Gaseous Discharge Chamber, A. M. Govorov, V. I. Nikanorov, G. Peter, A. F. Pisarev, and Kh. Poze, pp. 1089–1091.

Operational characteristics of a gaseous discharge chamber are given using electrodes spaced 70 mm apart.

One of the promising methods for recording charged particles uses a gaseous discharge chamber as a tracking element which was proposed in other papers. These chambers differ from the ordinary spark gap chambers in that their electrodes are separated from the working space by a dielectric material. Investigations have shown that with an electrodes separation of 20 mm, the width of the tracks obtained is 2 mm, the average angle of inclination of the discharge path along the trajectory of the particle with respect to the electric field direction is 18°, and the duration of sensitivity equals 6 to 10μsec. In the present article, similar characteristics of chambers with larger interelectrode gaps are investigated. Furthermore, the problems of dependence of the high voltage pulse amplitude applied to the chamber on the pulse duration (provided a visible track is to be obtained) and the part played by the cleanup field, which have not been investigated elsewhere, are studied.

Ultra-High-Speed Pulse Oscillograph, L. S. Bartenev, G. V. Glebovich, and K. N. Ptitsin, pp. 1120–1122.

An oscillograph is described, with maximum spot velocity $2 \cdot 10^{10}$ cm/sec at a time instability not greater than $1.5 \cdot 10^{-11}$ sec, permitting pulse processes of duration 10^{-10} sec to be registered.

Device for Calibrating Sensitivities of Ion Current Measurement Channels of Dual-Beam Mass Spectrometers, I. V. Gol'denfel'd and I. Z. Korostyshevskii, pp. 1122–1125.

A method and a device for calibrating the sensitivity ratio of the measuring channels of dual-beam mass spectrometers without performing isotopic analysis are described. The calibration accuracy is not worse than ±0.02%. This method can also be used for determining the absolute values of high resistance resistors and for checking their linearity.

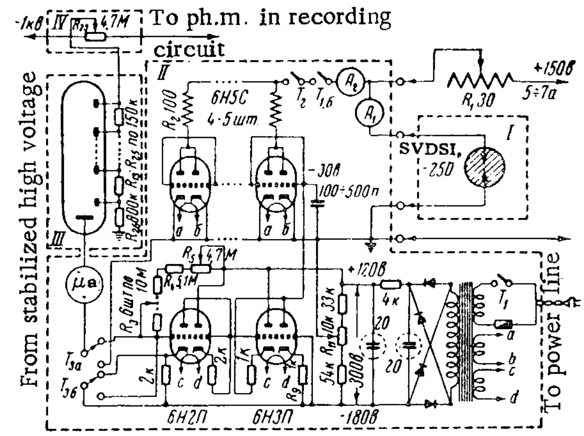
New Photomultipliers, G. S. Vil'dgrube, N. V. Dunaevskaya, and I. A. Kharitonova, pp. 1130–1132.

The design of photomultipliers FEU-52 and FEU-53 is described, and their parameters, characteristics, and recommended operating conditions are presented.

Table 1

Characteristics and parameters	FEU-53	FEU-52
Overall length, mm	117.0	125.0
Envelope diameter, mm	51.3	80.0
Photocathode diameter, mm	45.0	75.0
Number of multiplier stages	14	12
Region of spectral sensitivity A	2500–6500	3000–8000
Spectromaximum A	4100 ± 100	4200 ± 100
Maximum quantum efficiency of photocathode, %	18.0	25.0
Integral sensitivity of photocathode, μamp/lu	40.0	80.0
Integral sensitivity at multiplier output, amp/lu	U_0=1700v 40 U_0 = 2200v 4000	U_0=1700v 8 U_0=2200v 800
Dark current, amp	U_0=1700v $4 \cdot 10^{-7}$ U_0=2200v $2 \cdot 10^{-5}$	U_0=1700v $5 \cdot 10^{-8}$ U_0=2200v $2 \cdot 10^{-5}$
Maximum output current, ma	10.0	10.0
Maximum supply voltage, kv	2.5	3.0
Amplitude resolution for Cs^{131} from NaI(Tl) crystal, %	9–11	9–12
Limit of light characteristic linearity with pulse illumination, amp	1.0	1.0
Current stability at output with V_0–1700 v, %	±2.5	±2.0
Noise equivalent energy in scale of NaI(Tl), kev	5.0	5.0
Pulse rise time at multiplier output, sec	$(4–5) \cdot 10^{-9}$	$(5–6) \cdot 10^{-9}$

