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Communications

Analysis of Today's Methods of SECAM, PAL, and NTSC Composite Color Signal Decoding

[Article by Yu.A. Medvedev, V.V. Babich, O.V. Gofayzen, V.T. Basiy, Yu.R. Didych, T.D. Kryukova, N.A. Platzerova, A.V. Shishkin, V.V. Skopenko, A.A. Matveyev, Elektron Television Scientific Research Institute and Odessa Telecommunication Institute imeni A.S. Popov; UDC 621.397.6]

[Abstract] Various foreign and domestic publications dealing with the issue of analyzing modern composite color system decoding and decoders for the SECAM, PAL, and NTSC standards are reviewed and the most important engineering designs are evaluated. Block diagrams of the TV receiver's digital video section and the adaptive luminance (Y-) and chrominance signal separation (Y/C) systems are presented and examined and the following circuit components and features are considered in detail: band-elimination filters (RF), vertical comb filters and decoders, two-dimensional decoder Y/C separation filters, the use of low- and high-frequency components in the signal separation decoder, and the use of the frame and field memory in decoders. Understanding the principles of composite color signal decoding is necessary for realizing complex digital video signal decoding methods in TV receivers in order to lower the image distortions which have hitherto been regarded as inherent in color television systems and use new distortion and noise suppression algorithms. Figures 18; tables 4; references 24: 14 Russian, 10 Western.

Telecommunications From Business Viewpoint

[Article by A.P. Barsukov; UDC 621.397.2]

[Abstract] The role of national telecommunications ministries vs. the private sector in the development of telecommunications in the new economic environment is investigated and recent advances in the telecommunication and television fields exhibited at three fairs—the Second International Computer Forum held at the International Trade Center by the International Computer Club (MKK), the First Russian Forum on the "Telecommunications Technology for the 90's", and the Second International "PC World" Forum—are examined from the private business viewpoint. The economy of scale—the "law of big bucks"—as it applies to venture capital and the cooperation between foreign companies and Russian engineers and computer specialists and the pitfalls of doing business in the West are examined and the role of today's high-power chips in the development of computer systems is analyzed. Current periodicals in the field of computers and the issue of copyright are reviewed and future trends in the communication and computer system development are evaluated. The specific products and services being offered by various private foreign and domestic companies are reported and the advantages and shortcomings of existing multiple access methods are summarized. Tables 2.

Charge-Coupled Device-Based Test Structures

[Article by Yu.I. Tishin, Scientific Research Institute of Physical Problems imeni F.V. Lukin; UDC 621.382]

[Abstract] The slow pace of charge-coupled device (PZS) implementation in semiconductor engineering in the past 15 years and the problems which hinder their faster implementation—a high sensitivity to the quality of semiconductor materials and the parameters and purity of processes occurring in them—are reviewed and the use of charge coupled devices as test structures for determining the factors which affect the yield percentage of serviceable integrated circuits (IC) is considered. The following IC rejection factors are identified with the help of charge coupled devices, particularly dynamic RAM (DOZU) chips which are the closest to charge coupled devices in their physical operating principles: the thermoelectric minority carrier current as a function of the field electrode temperature and voltage and the semiconductor/dielectric interface relief; the minority current or charge determined by abnormal generation as a result of a local semiconductor breakdown as a function of temperature and field and the breakdown location relative to the charge coupled device elements; the density of surface or volumetric states as a function of the charge coupled device type; and the thermal relaxation time spread. The test CCD whose configuration and number are determined by the type of measurements may be built into test chips manufactured simultaneously with the IC's being tested. References 14: 6 Russian, 8 Western.

Bulk Integrated Circuits for Discrete Control of Microwave Signal Parameters

[Article by V.I. Gvozdev, V.P. Dmitriyenko, M.Yu. Litvinenko (deceased), Moscow Institute of Electronic Engineering; UDC 621.376]

[Abstract] The task of increasing the reliability, improving the electric characteristics, and decreasing the overall dimensions, mass, and cost of devices for discrete control (UDU) of microwave (SVCh) signal parameters and the requirement imposed on the discrete control devices, primarily their wide operating frequency band, are formulated and a simplified block diagram of a discrete control device is cited. Functional modules for developing a unified component base of discrete control devices are integrated in order to control several signal parameters simultaneously. These functional modules are developed on the basis of bulk integrated circuits and their amplitude, phase, and frequency characteristics are investigated. Analysis shows that given low losses, control signals within a 0-3 GHz frequency band may be used. The small overall dimensions, high speed, and broad frequency band of the devices make it possible to use them in analog and digital multichannel microwave systems as well as for designing diverse discrete data transmission and processing equipment. Figures 4; references 3.

Reliability of Redundant Memory Chips in Which Data are Matched With State of Failed Storage Cells

[Article by P.P. Urbanovich, S.L. Loyka, Minsk Radio Engineering Institute; UDC 681.3.07.62.-192]

[Abstract] The issue of analyzing the reliability of a redundant storage (ZU) VLSI chip (SBIS) in which the information bit being recorded in the failed storage cell (EP) is matched with the logic state of the cell is addressed. The method amounts to determining the logic state of the storage cell being accessed beforehand and is based on using hardware which realizes the redundant information encoding principle. The position of the redundant units and storage cells on the chip is determined as a function of the most likely typos of failures which can be neutralized with the help of adequate codes and redundant equipment performance algorithms. The need to develop relevant VLSI chip reliability models which make it possible to assess the reliability of prospective redundant (i.e., failure-safe) chips is stressed. A state graph of a storage cell is plotted. It is shown that the method of correcting isolated errors by the Hamming code when reading data from a storage and the method of matching the data being written with the logic state of the failed storage cell increase the VSLI chip reliability by approximately the same factor. Figures 2; references 7.

