 2 mm, and the direct-current resistance was 2000 ohms. The rod was installed along the axis of the waveguide with a diameter of 70 mm in a foam plastic holder (Figure 3a). The design of the absorber was somewhat different for the range of 6 GHz. We used four glass rods (resistors) which were installed at the points where E_z was maximal for the E_{11} wave. One pair was intended for suppressing the E_{11} wave with horizontal polarization of the field, the other pair -- with vertical polarization. The two pairs of glass rods absorb, although less effectively, also the E_{01} wave. The glass rods in this case were fastened with capron threads (Figure 3b).

Results obtained. Directional patterns of the RPA were obtained in two frequency ranges (f = 3.68 and 5.86 GHz) in the horizontal plane on the E_{01} wave for the cases with and without the absorber. The energy level of the E_{01} wave was read from the energy level of the H_{11} wave received from the principal direction.

The directional patterns of the RPA on the E_{01} wave at a frequency f = 3.68 GHz for horizontal and vertical polarizations of the field during transmission are shown in Figures 4 and 5, respectively (solid line -- without the absorber, broken line -- with the absorber). As can be seen from Figure 4, the attenuation of the field in the main direction is $\sim$ 30 dB in relation to the H_{11} wave. The maximum level of the field on the E_{01} wave is minus 8 dB at the angles of $\pm$1.25 degrees. When the absorber of the E_{01} wave is installed in the wave guide, the field level of this wave attenuates considerably (in this case by 36 dB).

In the case of the vertical polarization of the field (Figure 5), due to the absence of symmetry along the electric field, there is no dip on the E_{01} wave during the reception from the main direction. The level of the field excited in the receiving

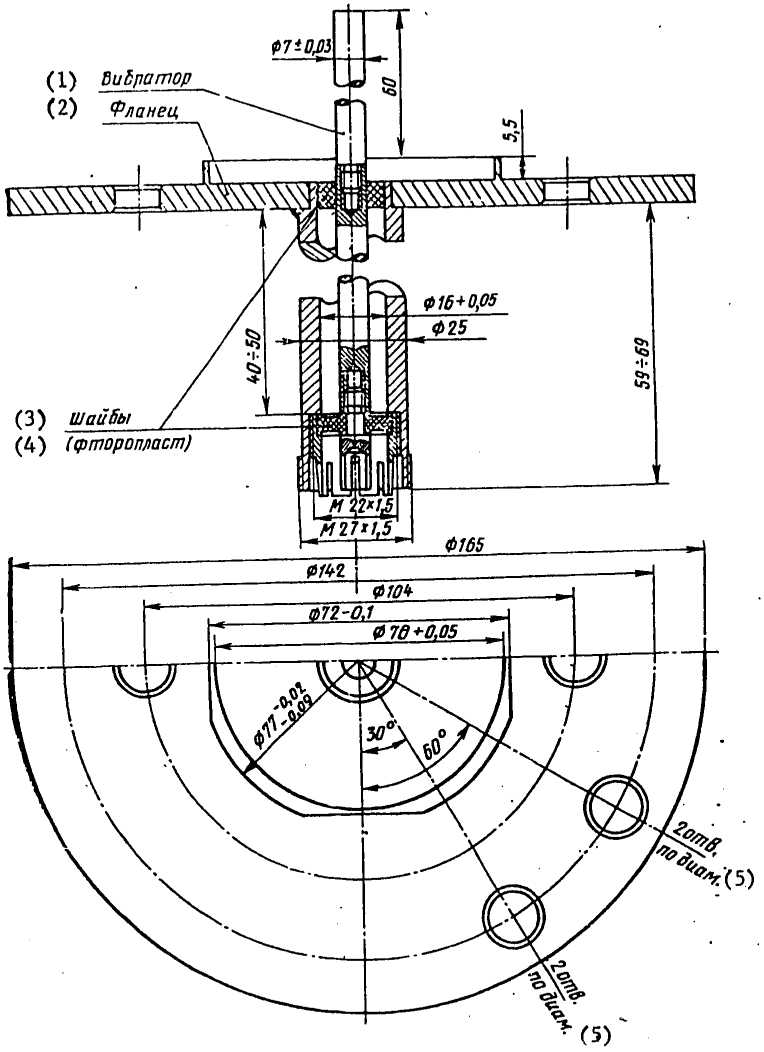

Figure 2

Key: 1. Oscillator
2. Flange
3. Washers
4. (Fluoroplastic)
5. 2 Apertures along the Diameter

antenna on the E_{01} wave is considerably lower than the level of the field in the case of horizontal polarization. In this case, the absorber noticeably attenuates the level of the side lobes (of the order of 20 dB) of the E_{01} wave.

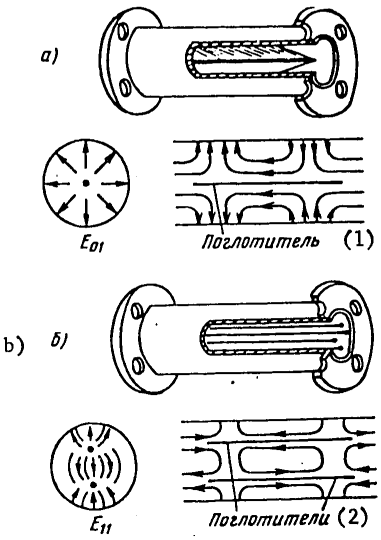

Figure 3

Key: 1. Absorber
2. Absorbers

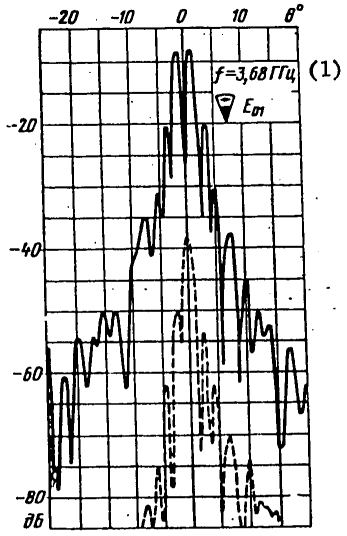

Figure 4

Key: 1. GHz

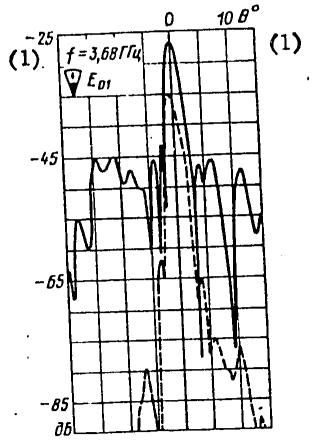

Figure 5.
Key: 1. GHz

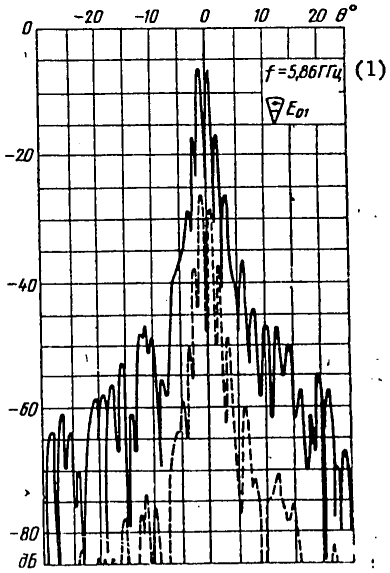

Figure 6
Key: 1. GHz

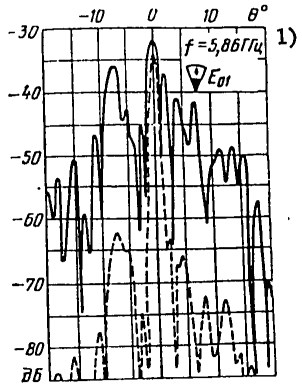

Figure 7
Key: 1. GHz

Analogous directional patterns for the frequency f = 5.86 GHz are shown in Figures 6 and 7. It can be seen from them that the installation of the absorber of the E_{01} wave in the circular waveguide considerably lowers its level.

A good symmetry of the directional patterns of the antenna on the E_{01} wave with a deep trough in the principal direction during horizontal polarization of the incident field can be used for accurate orientation of the antenna in the horizontal plane at a minimal level of the parasitic wave E_{01}. Experience shows that with this method the RPA can be oriented accurate to $\pm 5'$. In the case of the orientation in the vertical plane, the incident field must have vertical polarization. Let us note that the method of the orientation of antennas on the principal wave H_{11} which was used until recently does not make it possible to align the antenna in the principal direction of radiation with such a high degree of accuracy.

Conclusions. 1. Absorbers lower the level of the E_{01} wave to minus 25 dB (maximum value) instead of 7-8 dB (maximum value).