Stabilizer of Photoluminescence Light Flux, N. I. Kuznetsov, pp. 1175–1176.



Circuit diagram of stabilizer: I) Excitation light source; II) stabilizer block; III) controlling photomultiplier; IV) distribution box for high voltages supplied to two ph.(oto) m(ultipliers).

An instrument is described which makes it possible dependably to stabilize photoluminescence flux by automatic adjustment of the excitation source potential. A photomultiplier exposed to the photoluminescence to be stabilized is used as the directing element of the control action. Only an insignificant part of the stabilized flux is used in this control action.

MEASUREMENT TECHNIQUES (Izmeritel'naia Tekhnika). Published by Instrument Society of America, Pittsburgh, Pa.

Number 1, September 1961

Uniformity of Measurements in the Sphere of Accelerometry, P. N. Agaletskii and V. I. Kiparenko, pp. 23–26.

Induction Transducer for Measuring Rapidly Changing Pressures, S. M. Gugel', pp. 27–28.

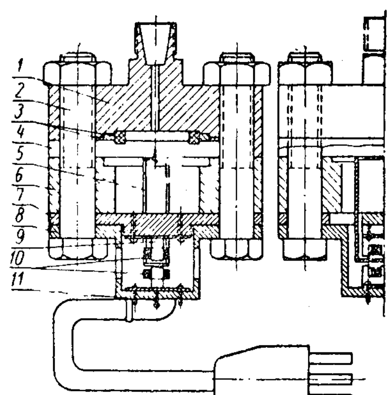


Fig. 1. Schematic of a high-pressure induction transducer. 1) Fuel receiver; 2) bolt with a nut; 3) packing; 4) diaphragm; 5) magnet coil; 6) thrust collar; 7) magnet holder; 8) lid; 9) core; 10) coil; 11) adjusting screw.

For investigating the value and nature of pressure variations in a fuel supply system for internal combustion engines we constructed a high-pressure induction transducer. Induction transducers have not been used previously for measuring high, rapidly changing pressures and, therefore, the satisfactory results we obtained in this respect are of some interest.

The main components of the transducer (Fig. 1) consists of two E-shaped cores 9 made of transformer iron. The cores carry coils 10 with 220 turns of 0.2-mm wire. One of the cores is mounted on transducer lid 8 which has two openings, making it possible to vary the distance between the cores during adjustments. The other core is mounted on the magnet-holder 7 which is made dismountable for admitting the transducer coil. In the gap between the cores the magnet coil 5 is placed and connected to diaphragm 4, which is fixed between the fuel receiver 1 and the thrust collar 6. Hermetic sealing in the high pressure area is provided by copper packing.

After the transducer is assembled, the position of the magnet coil is adjusted in such a manner that the gaps between it and the lower cores are equal. This is attained by a displacement of the upper and lower cores. The upper core is displaced by means of packing, and the lower by the adjusting screws 11. Equal gaps provide equal coil currents, and, owing to their opposite direction, a zero reading on the indicator (oscilloscope or milliammeter).

Complex of Metrological Work on Establishing Methods and Apparatus for Precise Measurements of High Temperatures, A. N. Gordov, K. S. Izrailov, V. V. Kandyba, I. I. Kirenkov, V. A. Kovalevskii, É. A. Lapina, V. E. Finkel'shtein, and N. N. Érgardt, pp. 31–35.