Season of Big Exhibits

[Article by R. Levin]

[Abstract] The exhibits displayed at the traditional Svyaz-91 fair held for the fifth time and the new Ekspokom-91 fair held for the first time at the Ekspotsentr and organized by Hannover Messe International (Germany) and E.J. Krause & Associates, Inc. (United States) are summarized. The new fair gives a clear idea about the state of telecommunications equipment development in the USSR and abroad. Marine computer-aided communication systems developed by the Omsk Instrument Making Scientific Research Institute, a Sopka transmission system developed by the Long-Range Telecommunication Scientific Production Association in Leningrad, AVR-1 and AVR-2 Sapfir mobile communications radio stations developed by the Vega Scientific Research Institute in Voronezh, a Baltika marine computer-aided telephone and telegraph radio station developed by the Musson Scientific Production

Association in Sevastopol, STVOL-Tsifra-2 equipment for transmitting TV signals over fiber optic cables developed by the Long Range Telecommunication Scientific Production Association, an APM-K/S emergency radio beacon for the COSPAS-SARSAT satellite system developed at the Musson Scientific Production Association, a BT cordless telephone developed by the Zarya Scientific Production Association in Voronezh, a videoconferencing system by PKI AG (Germany), the NMT-450 mobile radio communication equipment by Nokia (Finland), an LS-24S/OF fiber optic transmission system by PKI AG, pagers by Iskra (Yugoslavia), a ZWOG-6 network analyzer by Rohde & Schwarz (Germany), Samsung and GoldStar (Korea) office automation equipment, as well as computer and communication systems from the United States and Republic of China are described. It is anticipated that Ekspokom exhibits will be held biannually. Figures 2.

Increasing Communication Network Adaptability and Intelligence

927K0164B Moscow ELEKTROSVYAZ in Russian No 8, Aug 91 pp 8-11

[Article by G. Wayst, Siemens AG, Federal Republic of Germany; UDC 621.394/395.74]

[Abstract] Methods of increasing the flexibility and intelligence of communication networks are investigated from the viewpoint of a single global data transmission system market which will eventually lead to the development of a wide-band integrated services data network. Attention is focused on the tasks of developing modern switching systems, the rising demand for new modern wide-band communication services, on increasing the ISDN network range to above 64 kbit/s, on standardization of high-definition TV systems and wide-band switched communication services, on today's engineering trends in the development of wide-band networks in particular and network development trends in particular, and on the concepts underlying the Siemens AG network design. The development trends of speech and data transmission services in the world and the requisite wide-band transmission rates are examined and plotted. The evolution of communication networks is reviewed and the concept of intellectual integrated network is visualized as a block-diagram. The conclusion is drawn that planning and implementation of the first phase of an intellectual worldwide wide-band system on the basis of unified standards should begin soon. The article is reprinted from *Telcom report* Vol. 13 No. 4, 1990, pp. 13-14. Figures 4; references 1.

K-420 Analog Transmission System for Consolidated Computer-Aided Communication Network and Interoffice Networks

927K0164C Moscow ELEKTROSVYAZ in Russian No 8, Aug 91 pp 22-24

[Article by O.G. Gedovius, A.V. Kogan, V.V. Lapin, V.N. Parkhomenko; UDC 621.395.462.4]

[Abstract] The communication architecture characteristics of nation-wide and local networks organized on the basis of K-420 analog transmission systems (SP) are illustrated by the Consolidated Computer-Aided Communication Network (YeASS) and Interoffice Networks. The K-420 transmission system is intended for area-wide communication (VZS) between oblast and rayon centers (OTs and RTs) and in area-wide communication system trunks and primary trunk networks—for operation between oblast centers and network nodes. The operation of the parallel channel allocation stations (PPV) and unmanned allocation stations (NPV), the use of the K-420 transmission systems for combined radio and cable communication, and the characteristic features of K-420 design and setup are considered. The new analog transmission system makes it possible to set up area-wide networks with sufficient flexibility and can be used for setting up departmental communication networks for the pipeline companies with the help of combined cable and radio communication systems. The K-420 is a two-band single cable system operating in the 312-4,584 kHz band and is capable of allocating channels and baseband portions at unmanned stations and allocating several audio frequency channels at any point along the line. Figures 1; references 3.

Peculiar Features of Transmission Characteristics of Coaxial Cables With Thin-Walled Conductors

927K0164D Moscow ELEKTROSVYAZ in Russian No 8, Aug 91 pp 28-29

[Article by I.G. Zdanovich, A.A. Pavlov, M.G. Chernetskiy; UDC 621.372.2]

[Abstract] The relationship between the damping factor per unit length and the diameter of coaxial RF cables and methods of decreasing the damping factor without making the cable too heavy is discussed. At high frequencies, current propagates primarily in a very thin surface layer, making it possible to increase the conductor diameter while at the same time decreasing its thickness. The dependence of the amplitude and phase of the linear impedance on frequency in coaxial cables, the dependence of the attenuation factor on frequency, the non-linear section of the matched kilometer-long coaxial cable's phase-frequency characteristic (FChKh), and the transient response of a cable with a 75 Ω load are plotted. An analysis of the findings reveals that coaxial cables with a 5-10 cm diameter and 1-100 μm thick conductors may have a flat amplitude-frequency response (AChKh) within a broad frequency band of 100 kHz to 10 GHz with a severalfold signal attenuation over a 1 km length. This characteristic makes it possible to transmit pulse signals with an up to several hundred nanosecond duration and a subnanosecond resolution. RF cables with such a resolution are suitable for data transmission over several kilometer long lines. Figures 7; references 3.

Sharing Experience in Developing and Using Computer-Aided Design Systems

[Article by N. Yefimova]

[Abstract] The proceeding of a seminar workshop on the "Experience of developing and using instrumental-technological CAD systems" held in the village of Slavskoye, Lvov oblast, and organized by the Ukrainian Republican House of Dissemination of Economic and Scientific and Engineering Knowledge of the Znaniye Society, the Lvov Polytechnic Institute (LPI), and the Polyaron Production Association in Lvov are reported. More than 100 professionals from Moscow, Leningrad, Lvov, Kiev, Odessa, Taganrog, Zaporozhye, Tallinn, Penza, Voronezh, Novosibirsk, and other cities participated in the workshop. The issues of the expert CAD (SAPR) development and operation experience, process simulation and diagnostics, computer-aided radio electronic equipment (REA) design methods, and analysis and simulation of physical fields were emphasized at the seminar; the areas requiring special attention by the experts in the field are identified. In the participants' opinion, the workshop has achieved its stated goals. It is suggested that the Association of CAD System Users and Designers be invited to the next seminar which is tentatively scheduled for the first quarter of 1993.

Methods of Improving Gunn Diode Parameters: Survey

[Article by V.V. Muravyev, V.I. Shalotonin; UDC 621.382.2]

[Abstract] Methods of improving the efficiency (KPD) and reliability of GaAs Gunn Diodes in the millimeter wave band are surveyed. Attention is given to Gunn diodes with a graded $GaAs/Al_xGa_{1-x}As$ junction, Gunn diodes (DG) with a n-GaAs/p-GaAs cathode structure, and Gunn diode doping profile optimization. These methods of improving the Gunn diode characteristics demonstrate that the potential of devices with an inter-valley electron transition has not been fully realized and that there is a real possibility of improving the diodes' energy parameters and reliability much further, particularly by using an injecting structure while at the same time optimizing the doping profile. The new methods also make it possible to avoid relatively simple but inefficient homogeneous semiconductor structures and give an impetus to developing Gunn diodes with a complex active area. The use of new competitive GaAs materials such as indium phosphide and certain solid solutions on its basis is discussed. Figures 6; references 22: 11 Russian, 11 Western.