2. For accurate alignment of an RPA, it is recommended to use the method of orientation by the E_{01} wave at its minimal level.

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CSO: 1860/225

UDC 621.396.677:629.733

ANTENNAS OF 'MOSKVA' STATIONS

Moscow ELEKTROSVYAZ' in Russian No 1, Jan 81 pp 61-64

[Article by A. G. Kvitko and A. M. Pokras: "Antennas of 'Moskva' Stations", manuscript received 13 May 1980]

[Text] The role and place of the satellite television broadcast system "Moskva" were defined in [1,2]. The same works gave the basic characteristics of the equipment of the receiving ground station (ZS). The purpose of this work is a more detailed description of the antennas of the stationary and transportable stations (Figure 1).

The ZS antenna had the following requirements: gain coefficient (KU) in the sector of angles $\pm$1 degree not lower than 35 dB, noise temperature during the direction of the beam at an angular altitude of 5 degrees not over 70 K, level of the first side lobe not over minus 20 dB, work at circular polarization with an ellipticity factor (KE) of not less than 0.7, manual coarse adjustment of the antenna beam within the limits of $\pm$90 degrees by the azimuth and 0-60 degrees by the angular altitude, smooth manual adjustment by the azimuth and angular elevation $\pm$5 degrees, the possibility of adding a servo drive for operation in the mode of automatic tracking with smooth beam guidance by two axes within the limits of $\pm$2.5 degrees, simplicity and technological effectiveness of the design.

The antenna used a series produced mirror 2.5 meters in diameter with an angular aperture of 160 degrees and a focal distance of 750 mm. With the above-mentioned diameter, it is possible to fulfill the requirement for a low level of side lobes, ensuring the prescribed gain. The lowering of the level of side radiation is achieved due to a rapid drop of the amplitude of the field toward the edges of the mirror aperture at a low blockage of the aperture by the feed. Therefore, the irradiation of the mirror is designed as a single-mirror circuit. The small dimensions of the mirror eliminated the possibility of using a two-mirror irradiation circuit, because in the range of 4 GHz the minimum size of the counter-reflector would exceed 0.5 m and the aperture blockage would become impermissibly great.

The requirement for operation with circular polarization made it practical to use a simple spiral feed (Figure 2). It is a double-screw logarithmic spiral excited by a coaxial balun. The latter is designed in the form of two half-wave diametrically opposite longitudinal slits in the external conductor of the coaxial line. One of the sides of the slits in the middle is connected by a short-circuiting jumper with

the central conductor. A circular short-circuiting jumper is installed at the end of the balun.

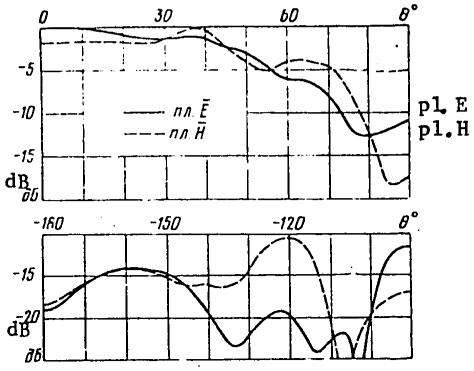

Figure 3

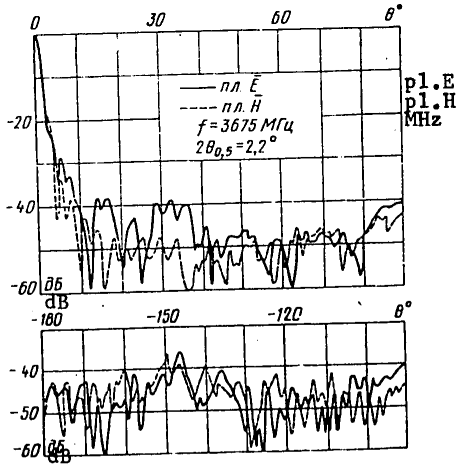

Figure 4

In order to match the effective resistance of the balun loaded with spirals and the coaxial line with a wave resistance of 50 ohms, a transformer in the form of a quarter-wave insert was introduced in the central conductor. The reactive components are matched by means of adjustment screws passing through the external coaxial conductor which further passes through the side waveguide-to-coaxial adapter to the waveguide with a cross section of 58X25 mm. The dimensions of the spirals are selected in such a way that in the direction of the edges of the mirror (angles $\pm$80 degrees) the irradiation level along the directional pattern (DN) of the feed

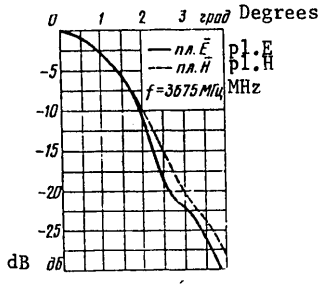

Figure 5

fell by 11.5 dB. With the consideration of the difference of the routes from the phase center of the feed to the center and the edges of the mirror, the drop in the excitation tc the edges of the aperture reached minus 16 dB. In this case, it was possible to obtain the ellipticity of the coefficient of the antenna higher than was prescribed.

The directional patterns of the feed and the antenna are given in Figures 3, 4, and 5 (due to the symmetry, halves of the DN are given). The level of the first side lobe does not exceed minus 20 dB. Measurements showed that the antenna had the following characteristics: KU at a frequency of 3675 MHz was 37.5 dB (KIP 0.61) and in the sector ± 1 degree not less than the prescribed 35 dB, KE did not exceed 0.85, KSV [standing wave ratio] at the input of the feed in the working range was not over 1.2.

In order to reduce the power of the electric servo drive, the orientation of the beam in the automatic-tracking variant of the antenna (Figure 6) is done without turning the mirror. As it follows from the DN shown in Figure 4, the prescribed limits of guidance to ± 2.5 degrees are approximately one width of the DN with respect to the level of half-power. Such a turn of the beam can be obtained by transverse shifting of the feed by 40 mm with a gain loss of less than 0.5 dB [3]. In order to simplify the design, the carrier pipe of the feed was secured on two hinges located in the vicinity of the top of the mirror which made it possible to move the feed in two orthogonal planes by turning the carrier pipe. Since the distance from the hinges to the phase center of the feed was about 0.8 m, the circular arc practically does not differ from the chord when the swing angle is small.

The swinging device of the feed is equipped with an electric servo drive. The beam is moved with a discreteness of 12' on commands from a two-coordinate extremal automatic device which performs consecutive searching of the extremum along two axes. Structurally, discreteness is achieved with the aid of the combination of reducers and a "Maltese cross" which eliminates uncontrolled turns due to the "rundown" of the motor after de-energization.

The stand on which the antenna for ZS is installed is stationary (Figure 7) and is a combination of welded frames connected with hinges and joined with rods whose lengths can be regulated with the aid of turnbuckles 5, 6. The location points of the hinges are selected on the basis of the prescribed angular coordinates of the

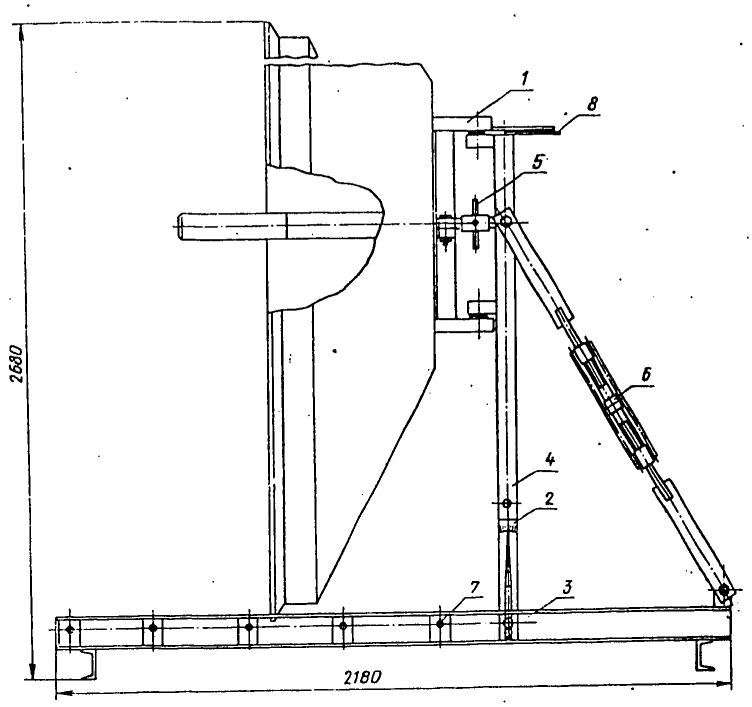

Figure 7

ISZ [artificial earth satellite]. For this purpose, holes 7 are drilled in the walls of the frames. The bolts inserted into them connect the horizontal frame 3 with frame 4. The horizontal frame is positioned approximately along the prescribed azimuth. On frame 4, also on hinges, is attached frame 1 to which the mirror is bolted. The mirror turns smoothly with the aid of turnbuckles along the azimuth at $\pm$7.5 degrees and turns up and down at $\pm$5 degrees. The readings of the angles are taken from scales 2 and 8. In this manner, the beam of the antenna is guided to the ISZ. If an electric drive is installed on the antenna, further ISZ tracking, if necessary, can be achieved by the swinging of the feed.