Requirements for accuracy and range in high temperature measurements which have arisen in recent years in various branches of industry and new technology necessitate a radical reconstruction of the whole metrological system in the measurement of high temperatures, as well as the development of new standard and reference instruments based on the latest achievements of science and precision instrument making. In this connection the institutes of the Committee of Standards, Measures and Measuring Instruments, namely, the D. I. Mendeleev VNIIM (All-Union Scientific Research Institute of Metrology) and the KhGIMIP (the Khar'kov State Institute of Measures and Measuring Instruments), have mapped out a complex of metrological work on establishing new high-precision standards and reference instruments for temperatures up to 1000°C. This enormous work was completed in 1960. It represents a single complex of metrological investigations necessary for insuring technical progress in the branches of industry and new technology which make use of high temperatures.

As a result of this work, a metrological foundation has been laid for providing the required accuracy and extending the range of high temperature measurements, new instruments and devices have been made and put into use for precise measurements at high temperatures and for insuring uniformity of such measurements.

The work was conducted in four basic aspects—gas thermometry, thermoelectric pyrometry, optical and visual pyrometry, and objective pyrometry (photoelectric and radiation)—which comprised nine sections: 1) more precise determinations by means of gas thermometer methods of the deviations in the International Practical Temperature Scale from the thermodynamic scale; 2) development and introduction of calibration methods for highly stable reference and industrial thermocouples at temperatures up to 1800°C; 3) production of high-precision luminous optical pyrometers for use as standard and reference instruments in a wide temperature range; 4) development of methods for calibrating and checking precision industrial pyrometers at temperatures up to 10,000°C; 5) development of methods of objective spectropyrometry and production of precision equipment for calibrating at high temperatures with the utmost precision; 6) reproduction of luminance and color temperature scales for objective methods; 7) establishment of a group of highly stable radiators to be used as standard and reference measures for calibration and checking of luminous and color pyrometers; 8) production and bringing into use of radiators and devices for calibrating and checking reference and industrial radiation pyrometers; and 9) production and bringing into use high-precision spectropyrometers for measuring temperatures by means of infrared radiation.

Number 2, October 1961

Differential Instrument for Comparing Radiation Pyrometers, M. S. Kayander, pp. 119–122.

Most commonly used device for calibrating and checking radiation pyrometer telescopes is a type URP-4 tester whose radiation source is a movie lamp, with a condenser lens that produces the radiator's image on the pyrometer objective. The pyrometers being compared are mounted in special holders which make it possible to place them in turn in exactly the same position in front of the radiator along the optical axis of the system. However, owing to an insufficiently rigid location, their position may vary, producing a nonuniform luminous flux, thus leading to a systematic error in comparing the telescopes. In order to avoid the possible differences in the position of telescopes with respect to the luminous flux when checking reference pyrometers, the position of the telescopes is interchanged during testing.

With this in mind, we proposed a differential method of comparing radiation pyrometers. In this method, the compared pyrometers are sighted on the radiator simultaneously and not one at a time as in the URP-4 set. The pyrometers are placed on either side of the radiator in such a way as to obtain an equal luminous flux. At the same time, the difference between their thermal emf is measured directly by connecting the electrical circuits of the reference and tested pyrometers differentially.

Choosing the Length of Torsion Suspensions, S. M. Pigin, pp. 135–139.

The length of torsion suspensions determines a whole series of measuring instrument parameters, including the dimensions of the measuring mechanism, the tensile strength of the suspensions for a given restoring torque, the sag of the suspensions in the horizontal position, the natural frequency and vibration-proof properties, the stress due to twisting, electrical resistance, and accuracy in reproducing the restoring torque. The length of the two suspensions is added to the height of the measuring mechanism, thus constituting an inherent part of the instrument's dimensions. Since the restoring torque is inversely proportional to the length of the suspension, variations in the latter for a constant torque inevitably lead to changes in its rigidity, and hence affect the tensile strength Q of the suspension.