New Block Diagrams of Solid State Power Limiters

[Article by I.V. Lebedev, A.S. Shnitnikov, R.A. Prokhorov, D.V. Skorobogatov; UDC 621.372.85]

[Abstract] The use of power limiters in microwave devices, primarily for protecting radar and communications receivers from overloads resulting from own transmitter operation as well as high-power random or deliberate jamming signals is considered and urgent problems facing the designers of "passive" or self-controlled diode limiters characterized by weak signal transmission with low losses and effective microwave (SVCh) circuit cutoff at a high input power level are discussed. The ongoing search for new *pin*-diode design versions for this purpose which involves optimization and structure and design upgrading, development and improvement of electrodynamic limiter systems on the basis of known advances in integrated circuit technology, and synthesis of new types of nonlinear limiters is reported and the characteristics of computer analyses are summarized. The limiter designs under study are characterized by the interaction of individual types of semiconductor structures realized among microwave voltages and currents simultaneously as well as among direct components. A trend toward the development of limiters with both interstage and intrastage coupling is identified and emphasis is placed on trying to design the new structures on an integrated circuit basis. Figures 4; references 16: 12 Russian, 4 Western.

Measuring Electromagnetic Millimeter and Submillimeter Wave Band Radiation Frequency Using Alternating Current Josephson Effect

[Article by S.Yu. Larkin, P.V. Khabayev, S.Ye. Anishchenko, A.G. Denisov; UDC 537.312:537.962]

[Abstract] The difficulties of measuring frequency in the millimeter and submillimeter wave band—a cutoff region for most semiconductor devices—are summarized and the possibility of using the Josephson effect at up to infrared frequencies due to the quantum nature of semiconductor elements is discussed. In particular, the AC Josephson effect which presupposes the existence of an alternating (periodic) supercurrent in any structure consisting of two or more weakly coupled superconductors is considered. A technique for measuring the frequency of electromagnetic radiation in the millimeter and submillimeter band with the help of the AC Josephson effect is investigated and the device used for this purpose is described. Several types of Josephson junctions are examined. The voltage-current curves of Josephson junctions are plotted using a microprocessor

controller linked to an IBM PC/AT-286 microcomputer through a special interface which makes it possible to output data directly to a graphic display. The findings confirm the feasibility of developing instruments for the millimeter and submillimeter bands with a close-to-ultimate sensitivity which make it possible to obtain information about the frequency and spectral characteristics of microwave signals. Figures 6; references 5: 4 Russian, 1 Western.

Slow-Wave Structure-Based Quasiresonators

[Article by A.A. Yelizarov, Yu.N. Pchelnikov; UDC 621.385.632]

[Abstract] The possibility of developing quasiresonators on the basis of slow wave structures of the cylindrical and radial logarithmic helix type is investigated; due to a significant decrease in their resonance dimensions, the study is limited to relatively low frequencies where the longitudinal biasing current is low compared to the current in the conductor and the characteristic impedance can be found rather accurately from the ratio of linear inductance to the linear capacitance. Four types of quasiresonators are considered; it is shown that at a given frequency, the geometrical dimensions of such systems may be decreased considerably compared to waveguide- or coaxial transmission line-based quasiresonators. An analysis of the designs shows that it is possible to develop small quasiresonators on the bases if a series connection of a slow wave structure and a section of a conventional RF transmission line of an equal length but with a higher linear capacitance. Advances in printed circuit technology make it possible to design quasiresonators on the basis of parallel radial helices with an opposite winding direction or from a single shielded spiral. Figures 4; references 3.

Nonreciprocal Microwave Power Dividers

[Article by Yu.A. Kirsanov, V.S. Lesin, O.K. Lipkan, V.F. Manoylov; UDC 621.373.832]

[Abstract] The shortcomings of existing microwave power dividers whose input and output arms are not decoupled at random loads, thus increasing the possibility of unstable equipment operation, are discussed and the need for devices capable of performing the power division and addition and decoupling functions is identified. Two two-channel nonreciprocal power divider designs based on combining transmission lines with an axially positioned ferrite resonator which have a low channel coupling and a narrow bandwidth are considered; their operating principle is based on the surface

ferrite wave (PFV) phenomenon. The operating principles of the power divider is described and its block diagrams are cited. The nonreciprocal dividers' most important tuning parameters are the ferrite material saturation magnetization, the external biasing field strength, and the ferrite insert dimensions. The above designs have a number of advantages over known reciprocal dividers: a better isolation between the output channels and between the input and output channel; the possibility of using them in circuits with various transmission lines; and the broad range of output channel impedance with changes in the electrical parameters; the new devices have a higher direct attenuation of 0.6 to 0.7 dB. Figures 2; references 2.

Rectangular Waveguide With Superconducting Film

[Article by V.A. Kalmyk, A.S. Rayevskiy; UDC 621.372.8]

[Abstract] The advantages of structures with superconducting films for developing functional microwave units and bulk integrated circuits in the UHF and EHF band are discussed and the design of a rectangular waveguide with a superconducting film which can be made from a high-T_c $YBa_2Cu_3O_{7-8}$ superconductor with a 95K critical temperature—a ceramic material which is a nonordered system of small crystalline grains in weak electric contact with each other—is examined. A schematic diagram of the structure is cited and the frequency dependence of the slow-wave and attenuation factors is plotted. The dispersion equation of the H_{m0} is derived and solved numerically on a computer. An analysis of the solution shows that in the rectangular waveguide with a superconducting film there exists an H_{10} wave which has no critical frequency; the rectangular waveguide with a symmetrically located superconductor film is also characterized by the presence of H_{m0} waves in its spectrum with only even m. Figures 3; references 2.