The stand for the antenna of a transportable station is shown in Figure 8. Its substantial differences from the stand for a stationary variant are explained by the following circumstances: the antenna arrangement must be compact and allow for the possibility of setting the mirror in the transportation position (zenith). Accordingly, the limits of the angular elevation turns of the mirror are widened from 0 to 90 degrees, which is accomplished with the aid of sectional pull rods 1. Smooth manual angular elevation adjustment is done within the limits of $\pm$10 degrees with the device 2 (a motion screw and a nut) fixed in the required part of the sectional pull rods. The chassis of the trailer of the station is preset in the position along the prescribed azimuth. Smooth adjustment is done manually with turnbuckle 3. Since the antenna is rigidly fixed to the chassis on which the cabin is situated,

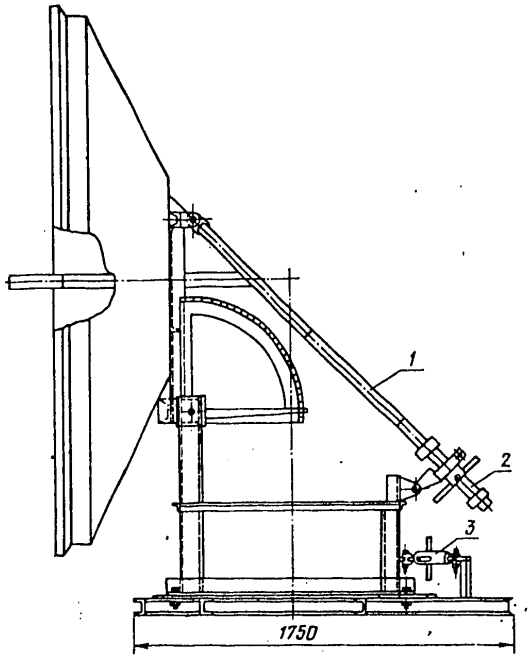

Figure 8

the limits of the movement of the mirror along the azimuth were increased to ±10 degrees.

The designs of the stands of both types allow for the possibility of installing an electric drive for swinging the feed.

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10,233
CSO: 1860/225

COMMUNICATIONS, COMMUNICATION EQUIPMENT, RECEIVERS AND TRANSMITTERS, NETWORKS, RADIO PHYSICS, DATA TRANSMISSION AND PROCESSING, INFORMATION THEORY

BOOK DISCUSSES CONSTRUCTION OF LONG-DISTANCE COMMUNICATIONS CABLE LINES

Moscow UKAZANIYA PO STROITEL'STVU MEZHDUGORODNYKH KABEL'NYKH LINIY SVYAZI in Russian 1972 pp 3, 568-575

[Foreword and table of contents from book "Instructions for the Construction of Long-Distance Communications Cable Lines", Izdatel'stvo "Svyaz'"]

FOREWORD

/Text/ Existing statutes on rules, directions, instructions, technical conditions, state standards and so forth were used as the basis for drawing up these Instructions for the construction of long-distance communications cable lines.

The content of these Instructions corresponds to the present-day level of equipment, technology and organization of the construction of long-distance communications cable lines. The Instructions incorporate experience that has been accumulated in designing, constructing and operating long-distance communications cable lines, the industrialization and mechanization of construction and the use of leading labor methods.

These instructions must be observed by construction, design, operational and other organizations of the USSR Ministry of Communications. The publication of these Instructions renders the "Rules for the construction of long-distance communications cable lines", published in 1958, null and void.

These Instructions were developed by the Giprosvyaz' /State Institute for the Surveying and Designing of Communications Installations/ Institute, reviewed by an expert commission, revised and edited by the Orgtekhsvyaz'stroy /communications construction/ Trust. The development, delivering of an expert opinion and revision work involved leading specialists from construction, designing, operational, and scientific-research organizations of the USSR Ministry of Communications.

Chapters 1, 2, and 3 were compiled by D.A. Baron, Chapter 4 by N.S. Oreshkin and A.D. Isayevich, Chapter 5 by A.D. Isayevich, Chapter 6 by Ye.A. Kozyreva and N.A. Osipov, Chapter 7 by D.A. Baron and B.I. Gershman, Chapter 8 by A.Ye. Slavina, Chapter 9 by N.S. Oreshkin and A.D. Isayevich, Chapter 10 by K.P. Fomin, A.D. Isayevich and N.K.

Gorodetskaya, chapters 11, 12 and 13 by V.N. Akulenk. Chapter 14 by Yu.G. Fedorov, chapters 15 and 16 by V.A. Shipilov and D.M. Samorukov, Chapter 17 by F.L. Letichevskiy, D.Yu. Brodskaya, A.Ye. Slavina and D.I. Kifer, and the appendices were compiled by M.P. Solov'ev and D.A. Baron.

The Instructions were reviewed by an expert commission of the USSR Ministry of Communications. The commission members were: N.S. Glagolevskiy (chairman), M.K. Titov (deputy chairman), G.S. Mizheritskiy, M.T. Nefedov, A.N. Golubyatnikova, V.P. Skripnik. V.N. Alekseyev, A.Ye. Yakovich, P.P. Dorozhko. M.D. Mel'nikova, V.I. Chesnokova. The expert conclusion with specific recommendations was prepared by a working group of the commission, comprised of: D.A. Baron, A.D. Isayevich, G.S. Mizheritskiy and V.P. Skripnik.

All comments and suggestions concerning the Instructions should be sent to the SVYAZ' Publishing House (Moscow-Center, Chistoprudnyy Boulevard, 2).

Main Administration of Capital Construction of the USSR Ministry of Communications, Giprosvyaz' and Orgtekhsvyaz'stroy.

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INSTRUMENTS, MEASURING DEVICES AND TESTERS, METHODS OF MEASURING, GENERAL EXPERIMENTAL TECHNIQUES

UDC 621.396.621.53.029.65:537.312.62

MODULATION SUPERHETERODYNE RADIOMETER OF THE 2-mm WAVE BAND WITH A JOSEPHSON FREQUENCY CONVERTER AT THE INPUT

Moscow RADIOTEKHNIKA I ELEKTRONIKA in Russian Vol 26, No 1, Jan 81 (manuscript received 4 Dec 79) pp 167-172

[Article by V. S. Ablyazov, S. A. Andreyev, A. N. Vystavkin, V. N. Gubankov, V. P. D'yakov, A. P. Zhukov, A. G. Kislyakov, K. A. Rulev, M. A. Tarasov, S. Yu. Turygin, V. I. Chernyshev]

[Text] This is a report on successful tests of a Josephson superheterodyne radiometer of the 2-mm wave band on the RT-25 X 2 radio telescope of the IPF [Institute of Applied Physics] of the USSR Academy of Sciences. The results obtained make it possible to refine the determination of the brightness temperature of the sun in this band.

Introduction

Although superheterodyne radiometers of the shortwave part of the mm-wavelength band are inferior to crystal video radiometers with respect to the level of the threshold signal ΔT_{fl} [1], they cannot be replaced by the latter in studying spectral characteristics of radiation. At the present time they are actually the only receivers of radiation in this band which preserve information on the phase of the signal. In recent years, the problem of increasing the sensitivity of superheterodyne radiometers has aroused great interest in Josephson's down converters of frequency [2,3,4]. These works presented a detailed study of the operation mechanism of such mixers and demonstrated their high potential sensitivity. However, the laboratory models of mixers used there could not be used in real radiometers due to imperfections in the design.

This work reports on the design, parameters, and results of field tests of a superheterodyne radiometer of the 2-mm wavelength band with a Josephson frequency converter at the input developed by the IRE [Institute of Radio Engineering and Electronics] of the USSR Academy of Sciences. Field tests of the radiometer were conducted on the RT-25 X 2 radiotelescope of the IPF of the USSR Academy of Sciences (Gor'kiy).