Conclusions: It is shown that there is no optimum length for torsion suspensions. For a number of parameters (overall dimensions, sagging, vibration-proof properties, electrical resistance), it is advisable to decrease the length; for other parameters (strength, failure to return to zero, stress due to twisting, accuracy in reproducing the torque), it is advantageous to have longer suspensions.

In particular cases, the possibility of using a suspension of a certain length can be checked easily by simple calculations, and the actual conditions of its application will indicate which are the controlling factors.

In general, it should be noted that the most suitable lengths for suspensions are in the range of 5–20 mm; moreover, the shorter suspensions should be used in rack-mounted instruments and the longer ones in laboratory instruments of increased and high grades of accuracy. For superminiature instruments (with a deflection angle up to 90°) even shorter suspensions of 2.5–3 mm may be used. The use of suspensions longer than 20 mm is not advisable.

High-Precision Moving-Coil Laboratory Instruments with Torsion Suspensions, Yu. K. Obram and Z. V. Grigor'eva, pp. 140–144.

Photocompensated Amplifiers with Torsion-Suspension Galvanometers, S. G. Rabinovich, pp. 148–150.

Our recent investigations have shown that, in order to decrease drastically the galvanometer's sensitivity to shock, it is necessary to suppress or prevent transverse oscillations of its moving part. This can be achieved by the use of transverse oscillation dampers.

Magnetic induction dampers, for instance, can be used. Transverse oscillations occur almost exclusively in the direction of the least stiffness of suspensions, thus facilitating the design of magnetic induction dampers.

However, liquid dampers seem to be more promising. Such damping can be achieved either by immersion of the whole moving part in a liquid, or by means of concentrated drop dampers. Preliminary experiments have shown the great efficiency of liquid dampers. It would appear that the use of such dampers in the control galvanometers of photocompensated systems will make it possible to use these instruments under the most difficult operating conditions.

Number 3, November 1961

Accelerometric Instruments, N. I. Kotel'nikov, pp. 187–190.

Relation of the Thermal EMF to Temperature in Telescopes Type Tera-50/900–1800, E. S. Shpigel'man and L. M. Golub, pp. 192–194.

As the result of the present investigation, we obtained a mean calibration curve and an analytical equation which represents with sufficient accuracy the relation between the thermal emf and temperature for the types of telescopes we investigated. This makes it possible to recommend a new, more efficient technique of calibrating grade 2 telescopes at four temperatures in the range of 900–1800°C.

Applicability of Kotel'nikov's Theorem to Discrete Measurement Techniques, V. N. Khlistunov, pp. 203–207.

1) The linear interpolation method requires a higher (by a factor of 1.4) rate of transformation for signals of the simplest form compared with approximation functions of the type of sin$x$ or sinx/x, but it reduces that rate to hundredths and thousandths of that required for the latter functions in transforming variables of a more complex form, for instance, of the exponential type.

2) Kotel'nikov's theorem applies to approximations by means of a function of the type of sinx/x; hence it is not suitable for discrete measurements for the reasons previously given. Moreover its application makes it difficult to obtain the values of the measured variable between two adjacent discrete readouts.

3) A linear approximation appears to be sufficiently suitable and convenient for discrete measurements of continuous variables; its application does not require additional computations, devices, or gages, which would have been required for any other approximating function.

4) When signals approaching a harmonic form are measured by the discrete method, the main propositions of Kotel'nikov's theorem hold if the highest frequency f_s of the measured signal spectrum is taken to be the harmonic frequency which must be evaluated in order to obtain a discrete representation of a harmonic pulse signal with a given accuracy.

Number 4, November 1961

High Speed Electromechanical Digital Voltmeter, V. M. Shlyandin, pp. 290–293.