Optimum Detection of Band-Limited Signals

[Article by P.P. Zagnetov, A.N. Lozhkin; UDC 621.396.96]

[Abstract] The appearance of intersymbol interference (MSI) as a result of the signal band limiting necessitated by the requirement to transmit data at high rates with a transmission rate/bandwidth ratio of more than 2 bit/Hz is discussed and a receiving device synthesis method which may be used with an interference interval of an arbitrary duration as well as with other signals with intersymbol coupling, e.g., GMSK and TFM signals, is

considered. It is shown that ways of reducing the effect of intersymbol interference include optimizing the communication system characteristics which determine transient processes and using amplitude-frequency and phase-frequency correctors. There is another way of raising the confidence coefficient of data transmission—by means of optimum detection of interfering signals; the problem of synthesizing the above optimum character-by-character receiving device is solved in a general form. The proposed method is applicable for signals with intersymbol interference caused by the spectrum limiting of the signal emitted on the transmitting end of the radio link in the whitening filter which appears during detection against the background of nonwhite noise as well as for signals with intersymbol coupling, e.g., FM (ChM) signals with a continuous phase. Figures 3; tables 1; references 3.

Characteristics of Devices for Detecting Composite Signals With Unknown Structure by Their Maximum Energy Spectrum Spikes

[Article by N.I. Smirnov, S.F. Georgadze; UDC 621.396.96]

[Abstract] An attempt to identify the conditions for improving the characteristics of detecting a composite signal with an unknown structure by a device which takes into account the nonuniformity of its energy spectrum is reported. The design efficiency of a multichannel circuit with bandpass filters in each channel used for detecting a phase-shift-keyed composite signal (SIS) is estimated, the signal detection time is determined, and the signal/noise ratio on the multichannel detector input is measured. The detection time of the composite signal detector is compared to that of a known energy-type detector consisting of a filter with a given transmission band, a square-law detector (KD), and an analog or digital storage for the detection time duration. A comparison reveals that detection of composite signals of an unknown structure by a multichannel detector makes it possible to shorten the detection time compared to the energy-type detector; the detection time gain reaches tenfold given a signal/noise ratio on the receiver input of $10^{-3} \leq P_s/P_n \leq 10^{-1}$; when the $P_s/P_n \geq 1$, the gain η=2-3. The final selection of the unknown composite signal detector structure must in addition to the above factors, take into account the possibility of designing the devices on the basis of microelectronics technology and its reliability. Figures 3; references 5.

Scaling of Polysilicon VLSI Transistor Structures for Cryogenic Conditions

[Article by A.N. Bubennikov; UDC 621.3.049.77]

[Abstract] The problems of scaling very high speed very large scale IC's (S^3BIS) in order to develop high-quality transistor structures (TS) serviceable at 80K with a logic element (LE) process delay of several tens of picoseconds in the microconditions, e.g., ensuring sufficient gain and an acceptable current transfer ratio, preventing base punch-throughs, ensuring an acceptable punch-through voltage, preventing the destabilizing tunneling factors, high recombination-generation currents, p-n-junction bulk of surface leakage, and ensuring the necessary transistor structure speed and acceptable power demand, are considered. The dominant physical mechanisms preventing efficient transistor structure scaling are addressed and eight different scaling strategies are considered. The scaling strategies are compared with the help of the FIZTEKh physical and engineering simulation software package whereby the principal electrical parameters of the transistor structures which determine their speed and quality are analyzed. The study shows that it is possible not only to improve greatly the adequacy of the numerical analyses of the logic elements and VLSI circuit fragments in the framework of combined simulation but also to avoid serious problems involved in experimental identification of electrical parameters of transistor structures as well as produce a precise logic element design and clarify the results of polysilicon transistor structure scaling in cryogenic conditions. Tables 2; references 8: 5 Russian, 3 Western.

Moving Target Indication by Synthetic Aperture Radar

[Article by M.N. Surkov, V.P. Fedosov, V.M. Chuykov; UDC 621.396.96:621.391.26]

[Abstract] Slow moving target indication (SDTs) by synthetic aperture radar (RSA) by means of space-time processing of the echo signals is discussed and the shortcomings of traditional devices used for this purpose are analyzed. A method of improving the moving target indication efficiency of synthetic aperture radar based on complicating the antenna system, i.e., substituting two pencil-beam antennas with a phased antenna array (FAR) is investigated. To this end, the dependence of the discriminator response on the target velocity is described by an error function through the difference beam pattern (DN) formed by two partial pencil-beam antennas connected to a ring waveguide bridge. The principle of the difference beam pattern smoothing is examined and plotted, the dependence of the selector response amplitude on the target velocity is plotted, and the relationship of the error function and the MTI efficiency of SAR is analyzed. The improvement factor which takes into account both the ground clutter attenuation and the mean moving target echo amplification is calculated. An analysis of the findings confirms that the method of analyzing the MTI efficiency of SAR may be used in virtually all important cases. Figures 4; references 4.

Amplitude-Phase Phased Antenna Array Control Using Phase Shifters

[Article by V.I. Samoylenko, V.P. Ryzhov, O.I. Zarosh-chinskiy, A.S. Pavlov; UDC 621.396.67.012]

[Abstract] Known methods of controlling the amplitude-phase distribution (AFR) in phased antenna arrays (FAR) with the help of attenuators (amplifiers) and phase shifters or two attenuators (amplifiers) and their shortcomings are addressed and the task of forming a phase distribution on the phased antenna array surface which is equivalent to the amplitude-phase control so as to be able to control the array with the help of phase shifters alone is formulated. To this end, the amplitude-phase distribution vector on the antenna array (AR) surface and each vector component are derived. An analysis of the expressions demonstrates that by dividing the channel of each antenna element into two subchannels, connecting a phase shifter to each subchannel, and composing the signal, it is possible to realize antenna array control with the help of phase shifters alone. The capabilities of the method are illustrated using an adaptive antenna array whose operation is based on maximizing the signal/noise ratio. It is shown that phase control results in a certain blurring of the beam pattern (DN) nulls. Figures 3; references 2.

Optimum Detection of Signals With Low On-Off Time Ratio Through Passive Noise

[Article by A.K. Polov; UDC 621.396.677.494: 621.391.24]

[Abstract] Although the peak radar probing pulse power can be lowered at a given detection range by decreasing the on-off time ratio, passive noise (PP) from closely positioned objects becomes superimposed in time onto the weakened legitimate echo signals from remote targets, thus making it impossible to use the anticlutter automatic gain control (VARU) and lowering the signal/noise ratio (OSP) on the processing system output; furthermore, passive noise overloads the receiving circuit and is decorrelated, reducing the moving target indication (SDTs) efficiency. A new probing signal and its processing which resolve the aforementioned problems are proposed and the improvement in the signal/noise ratio is assessed. A decrease in the peak pulse power does not worsen the detection characteristic. It is suggested that a large number of noncoherent storage channels be realized if the target range rate is not known *a priori* and its variations are significant; each such channel corresponds to its own set of phase shifters. The inputs of all channels must in this case be connected directly to the antenna in order to ensure the necessary

dynamic range within a broad transmission band. A block diagram of the signal processing system is cited and the dependence of the signal/noise ratio on the relative target range is plotted. Figures 3; references 3.