1. Design of the Radiometer

The radiometer has a modulation circuit with a pattern switch at the input [1] (direct losses 0.5 dB). In order to reduce losses, the input channel is made of

circular oversized waveguides 19.6 mm in diameter. Figure 1 shows a schematic of the mixing chamber, and Figure 2 shows its general appearance. The pressure-type superconducting point contacts (STK) used in it have a resistance in the normal state of R = 15 ... 80 ohms and characteristic voltage $V_c=I_cR=300...600$ microvolts; I_c -- critical current of STK.

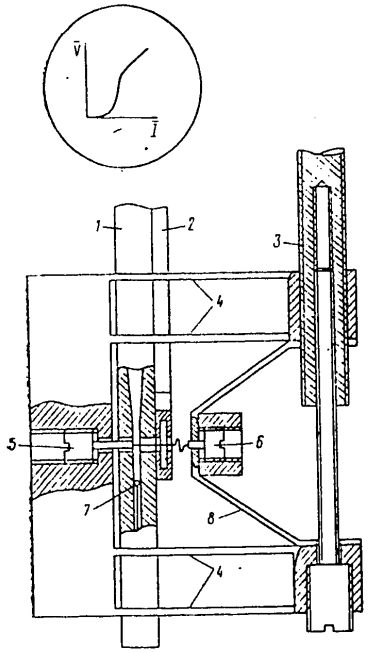

Figure 1. Schematic of the mixing chamber: 1 -- signal waveguide; 2 -- heterodyne waveguide; 3 -- differential screw; 4 -- parallelogram springs; 5 -- target; 6 -- needle holder; 7 -- piston; 8 -- V-shaped spring. The insert shows the volt-ampere characteristic of a typical superconducting point contact used in radio astronomy observations.

The needle was sharpened and the end of the target was cleaned on a special disc covered with abrasive paper No 00. The disc was rotated ($\lesssim$ 10 rpm) by a micromotor. After the treatment on the abrasive paper, the electrodes were washed in oxygen-free water. The assembled mixing chamber was immediately placed in a thin-walled stainless steel housing. The housing was filled with gaseous helium, which prevented the contamination of the electrodes. The exposure of the electrodes to atmospheric air did not exceed 15 minutes. The housing protected the mixing chamber against shocks during its submerging into the Dewar vessel, and also made it possible to cool the chamber in a Dewar vessel with liquid nitrogen prior to its submerging into liquid helium.

The contacting was done after the mixing chamber was placed in the Dewar vessel filled with liquid helium. The formation of the STK and the selection of its parameters were done with the aid of a pull rod extended to the cap of the Dewar vessel. The pull rod put in motion a pair of parallelogram springs rigidly connected with the needle. The use of the parallelogram pair ensured both a smooth contacting of the electrodes and the protection of the STK against external mechanical influences (shocks).

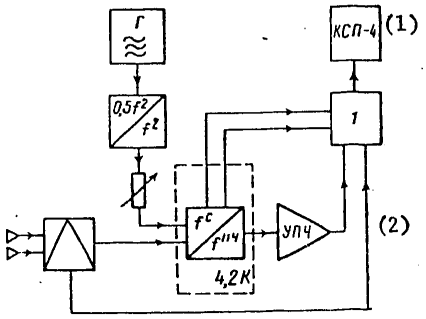

Figure 3. Block diagram of the 2-mm band radiometer: 1 -- circuit of prescribing the operating point and joining with the low-frequency part of the modulation radiometer.

Key: 1. KSP-4 recorder
2. UPCh [intermediate-frequency amplifier]

Figure 3 shows a block diagram of the radiometer. A semiconductor frequency doubler fed from a standard 4-mm generator G3-37 was used as a heterodyne. Heterodyne radiation was delivered to the STK through a separate channel. The connection between the signal channels and the heterodyne was accomplished only through the flow of current through the STK, i.e., it was reduced to a minimum. The latter reduced the depths of parasitic modulation of the heterodyne radiation at the input modulator of the radiometer [4]. When the 10-liter transportation helium Dewar vessel containing the mixing chamber was filled completely, it was possible to work continuously in the course of 48 hours. This length of operation is not at all maximal and later it will be increased by at least one order through the introduction of thin-walled waveguides of stainless steel, instead of the copper ones, in the section of the heterodyne channel, as well as by using a Dewar vessel which will make it possible to add liquid helium periodically in the process of operation.

The low-frequency part of the modulation radiometer was structurally connected with the circuit for prescribing the operating point (SZRT). The SZRT ensured both the observation of the volt-ampere characteristics (VAKh) of the STK on the oscillograph (sweep frequency 90 Hz), and their recording on a XY-recorder (sweep period from 10 seconds to 40 minutes). Moreover, the SZRT made it possible to regulate independently the amplitudes of the variable and constant components of the current flowing through the STK. The insert in Figure 1 shows the VAKh of typical STK used in radio astronomy observations. In order to suppress the modulation-demodulation [4],

the work was done in the mode of prescribing a constant voltage on the STK, which was ensured by a circuit of low-frequency shunting of the STK built into the SZRT.

A transistor amplifier with a noise factor of $\sim$ 3 dB and a band of amplified frequencies $f^{\text{ПЧ}}$ =200...400 MHz was used as an UPCh. The low value of $f^{\text{ПЧ}}$ made it possible to perform all measurements only in a two-band mode. In order to reduce the influence of the background and to suppress parasitic signals on frequencies multiple to the frequency of the signal, a resonant diaphragm similar to the one described in work [4] was installed directly before the mixer. Registration of signals was done with the aid of a KSP-4 recorder connected at the output of the synchronous detector.

The value of ΔT_{f1} was measured in the process of the laboratory tests of the radiometer. Measurements were done with the aid of two matched loads applied to the inputs of the pattern switch. One of the loads had a constant temperature of 290 K, while the temperature of the other load was changed from 290 to 77 K. The value of the signal/noise ratio measured at that time corresponded [1] to ΔT_{f1} adjusted to the input of the pattern switch, being equal to 0.2...0.3 K at a time constant of 1 sec for the overwhelming majority of the contacts. The best registered value of ΔT_{f1} was 0.12 K, which is not any inferior than the sensitivity of the best modern superheterodyne radiometers of the 2-mm band [5] which, however, use UPCh having a noise temperature which is 4...5 times lower.

Since the main contribution to the total noise of the receiver was that of the UPCh, further improvement of the sensitivity of the radiometer must be connected primarily with the use of transistor amplifiers with a lower value of the noise factor. It is feasible to reduce the ΔT_{f1} to approximately one half. It is also possible to increase somewhat the conversion factor and, accordingly, to increase the sensitivity by narrowing the band of the input filter (approximately by a factor of 1.5). A more radical increase of sensitivity is possible through the use of cooled UPCh. For example, by using a maser as an UPCh [6], it is possible to improve the ΔT_{f1} approximately to 0.02 K, which is substantially better than the ΔT_{f1} which can be obtained with mixers of other types.

2. Results of Radio Astronomy Observations

In March 1979, the radiometer was installed on a radio telescope of the millimeter wavelength band RT-25X2 [7] of the IPF of the USSR Academy of Sciences (Gor'kiy).

The matching of the radiometer with the antenna of the radiotelescope was accomplished with the aid of two parabolic-horn feeds of the 2-mm band [8] which had a horizontal diversity of 4 angular minutes. The horns ensured cosinusoidal irradiation of the parabolic reflector and reception of radiation from a source of only one polatization -- vertical. The losses in the feeds did not exceed 2 dB.

The antenna system of the RT-25X2 is periscopic with a flat reflector with whose aid the elevation guidance to the source is accomplished and which ensures (at its vertical position) the mode of monitoring and studying the directional characteristics of the antenna by the autocollimation method [7,9]. The autocollimation method in application to the RT-25X2 makes it possible to register the field distribution in the focus of the antenna and thus to measure the directional pattern of the telescape in its far zone. Figure 4 shows a horizontal section of the directional

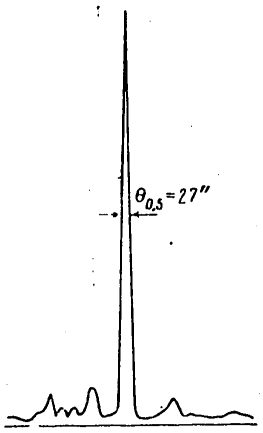

Figure 4. Horizontal section of the directional pattern of the RT-25X2 on a 3-mm wave obtained by the autocollimation method.

pattern of the RT-25X2 on a 3.1-mm wave obtained by the autocollimation method with the aid of the radiometer described above. The directional pattern of the RT-25X2 is of the beavertail-type -- narrow in the horizontal plane and wide (wider by approximately one order) in the vertical plane. On a 3.1-mm wave, the width of the principal lobe of the directional pattern at the half-power level was $\theta_{0.5h}$ = 27" in the horizontal plane and $\theta_{0.5v}$ = 5' in the vertical plane. On a 2.2-mm wave, we have respectively $\theta_{0.5h}$=20" and $\theta_{0.5v}$=3.5'. The level of the side lobes in this case, according to our evaluation, was of the order of 14% of the principal with respect to the amplitude, the antenna surface utilization factor was about 30%, and the effective surface of the antenna was 15 m^2. The threshold signal level on the antenna was 0.3 K. Somewhat lower sensitivity in comparison to that measured under laboratory conditions can, possibly, be explained by the losses introduced by the feeds of the antenna.

During the testing of the radiometer on the RT-25X2, radio emission of the sun, moon, and the atmosphere was measured. It was impossible to fulfill the program of observations of planets and discrete sources due to bad weather conditions.

Figures 5 and 6 show central scans -- recordings of the passing of the sources of radio emission through the directional pattern of the telescope (the sun and the moon, respectively). Observations of the moon and the sun were conducted on the 27, 28, and 29 of March 1979. On March 28th, the sun and the moon had almost equal heights at the moment of culmination (difference in the heights -- 1.3 degrees), and the moments of observation differed only by 16 minutes. The phase angle of the moon was equal to 177.7 degrees; the illuminated part of the disk of the moon K=0 -- new moon.

In such a case, it is possible to assume that the absorption of radio emission in the earth's atmosphere on the reception beams remained practically constant at the

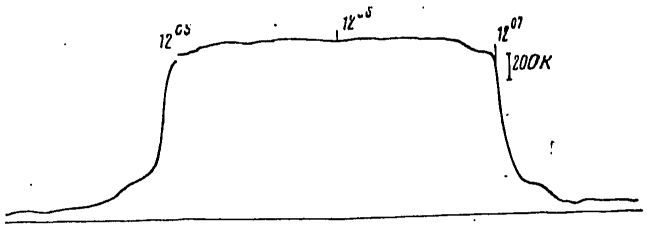

Figure 5. Central scan of the sun on a 2.2-mm wave obtained on the RT-25X2 on 28 Mar 79, T_{ca}=1424 K -- antenna temperature of the sun.

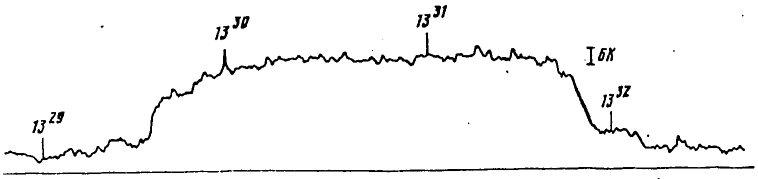

Figure 6. Central scan of the moon on a 2.2-mm wave obtained on the RT-25X2 on 29 Mar 79, $T_{Ла}$ = 39 K -- antenna temperature of the moon.

moments of observation of the sun and the moon, and the directional characteristics of the antenna did not change when it was retuned from the sun to the moon. With these assumptions, let us evaluate the brightness temperature of the sun on a 2.2-mm wave by the new moon which we shall use as a radiation standard [10].

Let us calculate the temperature of the moon on a 2.2-mm wave. Let us take into consideration that the directional pattern of the RT-25X2 is of the beavertail-type and, therefore, the effect of the averaging of the moon temperature by the directional pattern [11] in our case can be considered only in one plane -- vertical, taking only the dependence of the moon temperature on the selenographic latitude. We shall take the form of the directional pattern within the limits of the disk of the moon on the basis of measurements by the autocollimation method. The brightness temperature of the moon was calculated by the relation (13) from work [12] on the basis of the available data of works [13,14] with consideration for the latitudinal changes of the reflection coefficient for vertical polarization. The table shows: values of the phase angle of the moon Φ^{O}, brightness temperatures of the center of the moon $T_{Л}$ (0), values of average brightness temperatures of the moon $\overline{T}_{Л}$ with consideration for the directional pattern and brightness temperatures of the sun $T_{C}=k\overline{T}_{Л}$, where $k=\alpha_{C}/\alpha_{Л}$ -- ratio of the increment of the signal from the sun to the increment of the signal from the moon at the input of the radiometer. It can be seen that the brightness temperature of the sun on a 2.2-mm wave according to our data is $T_{C}=5300\pm100$ K. We did not take into consideration the possible errors due to inaccurate orientation of the antenna, due to instrument fluctuations and changes of the coefficients of absorption in the atmosphere, as well as due to changes in the characteristics of the antenna during its retuning.

Date	Φ°	$T_{д}(0)$, K	$\bar{T}_{д}$, K	k	$T_{с}$, K
27/III-79 г.	164,5	153	146	36,7	5366
28/III-79 г.	177,7	149	143	36,8	5268
29/III-79 г.	167,8	152	146	36,2	5282

The result obtained by us differs from the accepted value of the brightness temperature of the sun in the 2-mm wavelength band equal to 5600 K. It is impossible to explain this difference, for example, by the absorption of radiation proceeding from the lower layers of the chromosphere of the sun or by high and cold formations (spicula), since the level of the sun in the scans was practically over the entire disk (within the limits of 0.8 of the sun's diameter). It is evident that it is necessary to select the parameters determining the brightness temperature of the moon more correctly.

The authors are grateful to the members of the IPF of the USSR Academy of Sciences who participated in the preparations and observations on the RT-25X2, to V. D. Krotikov for the fruitful discussions of the results of observations, as well as to the members of the Radio Engineering Institute-7.5/250 of the MVTU [Moscow Higher Technical School] imeni N. E. Bauman, where preliminary tests of the first variant of the radiometer were conducted.

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10,233
CSO: 1860/232

MICROELECTRONICS

INSTRUMENTS OF FUNCTIONAL SEMICONDUCTOR ELECTRONICS

Moscow NOVOYE V ZHIZNI, NAUKE, TEKHNIKE. SERIYA "RADIOELEKTRONIKA I SVYAZ'": PRIBORY FUNKTSIONAL'NOY POLUPROVODNIKOVOY MIKROELEKTRONIKI in Russian No 2, Feb 81 (signed to press 13 Jan 81) pp 2-5

[Annotation, foreword by L. D. Bakhrakh, corresponding member of the USSR Academy of Sciences, and table of contents from book "News in Life, Science and Technology. Series 'Radioelectronics and Communications': Instruments of Functional Semiconductor Electronics", by Dmitriy Vasil'yevich Igumnov, candidate of technical sciences, and Galina Petrovna Kostyunina, candidate of physical and mathematical sciences, Izdatel'stvo "Znaniye", 38,180 copies, 64 pages]

[Text] This pamphlet treats the most developed directions of modern functional semiconductor microelectronics and the effects on which they are based. More attention is given to instruments with the MOP [metal-oxide-semiconductor] structure.

Foreword

Microelectronic products greatly improve technical and economic indexes of electronic equipment and open up a number of new possibilities. Solid integrated circuits whose main elements are designed as transistor structures of various properties and types have become the most popular. However, further development of transistor microelectronics has a theoretical limit due to design complexity, decrease in the reliability, power consumption, etc.

These limitations can be overcome only by changing over to the development of new directions in microelectronics. The main tendency of such development amounts to functional consolidation of structural devices. This consolidation is feasible with the use of physical phenomena which make it possible, with the aid of simple unseparable structures, to perform the functions which are usually performed with the aid of a complex multielement circuit or device. Implementation of this principle is due to the appearance of new types of devices which are usually called functional and, consequently, a new stage in the development of microelectronics: functional microelectronics.

In functional microelectronics, the carrier of information is a multivariant signal whose parameters are controlled by the dynamic nonuniformities of the medium occuring under the effect of the control signal. In functional devices, it is often impossible to isolate the areas performing definite specialized functions which are

capable of processing multivariant functions. The use of functional devices increases considerably the productivity of information processing systems at prescribed dimensions and power consumption, which is equivalent to a sharp increase in the degree of integration in comparison with the classical integrated circuits.

In functional microelectronics, the element itself is sometimes multifunctional. In addition to its main functions, it is capable of performing other functions.

An ideal functional device capable of performing the function of some device as a whole.

Functional microelectronics is characterized by the use of a large number of different phenomena. Apart from purely electrical circuits, it utilizes optical, acoustic, magnetic, chemical and other phenomena in solids.

This pamphlet describes instruments of functional semiconductor microelectronics.

Along with the instruments of functional microelectronics which have been developed, the authors discuss the ways of designing new instruments, as well as the tendencies of the development of functional microelectronics. Therefore, various directions of functional microelectronics are described in the pamphlet at different lengths.