Optical Image Detection Algorithm Characteristics in Presence of Spatial Noise and Distributed Clutter

[Article by G.A. Osetskaya; UDC 621.396.96: 621.373.826]

[Abstract] Image detection by an optoelectronic device with a mixture of spatial noise and distributed clutter, caused by the optical probing signal scattered by the underlying surface which may contain the detected target, on its input is considered. The optical image being analyzed is described by a Poisson field of random points in the observation field. Detection algorithms are synthesized for various *a priori* data on the optical image, noise, and distributed clutter intensity. The importance of knowing the legitimate image signal and background intensity is estimated and the loss of detection efficiency due to the lack of this information is determined. The worst detection efficiency loss occurs when the relative intensity of the field scattered by the legitimate image and the background intensity are not known. Figures 1; references 5.

Detection of Optical Pulse Train Received by Sluggish Photodetector

[Article by V.Yu. Volkov; UDC 621.391.2:621.396.624]

[Abstract] The efficiency of various optical detection algorithms with known and unknown gamma-distribution parameters of independent photodetector samples, whereby one of the parameters is related to the sample scale and is virtually unchanged while the other is related to the background radiation intensity which may not always be known, is examined. In order to stabilize the false alarm probability, an unbiased detection rule which necessitates a two-channel detection structure is used. In the case where there is an independent background sample in addition to the sample being analyzed, two-sample algorithms capable of considerably lowering losses under the conditions of *a priori* indeterminacy are analyzed. A method based on representing the unknown decision variable distribution density in the form of a product of a known positive function and a certain reference density with a manipulated parameter is used for calculating the detection characteristics. Threshold signal/noise ratios are calculated. An analysis of the findings demonstrates that two-sample algorithms have

definite advantages under *a priori* uncertainty conditions; the efficiency estimate method may also be used for other electronics tasks related to non-Gaussian distributions from the exponential family. Figures 4; references 3.

Artificial Radar Target Detection by Polarization Characteristics Through Ground Clutter

[Article by N.N. Badulin, V.V. Bylina, V.L. Gulko, A.F. Petrov, K.G. Sokolov, Ye.L. Shoshin; UDC 621.396.96]

[Abstract] The shortcomings of artificial reflector detection through ground clutter by the energy parameter are discussed and the use of the target polarization characteristics in order to relax the effective scattering area (EPS) requirements imposed on the reflectors themselves is considered. The modulation method whereby the target is irradiated by a polarization-modulated signal and the polarization parameters are determined from the amplitudes and phases of the echo signal's spectral components at frequencies each of which are a multiple of the polarization modulation frequency is used to measure the detection characteristics of artificial radar reflectors through several types of ground clutter, i.e., different types of the earth's surface. The experimental estimates of the polarization parameter distribution of the reflectors being detected and the interfering targets are used as the source data. The detection efficiency is different for individual polarization parameters due to the properties of the terrain area on which the reflector is being detected. The use of several polarization parameters in detecting artificial reflectors increases the detection efficiency. Navigation referencing of aircraft by markers is the most likely application of radar reflectors with specified polarization properties and radar systems capable of detecting them through ground clutter. Figures 2; tables 2; references 3.

Use of Radar Combined With Passive Reflector to Detect Water Surface Contamination by Oil

[Article by V.V. Leontyev; UDC 621.396.96.06]

[Abstract] The shortcomings of oil slick detection on the water surface due to the difference in the physical parameters of pure water and slicks are discussed and the possibility of detecting an oil film on a smooth water surface and measuring its thickness by the radar method is investigated. It is suggested that in the case of grazing incidence radiation, the presence of a film on the water surface be determined by the change in the effective scattering area of the corner reflector whose scattering properties near the interface depend on whether or not the water surface is contaminated. An analysis of the relationship between the complex dielectric permittivity of the water, crude oil, and air and their reflectance indicates that the use of passive reflectors, e.g., corner reflectors, together with radar (RLS) makes it possible not only to detect a crude oil film on a smooth water surface in a complex electromagnetic environment characterized by noise and clutter but also to measure its thickness at the spilling moment. Figures 4; references 5: 4 Russian, 1 Western.

Optimum Control of Frequency-Time Multichannel Radar Operating Conditions

[Article by V.V. Khutortsev; UDC 629.7.05.001.26]

[Abstract] Promising methods of increasing the utilization efficiency of multichannel radar stations (MRLS) with electronic antenna pattern control and time-division multiplexing, e.g., by optimizing their frequency-time operating conditions when tracking several targets (ON) simultaneously, and the problems of searching for optimum observations programs and using them in real time for multiple targets are discussed. Consequently, a mathematical model of the multiple target dynamics is derived and the invariant-group properties of the discrete-continuous filtering algorithms are used to synthesize the optimum frequency-time control law of the ρ-θ-multichannel radar station operation with an electronically controlled beam pattern and TDM channel division; optimization makes it possible to improve the tracking accuracy by 39 percent. The findings are applicable to both monostatic and multistatic multichannel radar stations and may be extended to the case of parallel interrogation of several multiple targets. Figures 2; references 5.

Acoustooptic Deflector Interaction Band in Self-Detuning Mode

[Article by V.V. Rozdobudko; UDC 535.241.13]

[Abstract] Methods of ultrasonic vibration excitation in acoustooptic (AO) microwave (SVCh) modulators and deflectors directly on the piezoelectric crystal surface with the help of a system of interdigital transducers (VPSh) are considered and the transmission band of a filter designed on the basis of an acoustooptic deflector with an interdigital transducer is analyzed and its transmission band control law within its frequency band is examined; moreover, the high acoustooptic deflector utilization efficiency in the self-detuning mode as the principal elements of a frequency-sensitive series-type device is demonstrated. An analytical expression is derived for the interaction band of microwave deflectors in the self-detuning mode allowing for the beam pattern

(DN) width variations with the frequency of the ultrasound excited by a system of interdigital transducers; the effective piezoelectric transducer length variation is taken into account. A LiNbO$_3$-based deflector is used in the experiment. The experimental results are found to be consistent with analytical data for a two-octave working frequency band. Figures 3; references 4.