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PUBLICATIONS, INCLUDING
COLLECTIONS OF ABSTRACTS

UDC 621.314.214

BOOK DISCUSSES DESIGN AND OPTIMIZATION CRITERIA FOR SEMICONDUCTOR DEVICES

Kiev OPTIMIZATSIYA POLUPROVODNIKOVYKH USTROYSTV ENERGETICHESKOY ELEKTRONIKI in Russian 1980 (signed to press 29 Sep 80) pp 2, 145

[Annotation and table of contents from book "Optimization of Semiconductor Devices for Power Electronics", edited by V. Ya. Pekurovskiy and L. D. Prokopenko, Izdatel'stvo "Naukova dumka", 800 copies, 145 pp]

[Text] The collection contains articles devoted to questions of the optimization and design of semiconductor devices intended for transformation of the parameters of electromagnetic energy: frequency converters, rectifiers, voltage regulators and stabilizers and secondary power sources.

It is intended for scientific and engineering and technical personnel specializing in the area of converter technology and automation equipment.

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9194
CSO: 1860/216

A CONCISE DICTIONARY OF RADIO-ELECTRONICS

Moscow KRATKIY SLOVAR' PO RADIOELEKTRONIKE in Russian 1980 (signed to press 19 Feb 80) pp 2-3

[Annotation and foreword from book "A Concise Dictionary of Radio-Electronics", by Anatoliy Pavlovich Verzhikovskiy (deceased), Nikolay Vladimirovich Gabis (deceased), Nikolay Mikhaylovich Kitayev, Ivan Ignat'yevich Tynyankin and Vladilen Grigor'yevich Grigor'yants, Voyenizdat, 25,000 copies 512 pages]

[Text] This edition of "A Concise Dictionary of Radio-Electronics" is a second revised and enlarged edition of the dictionary published in 1964.

The dictionary includes about 4,000 terms relating to radar, radio communications, radio navigation, television, remote-control, automation, radiometeorology, hydroacoustics, infrared technology, electronics, computer engineering, radiometrics, antenna systems, radio camouflage and electronic countermeasures; in addition, the dictionary lists the names of certain foreign radio-electronic systems and explains their designations.

The terms explained in the dictionary are arranged in alphabetical order and are set in bold-face capital letters. If a term explained in an entry is repeated, the term is designated by the initial letters of each of the constituent words in the term, each followed by a period. Certain of the terms explained are followed by their accepted abbreviations and explanations in parentheses. Explanations which are necessary for revealing the essence of the term and which are discussed in other articles are set off in italics. A system of symbols and abbreviations has been extensively employed in the book in order to reduce the length of the entries.

Open-source domestic as well as foreign (American, British, French and German) books, technical and military journals, reference books, official publications and other types of literature were used in compiling the book.

This dictionary is intended for a broad circle of readers concerned with questions of radio-electronics.

We request that all comments and wishes regarding the content and design of this dictionary be sent to: 103160, Moscow, K-160, Voyennoye izdatel'stvo.

9512
CSO: 1860/195

UDC 621.396:519.2-526

CONTROL OF TERRESTIAL ANTENNAS AND RADIOTELESCOPES

Moscow UPRAVLENIYE NAZEMNYMI ANTENNAMI I RADIOTELESKOPAMI in Russian 1980 (signed to press 16 Jul 80) pp 2, 278-279

[Annotation and table of contents from the book "The Control of Terrestrial Antennas and Radiotelescopes" by Pavel Vasil'yevich Belyanskiy and Boris Georgiyevich Sergeyev, Izdatel'stvo "Sovetskoye radio", 5000 copies, 280 pages]

[Text] This work treats problems in the design of modern systems for the automatic control of ground-based antennas within basic operating regimes taking into account control and disturbance effects, as well as the dynamic characterisitics of an antenna employed as a control device.

It is intended for engineers, scientific researchers, and designers working in the field of antenna design and application, radiotelescope and optical telescope design, space communications, and radioastronomy, as well as for graduate and post-graduate students.

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9481
CSO: 1860/191

UDC:539.2+621.382

COMPONENT STRUCTURE IN LARGE-SCALE INTEGRATED CIRCUITS

Novosibirsk STRUKTURA KOMPONENTOV BIS in Russian 1980 (signed to press 1 Oct 80) pp 2, 255-6

[Annotation and table of contents from the book "Component Structure in LIC", by Feliks Leonidovich Edel'man, Izdatel'stvo "Nauka", 1850 copies, 256 pages]

[Text] This book examines the structural features of components in LIC (large-scale integrated circuits)--the fundamental building blocks of computer technology: silicon dioxide films, silicon nitride films, and polycrystalline silicon films. Based in large measure on original research of the author, the book presents a picture of the close relationship of component design improvement to LIC technologies, of phase changes in films, and of contact interactions of materials. Included is a special discussion of the capabilities of current methods of structural analysis used for component research and structural correlation to LIC technology, as well as for description of semiconductor surfaces. Problems of LIC materials technology are examined with a view to current and future generations.

This monograph is intended for use by scientific and technical engineering personnel specializing in the field of semiconductor materials, instruments, and microcircuits.

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9481
CSO: 1860/206

CURRENT STABILIZATION METHODS AND EQUIPMENT

Kiev METODY I TEKHNICHESKIYE SREDSTVA STABILIZATSII TOKA in Russian 1980 (signed to press 8 Aug 80) pp 157-64

[Abstracts of articles from book "Current Stabilization Methods and Equipment", edited by A. I. Kuz'menko, Izdatel'stvo "Naukova dumka", 950 copies, 164 pages]

UDC 621.372.061

A METHOD OF REALIZING MULTIPHASE ELECTRIC CIRCUITS WITH GIVEN CHARACTERISTICS

[Abstract of article by Volkov, I. V., Gubarevich, V. N., Isakov, V. N., and Kaban, V. P.]

[Text] A method of constructing multiphase electric circuits with given characteristics is described on the basis of the utilization of simple active four-terminal structures. The article presents the future prospects for the application of this method in the construction and analysis of multiphase circuits of various functional purposes. 2 illustrations, 2 tables, 2 titles in bibliography.

UDC 621.311.6

A PASSIVE FOUR-TERMINAL TRANSFER NETWORK OPERATING WITH A CONSTANT INPUT CURRENT

[Abstract of article by Volkov, I. V., Zakrevskiy, S. I., and Basan'ko, Yu. V.]

[Text] This article examines the operation of a passive four-terminal transfer network with a constant-value input current when the load impedence varies within a broad range. It also examines the selection specifications for the circuit elements of particular devices and cites the relative and external characteristics of these devices. 3 illustrations, 4 titles in bibliography.

UDC 621.314.2.015.4

A GRAPHIC METHOD OF DETERMINING CURRENTS CONSUMED BY A THREE-PHASE INDUCTIVE-CAPACITIVE CONVERTER

[Abstract of article by Obukh, A. I.]

[Text] The article describes two graphic methods of determining linear currents consumed by a three-phase inductive-capacitive converter (IEP) with any combination of load impedences Z_l. The first method is based upon the use of a topographic diagram (nomograph) of voltages in the IEP, constructed beforehand using given values of Z_l. The second method--a method of current polar nomographs--makes it possible to determine quickly the current values directly from the parameters Z_l. 3 illustrations, 5 titles in bibliography.

UDC 621.372.061

ANALYSIS OF A THREE-PHASE BRIDGE-TYPE INDUCTIVE-CAPACITIVE CONVERTER BASED ON THE TRANSFORMATION RATIO

[Abstract of article by Zavarikhin, V. A., and Kosovskaya, L. V.]

[Text] This article examines a bridge-type inductive-capacitive converter with a current shift angle of 240° in each rod of the choke and with opposing coils, based on the transformation ratio of the choke. The basic relationships between currents and the installed capacities of the converter elements are obtained. It is shown that the minimum of the specific reactive capacities shifts to the right with an increase in the transformation ratio. 2 illustrations, 4 titles in bibliography.

UDC 621.372.161

A REFINED ANALYSIS OF THE PROCESSES IN A CHARGING CIRCUIT WITH A SINGLE-PHASE L-SECTION INDUCTIVE-CAPACITIVE CONVERTER

[Abstract of article by Pentegov, I. V.]

[Text] This article examines the processes involved in charging a bank of capacitors connected to a single-phase L-section inductive-capacitive converter through a rectifier bridge when it is assumed that an analysis of the processes in each of the half-cycles can be accomplished by a method of calculating on the counterelectromotive force.

It is shown that the charging current in this case is not constant and that it decreases with respect to an increase in the voltage on the capacitors. Formulas are presented which make it possible to calculate the parameters of the charging process. 4 illustrations, 3 titles in bibliography.