Structural and Technology Design Characteristics of Digital Devices on GaAs IC's

[Article by S.Ya. Korsakov, A.N. Sidnev, I.V. Steklov; UDC 621.3.049.75+621.3.049.77]

[Abstract] The difficulties of making GaAs integrated circuits (IC) and developing modules and units on their basis are discussed and the principal electric parameters of series K6500 integrated circuits are considered. The design and development characteristics of digital modules on the basis of GaAs integrated circuits which ensure the operation of devices at clock frequencies of up to 1 GHz are investigated. Design features of the printed boards made from several GaAs packaged integrated circuits are examined and the mutual effect of the conductors and junctions in multilayer printed boards for digital devices with subnanosecond pulses is analyzed. Two-layer microwave printed boards are used to develop high-speed modules for a multiplexer and demultiplexer ensuring data transmission at a 500 Mbit/s rate and a clock frequency of 500 MHz, each containing more than 20 series K6500 integrated circuits. Figures 7; tables 1; references 4.

Efficiency Analysis of Adaptive Antenna Array in Steady-State Condition in Presence of Correlated Noise

[Article by A.B. Gershman, G.V. Serebryakov; UDC 621.396.67]

[Abstract] The effect of the cross-correlation of the legitimate signal and noise on the operating efficiency of adaptive antenna arrays (AAR) due to the signal compensation with noise is discussed and expressions are derived for the principal signal processing characteristics of an adaptive antenna array; attention is focused on the output signal/noise ratio in the case where the legitimate signal and noise are correlated. An equally spaced linear adaptive antenna array is considered and its optimum vector of weight factors (VVK) is derived. Two types of correlated noise suppression mechanisms in the adaptive antenna array—beam (DN) nulling and coherent noise subtraction from the legitimate signals—are identified. It is shown that the expressions may be extended to the case where the methods of spatial smoothing by a sliding subarray are used to decorrelate the signal and noise. References 2.

Synthesis of Multilayer Diffraction Gratings From Metallic Strips

[Article by V.A. Bychkovskiy; UDC 621.372.852.1]

[Abstract] The use of multilayer diffraction gratings (MDR) made from thin metallic strips in antennae and resonance absorbers and a technique for synthesizing multilayer diffraction gratings on the basis of a given resonance frequency spectrum are investigated. The elements of a multilayer diffraction grating located in a dielectric layer of a known thickness and made from thin metallic strips whose edges are parallel to the magnetic field vector are described by mathematical expressions and a multilayer diffraction grating schematic diagram is cited. The proposed procedure makes it possible to solve the problem of multilayer diffraction grating synthesis and realize a specified resonance frequency band and is also more general than Richards's technique. Figures 2; references 4.

Transmitting TV Network Development in USSR

*927K0176A Moscow ELEKTROSVYAZ in Russian
No 10, Oct 91 pp 2-4*

[Article by A.M. Varbanskiy; UDC 621.397]

[Abstract] The development of the TV broadcasting networks in the USSR since the emergence of television sixty years ago is reviewed; the general TV broadcasting system structure, existing TV transmitter stations, transmission of TV programs over existing radio relay link (RRL) channels, satellite TV systems, and the characteristics of the Orbita, Ekran, and Moskva TV receiving stations and Molniya, Ekran, and Gorizont satellites are discussed in detail. The existing five-zone satellite TV coverage in the USSR with the help of the Moskva, Ekran, and Orbita satellite constellations is considered. It is noted that the transmitting TV network operating in the USSR encompasses some 1,100 high-power transmitters and 11,000 low-power transmitters, 80 Orbita satellite communication earth stations, 9,000 Ekran and Moskva earth stations receiving programs from seven satellites, and over 300,000 channel.km of terrestrial radio relay stations. The network makes it possible to receive two central TV channels and republican and oblast programs virtually everywhere. Figures 1.

Selecting Satellite TV Broadcasting Development Trends in USSR: Discussion

*927K0176B Moscow ELEKTROSVYAZ in Russian
No 10, Oct 91 pp 4-6*

[Article by L.Ya. Kantor; UDC 621.396.677:32]

[Abstract] The outlook for satellite TV (STV) development in the new economic and political environment is evaluated allowing for the availability of new equipment and methods. The development of satellite TV systems in the post-war years is examined from the viewpoint of the changing frequency bands, satellite TV system standards in various countries—PAL, SECAM, and NTSC—and transmission methods; satellite TV systems operating in the fixed satellite service (FSS) and direct satellite TV broadcast (NTV) bands are compared. The criteria of the power flux density (PPM) at the earth's surface and effective isotropically radiated power (EIIM) are analyzed. The goals behind satellite TV system developments are elaborated and the profitability of satellite TV systems is examined. Recommendations are given for selecting the types of satellite TV systems in the USSR. It is expected that for the time being, the SECAM standard and the FM (ChM) signal transmission method will continue to be used in the USSR. The long-range outlook for HDTV (TVCh) is considered. References 2.

From Community Antennas to Multifunction Information Systems

*927K0176C Moscow ELEKTROSVYAZ in Russian
No 10, Oct 91 pp 7-9*

[Article by N.A. Reushkin; UDC 621.397.13]

[Abstract] The rapid and extensive evolution of community TV reception systems which now make it possible to connect several dozen TV sets to one TV antenna gave an impetus to the development of a new generation of information systems and kindred areas. The operating principles of community TV reception systems (SKPT) is considered. The development of a multiprogram TV reception network on the basis of large-scale community TV reception systems (KSKPT) and the resulting development of a multifunction information cable TV system (SKTV) on the basis of a large regional video center connected to head TV stations by microwave (SVCh) radio relay links (RRL), fiber optic lines, or their combination is considered. The outlook for fiber optic communication line (VOLS) implementation in cable TV systems on the basis of the hub and spoke principle is examined. A block diagram of such a multifunction cable TV information system is cited. The prospect for developing multifunction cable TV information systems using digital data transmission methods is examined and the need to develop competitive analog-to-digital and digital-to-analog converters with the necessary parameters and acceptable cost is emphasized. It is expected that future receiving network development will proceed along the lines of expanding the types of services being provided while maximizing the utilization of existing facilities. Figures 3; references 6.