UDC 621.314.5

DETERMINING TRANSFORMATION RATIOS OF A RECTIFIER SUPPLIED BY A SOURCE OF STABILIZED CURRENT WHEN CHARGING A CAPACITIVE STORAGE CIRCUIT

[Abstract of article by Spirin, V. M., and Kurach, A. M.]

[Text] The article gives a determination of the transformation ratios of a rectifier supplied by a source of stabilized current based on the inductive-capacitive transformation of the voltage surge into a current source during the changing of a capacitive storage circuit of a pulse current generator (GIT).

The determination of the ratios is carried out with the use of the theory of experimental design, in particular, the synthesis of a second-order orthogonal design. The ratios are represented by polynomials for the encoded and natural values of the selected factors. The information in the article makes it possible to determine the transformation ratios of rectifiers for pulse current generators of a parametric number of electrohydraulic installations. The data can also be used to design pulse current generators. 2 illustrations, 2 tables, 4 titles in bibliography.

UDC 621.314.5

OPERATION OF A THREE-PHASE BRIDGE RECTIFIER FROM THE CURRENT SOURCE TO THE CAPACITIVE STORAGE CIRCUIT

[Abstract of article by Spirin, V. M.]

[Text] This article analytically determines the transformation ratios of a rectifier fed from a source of stabilized current and based on the inductive-capacitive transformation of a voltage source to a current source when there is a slow charge of a capacitive storage circuit of a pulse current generator (GIT). The article compares the ratios obtained with analogous ratios when the rectifier is supplied from a voltage source and a source of stabilized current for various types of loads. The data obtained make it possible to determine the transformation ratios of rectifiers for GIT charging devices and can be used to design pulse current generators. 2 illustrations, 1 table, 7 titles in bibliography.

UDC 621.3:621.791.75

A STATIC CONVERTER FOR CHARGING A RESERVOIR CAPACITOR WITH A MINIMAL EFFECT ON THE SUPPLY CIRCUIT

[Abstract of article by Kofman, D. B., Lomonosov, L. Ye., and Chorba, V. R.]

[Text] This article examines a new structure for a static converter operating in a constant power-consumption mode, used for charging a reservoir capacitor to a voltage considerably in excess of the voltage in the supply circuit. The article presents the relationships between the parameters of the converter and its analog, with the help of which one can determine the voltages and currents necessary for the efficient selection of the circuit elements. 2 illustrations, 3 titles in bibliography.

UDC 621.313.67.001.5

AN ANALYSIS OF THE STEADY-STATE BEHAVIOR OF A CONVERTER-RECTIFIER-MOTOR SYSTEM

[Abstract of article by Il'inskiy, N. F.]

[Text] The physical processes in a system composed of a three-phase inductive-capacitive converter, a rectifier and a DC motor are examined. Relations are obtained for determining the circuit's power factor and the distortion factor. Experimental results confirming the theoretical conclusions are cited. 10 illustrations, 2 titles in bibliography.

UDC 621.314.562

DIRECT-CURRENT ELECTRIC DRIVE USED IN POLYMER FILM WINDING MACHINES SUPPLIED BY THE ARMATURE CIRCUIT OF A RECTIFER-CAPACITIVE CURRENT SOURCE

[Abstract of article by Arkushin, V. P., and Osetskiy, Yu. M.]

[Text] This article presents a description of an electric drive for winding machines. An equation is derived for the external characteristic of a single-phase current source for uninterrupted current from the armature circuit. Expressions are also derived for selecting the power of the capacitor bank. The accuracy of the calculated relations is checked by experiment. 3 illustrations, 3 titles in bibliography.

UDC 621.314.572

STABILIZING CHARACTERISTICS OF FREQUENCY-DEPENDENT FOUR-TERMINAL NETWORKS IN THE CURRENT-STABILIZING MODE

[Abstract of article by Starodumov, Yu. I.]

[Text] This article examines the operation of current-stabilizing four-terminal networks with frequency-dependent parameters in circuits with loads that vary in value when the frequency of the supply line changes. An expression in a general form is obtained for the stabilization factor with respect to the load of a four-terminal network, based on the frequency variation. The article points out the feasibility of calculating the influence of a matching transformer upon the stabilizing characteristics of a four-terminal network. 3 titles in bibliography.

UDC 621.372.061

THE RIT-1 REGULATED STABILIZED CURRENT SOURCE FOR POWER SUPPLY TO LASERS

[Abstract of article by Zakrevskiy, S. I., and Gorbachev, M. N.]

[Text] The principle of circuit construction of an RIT-1 regulated stabilized current source is presented. Its description is given and its basic specifications are cited. 1 illustration, 4 titles in bibliography.

UDC 621.372.54.2.001.24

INSTALLED CAPACITY OF CAPACITORS AND CHOKES IN CIRCUITS WITH NONSINUSOIDAL VOLTAGE AND CURRENT

[Abstract of article by Nikitin, V. B., and Bezgachin, N. I.]

[Text] Several determinations of the installed capacity of reactive elements in circuits with nonsinusoidal voltage and current are examined. It is shown that the summation of reactive capacities of individual harmonics must of necessity be carried out using factors inversely proportional to the frequency of these harmonics when determining the installed capacity of ideal capacitors and chokes. A frequency-

dependent factor is introduced in order to calculate the frequency dependence of the specific reserve power of real capacitors and chokes. This makes it possible to utilize more reasonably the concept of installed capacity in calculating the weight and dimension indicators of reactive elements. 1 illustration, 1 table, 5 titles in bibliography.

UDC 621.314.621

A STUDY OF CASCADING OF ACTIVE POWER FILTERS WITH SERIES COMPENSATION

[Abstract of article by Ryaben'kiy, V. M.]

[Text] This article examines a filter device with a series-connected L-section *LC*-filter and two active filters with series compensation. Studies are carried out on the structure of the device and its efficiency. Recommendations are developed for its design. 2 illustrations, 2 titles in bibliography.

UDC 621.314.621

A HARMONIC ANALYSIS OF RECTIFIED VOLTAGE OF STABILIZERS WITH INVERTER REGULATION

[Abstract of article by Ryaben'kiy, V. M., Simonyan, S. T., and Shvets, E. A.]

[Text] This article examines a harmonic analysis of the rectified voltage of a converter with voltage stabilization on the alternating-current side, achieved with an inverter. An analysis of the level of harmonics is done for the instances of symmetrical and nonsymmetrical voltages in the supply line. 3 illustrations, 3 titles in bibliography.

UDC 621.3:621.791.75

AN INVESTIGATION INTO THE CHARACTERISTICS OF ALTERNATING-CURRENT SOURCES WITH INDUCTIVE POWER-STORAGE CIRCUITS WHEN THERE IS PARAMETRIC STABILIZATION OF THE WELDING PROCESS

[Abstract of article by Legostayev, V. A., Pentegov, I. V., Stemkovskiy, Ye. P., and Chayun, A. G.]

[Text] A comparison is made of two types of AC welding sources with inductive power-storage circuits regarding the power parameters of their charging devices, their efficiency and the power liberated in the arc interval. In order to facilitate the development of technical recommendations, a system of dimensionless criteria are proposed for the welding current. 4 illustrations, 5 titles in bibliography.

UDC 621.372.061

THE RIT-300 WIDE-RANGE REGULATED STABILIZED-CURRENT SOURCE FOR SUPPLYING A SUPERCONDUCTING SOLENOID

[Abstract of article by Gorbachev, M. N., Stepanov, P. P., and Novobranets, V. I.]

[Text] Questions are examined regarding the construction of a wide-range regulated current source for superconducting magnetic systems. A description is provided for the principal circuit of the source. Its features and basic specifications are cited. 2 illustrations, 5 titles in bibliography.

UDC 621.378.325;625.311.6

INSTALLATION OF THE 'KVANT-1GM' FOR HEAT-TREATING MATERIALS BY LASER

[Abstract of article by Chuchumayev, Ye. F., Filippov, V. K., and Bacan'ko, Yu. V.]

[Text] An industrial installation for laser heat-treating materials is described. The operational advantages of the "Kvant-16M" installation are shown in comparison to existing units. 1 illustration.

UDC 631.371:621.311.24

OPTIMIZING THE PERFORMANCE OF WIND-POWER INSTALLATIONS

[Abstract of article by Volkov, I. V., and Muzychenko, A. D.]

[Text] A block diagram is proposed for a wind-power electric station. When the wind velocity varies. the layout provides the maximum possible output of power corresponding to the velocity. 13 titles in bibliography.

UDC 621.311.1+621.3.015+621.3.018.3

RESONANCE PHENOMENA IN THREE-PHASE ELECTRIC CIRCUITS WITH NONSYMMETRICAL REACTIVE ELEMENTS

[Abstract of article by Kuznetsov, V. G., and Danilyuk, V. B.]