'Ilmen-2' Computer-Aided 25/2.5 kW TV Transmitter Station for Bands IV-V

*927K0176D Moscow ELEKTROSVYAZ in Russian
No 10, Oct 91 pp 13-16*

[Article by L.B. Kalinin, Yu.I. Matveyev, M.M. Panchenko, A.A. Popov; UDC 621.397.61]

[Abstract] Pilot operation of the Ilmen-2—a successor to the Ilmen-1 TV transmitter station—in channel 33 in Leningrad and channel 51 in Grodno is reported. The new decimeter band transmitter employs an HV-120 Vacha main feeder and a Shchel slot antenna. There are two transmitter versions, one for the 470-638 MHz band and one for the 638-790 MHz band. The station meets the color TV transmission specifications of GOST 20532—83 and requires servicing at 75 day intervals. A block diagram of the Ilmen system is cited and the characteristic features of individual transmitter components are elaborated. The design of the klystron amplifier, feeder devices, and built-in monitoring equipment is examined in detail. Structurally, the Ilmen-2 system is located on two floors with a 60 m² area. Separate video and audio signal amplification is used. The system has 100 percent preamplifier passive redundancy and sliding redundancy of the final amplifiers. The system is characterized in that it is transistorized up to the final klystron and the highest station voltage is lowered from 21 to 14 kV. Commercial production of the Ilmen-2 system is planned. Figures 7; references 4.

Method of Improving Satellite TV Broadcast Antenna Monitoring Systems

[Article by R.I. Rumyantsev; UDC 621.396.67.08-62]

[Abstract] Joint use of the same frequency bands by different satellite and terrestrial services which is permitted under Radio Communications Rules but complicates the electromagnetic environment is discussed; the problem can be solved by using satellite TV (AST) antennas with high spatial selectivity. The limitations of existing satellite TV antenna monitoring systems (SKAT) are outlined and a method of improving the satellite TV antenna monitoring systems is considered. The methods are based on correcting the error contributed by the scanner—the principal error source—intended for moving the probe in the scanning plane. Error reduction is based on using a probe deflection sensor and two stabilization systems. Tests of the method confirm that it meets the satellite TV antenna monitoring system requirements within the operating band and may be recommended for checking the parameters of satellite dishes. The proposed method is characterized in that it is possible to relax the accuracy requirements imposed on large scanner guides thus lowering satellite TV antenna monitoring system cost by 20-30 percent. Figures 1; references 2.

Leningrad's Pilot TV Center

[Article by V.A. Urvalov]

[Abstract] The events surrounding the implementation of electron scanning methods in Soviet television broadcasting and the story of the development of Leningrad's Pilot TV Center built by Soviet engineers from domestically manufactured units, parts, and electronic components are described. The circumstances facilitating the rapid (3-4 years) transition from 30-line optomechanical TV to electronically scanned TV are outlined; the development by V.K. Zvorykin of the first high-definition 300-line iconoscope in 1933 prompted the All-Union Radio Committee to order the development of Leningrad Pilot TV Center (OLTTs) components; most of the people charged with guiding the center operation were arrested by the NKVD but eventually released, except for A.P. Konstantinov who was sentenced to the highest measure of punishment. Work on restoring the center after World War II is summarized and the design of the early TV sets—the VRK in 1936 and the 17TN-1 in 1940—is described. On 15 April 1951, the restored Leningrad TV Center switched to a new broadcast standard with a 625 line, 25 frame, 50 field definition. It is noted that after 30 years of exemplar service, the current TV center (founded in 1963) no longer meets modern requirements and will cease operating as soon as construction a new TV center is completed. Figures 4; references 7.

Cable Transmission Systems at 'Svyaz-91' Exhibit

[Article by L.T. Kim; UDC 621.396.1]

[Abstract] It is noted that in scope and diversity, analog (ASP) and digital (TsSP) cable transmission systems exhibited at the Svyaz-91 Fair fell far from being electronic switching equipment, particularly private electronic automatic telephone exchanges (EATS), and state-of-the-art telecommunication systems; this relative scarcity of transmission system (SP) exhibits is attributed to the rising demand for new communications gear and switching systems and the technological threshold which today's transmission systems have reached: new analog systems are not being developed while the development of digital systems is hindered by the limitations of existing plesiochronous hierarchies used in the United States, Europe, and Japan. A new synchronous digital hierarchy (STsI) adopted by the CCITT (MKKTT) is described and the transmission system development trends displayed in the fair's exhibits as well as representative transmission systems either exhibited or presented in company brochures are summarized. In particular, analog transmission systems, digital line circuits with metallic cables, fiber optic line circuits, digital multiplexing equipment, digital on-line switching equipment (AOP), and subscriber loop access equipment as well as exploratory designs by the NEC, AT&T, NSI, Philips, Siemens, Tesla, Telkom, Newbridge, Italtel, and other companies are outlined. References 4: 3 Russian, 1 Western.

Mathematical Description of Electromagnetic Interactions on Far End of Four-Quad MKS Cable in Time and Frequency Domains

[Article by V.A. Andreyev, V.G. Shulga; UDC 621.315.2:621.39]

[Abstract] The effect of electromagnetic interactions (EMV) among the far-end circuits of a four-quad MKS cable on the instantaneous values of noise and the error rate—signal transmission quality indicators of line circuits (LT) in digital transmission systems (TsSP)—is discussed and an attempt to develop a unified mathematical model which describes the electromagnetic interaction on the far end in the frequency and time domains and makes it possible to connect the frequency and time characteristics of interaction over repeater intervals and face-to-face cable lengths to each other as well as to determine permissible standards for interference parameters is reported. Mathematical expressions are derived which make it possible to

plot the frequency response of noise immunity of an elementary cable section (EKU) and establish the relationship between the time and frequency characteristics of immunity. It is shown that the mean pulse immunity on the repeater decision circuit input is equal to the mean immunity at the half-clock frequency of the elementary cable section. The results may be used for optimizing the parameters of MKS cable-based digital line circuits and formulating permissible standards of circuit immunity. Figures 5; references 6.

Assessing Effect of External Electromagnetic Fields on Transmitting Characteristics of Optical Fibers

*927K0176I Moscow ELEKTROSVYAZ in Russian
No 10, Oct 91 pp 31-33*

[Article by G.I. Gordon, P.A. Mishnayevskiy, P.P. Ovvyan, V.I. Smirnov; UDC 621.372.0.09]

[Abstract] The influence of the external electromagnetic field on the transmitting characteristics of optical fibers (OV) is investigated allowing for the nonlinear effects developing in the fiber and the phenomena related to the optical fiber heating. To this end, the external electromagnetic field affecting the optical fiber is considered as a quasiplanar field with nonzero vertical and horizontal component of the electric fields strength vector and transverse component of the magnetic field strength vector in a cylindrical system of coordinates. The refractive index distribution in the fiber is plotted and the signal propagation in the fiber is analyzed. A physical model of the processes occurring in the optical cable under the effect of external electromagnetic fields is developed; numerical estimates are derived, showing that given an electric field strength on the order of 10^8 V/m, electromagnetic pulses (EMI) virtually do not corrupt the transmitted data or lead to noticeable changes in the fiber characteristics while given a field strength of 10^9-10^{10} V/m, the fiber temperature may rise to $10^{3°}$C, attenuation may increase by several decibels, the aperture may become distorted, and the single-mode fiber condition becomes upset. The transmitted data become noticeably corrupted and the signal/noise ratio increases. It is shown that these negative phenomena may be decreased by additional protective sheathing. References 11: 7 Russian, 4 Western.

Quasicoherent Processing of Multiposition Amplitude-Phase-Modulated Signals in Multichannel Modems

*927K0176J Moscow ELEKTROSVYAZ in Russian
No 10, Oct 91 pp 33-35*

[Article by L.N. Berkman, Yu.B. Okunev; UDC 621.391.26]

[Abstract] The use of frequency division multiplexing and multichannel modems with orthogonal channel signals in computer and data transmission networks with switched audio frequency (TCh) channels in order to decrease the effect of fluctuation noise, line distortions, pulse noise, and blackouts is discussed and a multiposition amplitude-phase modulated (AFM) signal processing algorithm is synthesized. A block diagram of the device realizing the algorithm is cited and specific algorithms of coherent processing of promising 16-position APM signals aimed at digital realization are considered. The results of statistical modeling of quasicoherent signal processing algorithms as a function of the error probability for various ratios of the mean signal power to the spectral noise density are plotted. Given a digital realization, the device is executed as a single processor incorporated in the multichannel modem. Figures 5; tables 4; references 6.

'Svyaz 91' in Moscow

*927K0137A Moscow VESTNIK SVYAZI in Russian
No 12, Dec 91 pp 2-5*

[Article by D.A. Podberezin, Central Scientific Research Institute of Communications]

[Abstract] The exhibits shown at the traditional Svyaz-91 fair held in Krasnaya Presnya in May 1991 by more than 350 firms and organizations from 19 countries, including the USSR, attest to the considerable progress in the communications industry since the previous Svyaz-86 fair. Interest in the trans-Soviet line (TSL)—a fiber optic communication line (VOLS) stretching across central Eurasia—is reported. The exhibits presented at the fair included a mobile videoconferencing system by Philips (Germany), a jitter meter by Wandel & Goltermann (Germany), a PF-6 all-purpose error and jitter meter for digital transmission systems (TsSP), an Optometer optical cable parameter analyzer by Salzgitter Elektronik (Germany), a mobile four-channel PION TV station by BANGA (Lithuania), an Echometer TO3/6 fault locators for cable lines with parallel conductors by Salzgitter Elektronik GMBG, an optical model 7723 reflectometer by Schlumberger Technologies (Great Britain), an SPM-15 selective level indicator by Wandel & Goltermann, the DRMASS multiple access network equipment by NEC (Japan), and intelligent multiplexer 3600, a product of a Soviet-Canadian Newbridge Soviet Telecom joint venture, and other items. The wide range of equipment has one common feature: it is aimed at delivering diverse data to any point on the globe and beyond at the highest speed, with the least losses, with sufficient reliability, and cheaply. Figures 7; references 3.

Training of Fiber Optic Communication Line Professionals

*927K0137B Moscow VESTNIK SVYAZI in Russian
No 12, Dec 91 pp 22-23*

[Article by B.V. Gizhitskiy, A.D. Yampolskiy, Kiev Communication Polytechnic]

[Abstract] The increasingly stringent requirement being imposed on the skill level of experts capable of proficiently wiring, tuning, and operating fiber optic transmission systems (VOSP) and fiber optic communication lines (VOLS) necessitated by their development and implementation is discussed and a new field training facility set up at the Kiev Communication Polytechnic (KPS) is described. The new facility for training fiber optic communication system professionals consists of an optical communications lab and workshops. The teaching aids and training manuals as well as workstations linked by optical line sections with standard interfaces developed by the optical communications lab are summarized. The lab has become a center for research work in the area of optical communications methods and devices and is equipped with a computer. Computer software which meets GOST 8207-76 requirements has been developed for the training program. The fact that upperclassmen working as interns are participating in work on laying and wiring fiber optic communication lines confirms the efficacy of the training curriculum. The training center's future plans are outlined.

Making Printed Boards Without Using Chemical Copper-Plating Solution

[Article by V.V. Gabelko, V.M. Yeskov, A.I. Roshchenya, S.N. Koltunov, USSR Telecommunications Ministry]

[Abstract] The shortcomings of thermodynamically unstable copper-plating chemical solutions used today for metallizing printed board walls and holes are summarized and it is shown that the printed board fabrication process can be greatly simplified by eliminating the chemical copper-plating operation and a number of rinsing cycles, making it possible to decrease the labor outlays and save scarce chemical reagents. Efforts preceding the development of the new method are outlined and the procedure of building up the copper layer on a conducting palladium film produced by treating the printed board blanks in a solution of copper sulfate, sulfuric acid, sodium chloride, an LTI additive, and an OS preparation is described. The electrolytic precipitation conditions are summarized. The resulting coat thickness (20 μm) meets the requirements of GOST 23752—79. The bonding strength (tearing force) reaches 98 N. The method has been commercially implemented.

'Tsensor-S' Monitors Rural ATX Equipment

[Article by K.V. Kostylev, A.N. Likontsev, A.G. Simanovich, S.F. Sharapov, Rossvyazinform Laboratory, Leningrad]

[Abstract] The Tsensor-S computer-aided control system for centralized monitoring of the operation of up to 32 unmanned rural automatic telephone exchanges (ATS) developed at the Rossvyazinform Laboratory consists of a central device (TsU) usually located at the regional communication center and local devices (OU) located at individual ATX's; the latter are connected to the former by signaling channels. System operation and data processing are controlled by a KL-08 microcomputer (PEVM). Three types of binary signals are monitored: general failure, emergency or impending emergency, and malfunction signals. A block diagram of the system is cited. System implementation made it possible to considerably shorten the equipment malfunction detection time, make timely repairs, and facilitate preventive maintenance and repairs. Figures 1.