[Text] The article deduces and analyzes expressions for resonance frequencies in electric circuits when symmetrical devices are connected. It is shown that a device with nonsymmetrical reactive elements can cause current resonance in the circuit at two frequencies. 1 illustration, 1 table, 3 titles in bibliography.

UDC 621.372.061

REGULATION OF OUTPUT CURRENT IN COMBINED SYSTEMS WITH INDUCTIVE-CAPACITIVE CONVERTERS

[Abstract of article by Lipkovskiy, K. A., and Aleksandrov, M. M.]

[Text] A comparison is made of various methods of regulating the current of a load supplied by a combined system with an inductive-capacitive converter. Requirements are determined for changing the parameters of additional electromotive force from the standpoint of the criterion for the maximum installed capacity of the elements. 4 illustrations, 2 titles in bibliography.

UDC 621.377.534.032.43

CIRCUITS FOR TRIGGERING LOW-POWER GAS LASERS WITH A PARAMETRIC DEFLECTION

[Abstract of article by Dovgalevskiy, A. Yu., Sapon, O. P., and Starodumov, Yu. I.]

[Text] A comparison is made of various circuits for triggering low-power gas lasers with a parametric deflection. A circuit is suggested for separate firing of dual-mode lasers. This arrangement possesses high economy and reliability of triggering both channels. 5 illustrations, 3 titles in bibliography.

UDC 621.372.061

NONRESONANT TUNING OF REACTIVE ELEMENTS AS A MEANS OF REGULATING THE LOAD CURRENT OF INDUCTIVE-CAPACITIVE CONVERTERS

[Abstract of article by Gubarevich, V. N., and Aleksandrov, M. M.]

[Text] This article presents results of an investigation into the nonresonant operation of variously structured inductive-capacitive converters. It points out the expedience of utilizing the nonresonant method of regulating the output current of an inductive-capacitive converter. 8 illustrations, 3 titles in bibliography.

UDC 621.372.54.061

DUALITY OF AC POWER ELECTRIC FILTERS

[Abstract of article by Nikitin, V.B.]

[Text] A comparative analysis of two classes of filters is presented: filters designed to attenuate the upper harmonic components of alternating voltage used at the output of static voltage converters, and filters designed to protect an electric circuit from the intrusion of upper harmonics of the current which appear when nonlinear loads are supplied from this circuit. It is shown that the use of the principle of duality makes it possible to apply methods developed for one class of filters in order to analyze and synthesize the other class of filters. 4 illustrations, 5 titles in bibliography.

9512
CSO: 1860/198

UDC 621.391.002.72:658.284(075)

INSTALLATION AND SET-UP OF INDUSTRIAL ELECTRICAL COMMUNICATION AND ALARM SYSTEMS

Moscow MONTAZH I NALADKA SISTEM PROIZVODSTVENNOY ELEKTRICHESKOY SVYAZI I SIGNALIZATSII in Russian 1980 (signed to press 10 Jun 80) pp 2, 278-80

[Annotation and table of contents from book "Installation and Set-up of Industrial Electrical Communication and Alarm Systems", by Sergey Vladimirovich Koshelev, Grigoriy Abramovich Klauz and Viktor Vasil'yevich Gvozdevskiy, Izdatel'stvo "Svyaz'", 23,000 copies, 280 pages]

[Text] This book examines the installation and set-up of systems of electrical communication, alarms, industrial (closed-circuit) television and electric clocks used at establishments and enterprises in various sectors of the economy. Questions regarding the organization of and preparation for installation and adjustment operations, safety methods, industrial hygiene as well as fire prevention are covered.

This book is intended for students at technical schools. It can be useful for students at vocational and technical schools as well as for skilled workers, team foremen and riggers concerned with the installation and set-up of industrial communication systems.

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9512
CSO: 1860/194

NEW COLLECTION EXAMINES ELECTRONICS MATERIALS AND EQUIPMENT

Moscow TRUDY MOSKOVSKOGO ORDENA LENINA ENERGETICHESKOGO INSTITUTA, TEMATICHESKIY SBORNIK: MATERIALY I PRIBORY ELEKTRONNOY TEKHNIKI in Russian No 456, 1980 pp 2, 76-77

[Annotation and table of contents of book "Works of the Moscow Order of Lenin Power Engineering Institute, Collection Devoted to a Single Topic: Materials and Devices of Electrical Engineering", edited by Candidate of Technical Sciences and Docent V. A. Chizhov, Moskovskiy energeticheskiy institut, 77 pages]

[Text] The present collection includes articles by associates and graduate students in the Department of Electronic Devices. The articles reflect a number of trends in the scientific research conducted by the department: study of the vacuum and emission properties of electronic engineering materials; physical processes in electronic and semiconductor devices; the development of methods and equipment for ultrasonic flaw-detection and for optimization of information display systems. Workers in industry who are associated with the department through their scientific interests participate in a number of the articles.

The materials in the collection may be beneficial to workers at enterprises and NII [Scientific Research Institutes] of the electronics industry.

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9194
CSO: 1860/214

UDC 539.3

OPTIMIZATION AND CONTROL IN ELECTRONIC VACUUM PRODUCTION

Kiev OPTIMIZATSIYA I UPRAVLENIYE V ELEKTROVAKUUMNOM PROIZVODSTVE in Russian 1980 pp 2, 215

[Annotation and table of contents from book "Optimization and Control in Electronic Vacuum Production", by Ya. S. Podstrigach, Ya. I. Burak, V. I. Shelepets, S. F. Budz and A. B. Piontkovskiy, Izdatel'stvo "Naukova dumka", 216 pages]

[Text] The scientific bases and methods of optimization and control in electronic vacuum production are examined. These are based on systematic analysis, mathematic modeling of processes, formulation of appropriate extreme problems and formalization and algorithmization of control. The methodology which was developed is illustrated with examples from the most characteristic production processes and control subsystems.

The book is intended for scientific workers and engineers studying aspects of the optimization of systems with distributed parameters.

56 illustrations, 2 tables, bibliography--pp. 206-214 (183 titles).

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9194
CSO: 1860/215

UDC:62-523.8

PHOTOELECTRONIC CONTROL SYSTEMS

Moscow FOTOELEKTRONNYYE SISTEMY UPRAVLENIYA in Russian 1980 (signed to press 26 Aug 80) pp 2, 204-5

[Annotation and table of contents from the book "Photoelectronic Control Systems", by Shimon Abramovich Vayner and Saveliy Abramovich Vayner, Izdatel'stvo "Mashinostroyeniye", 6000 copies, 208 pages]

[Text] This book is an examination of matters related to the theory and application of photoelectronic control systems(FESU). Included are investigations of the principles of control, mechanical trajectories, and the dynamic characterisitics of such systems. Methods are presented for computation of the data which are represented by chart and graphic symbols. Descriptions are given of highly accurate self-adjusting FESU, high-speed adaptive FESU, systems which provide for equidistant correction during line tracing, and FESU employing delayed pulse feedback--all of which permit the optimal realization of detection and measurement of signal parameters and noise levels.

Examinations are made of contemporary foreign and domestic photoelectronic systems, various types of technical equipment employing FESU, the practical results of their use, and prospects for future applications.

The book is intended for use by technical engineering personnel involved in the development and application of equipment employing FESU as well as in the automation of technical processes.

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9481
CSO: 1860/192

UDC 519.21

SEMI-MARKOV PROCESSES WITH A DISCRETE SET OF STATES

Moscow POLUMARKOVSKIYE PROTSESSY S DISKRETNYM MNOZHESTVOM SOSTOYANIY in Russian 1980 (signed to press 19 Sep 80) pp 2, 270-1

[Annotation and table of contents from the book "Semi-Markov Processes with a Discrete Set of States", by Dmitriy Sergeyevich Sil'vestrov, Izdatel'stvo "Sovetskoye radio", 5000 copies, 272 pages]

[Text] This book is devoted to an exposition of the theory of semi-Markov processes having a discrete(finite or denumerable) set of states. Various methods of representing semi-Markov processes and associated Markov processes are considered. The important class of functionals known as moments of initial acquisition is examined in detail. Considerable attention is given to random processes associated with semi-Markov processes: to regenerative processes with semi-Markov changeovers, as well as accumulation processes with semi-Markov changeovers. Investigations of limit and ergodic theorums for these processes are carried out. The basic classes of queueing systems which can be described within the framework of the theory of semi-Markov processes are thoroughly analyzed.

The book is intended for use by engineers and mathematicians engaged in the design and operation of complex stochastic systems.

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CSO: 1860/205

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