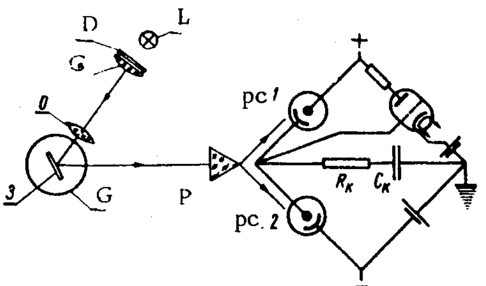


Fig. 1.

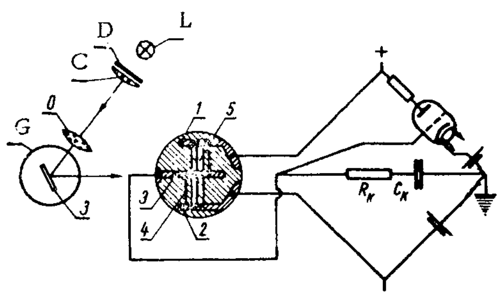


Fig. 2.

The known electromechanical voltmeters with a digital display used for measuring direct voltages are based on a compensation circuit whose balancing is achieved during measurements by the control unit which switches in consecutively (samples) the resistors in the circuit. This is done by means of commutating elements consisting of motors, step-by-step switches or relay circuits, programmed by means of a step-by-step switch. In the balancing process, the difference $U_x - U_k$ between the measured and compensating voltages is decreased in consecutive steps to a predetermined procedure, until it attains a value smaller than the minimum calibration of the instrument.

The characteristic of the voltmeter here described is in the absence of the consecutive comparison (sampling) of the measured voltage, with the voltage drop across individual resistors in the compensation circuit, i.e., a complete elimination of a long balancing process characteristic of normal instruments. Each voltmeter decade registers approximately the absolute value of the U_x voltage applied to it, compares it with the corresponding value of the reference voltage, and obtains the difference $U_x - U_k$. The absolute value of this difference is approximately registered by the next decade and compared with the corresponding value of the reference voltage of that decade, etc. The main advantage of this voltmeter is its high speed operation and the easy requirements with respect to the adjustment of the decade comparing elements.

Conclusions: The basic result of this work is a rigorously derived equation for a bridge with photoelements working in a dynamic condition and in derived relations, which provided a more detailed analysis than hitherto of various bridge designs, as well as facilities for their computation.

It follows from formulas given that it is possible by means of appropriate adjustments to reduce the effect of the supply voltage and illumination on the position of the " zero."

The given theory brings to light the peculiarities of different types of bridges and their operating conditions.

The applicability range of the given theory is determined by the requirements of the small inertial and the quasilinear characteristic of the photoelements.

Tissue-Equivalent Dosimeter for Fast Neutrons, M. F. Yudin and O. A. Filippov, pp. 303–308.

Our object is to develop a dosimeter which will measure doses due to fast neutron fluxes of a density of 20–30 neutrons/cm²·sec and more, and will possess a relation of its readings to the energy of neutrons similar to that of an absorbed dose in a soft tissue to the energy of neutrons irradiating that tissue.

Elements of the General Theory of Ultrasonic Flowmeters, G. I. Birger, pp. 309–317.

An important sphere of application of ultrasonic flowmeters is in checking the flow of corrosive liquids and pulp where it is impossible to use similar instruments and methods of measurement. However, nearly all the ultrasonic flowmeters described in the literature are intended for measuring the speed of flow in pure noncorrosive liquids (water, oil products, etc.). At the same time, in work published to date only a simplified theoretical treatment of ultrasonic flowmeters is given, without analyzing the errors, thus making it difficult to choose the most suitable type in the construction and layout of flowmeters for given measuring conditions and properties of the measured medium. Therefore, a pressing necessity has arisen for developing the foundations of an ultrasonic flowmeter theory with their classification and an analysis of their errors.

Number 5, December 1961

Capacitance Bridge Method for Measuring Speeds of Rotation, V. I. Fridlyand, pp. 358–361.

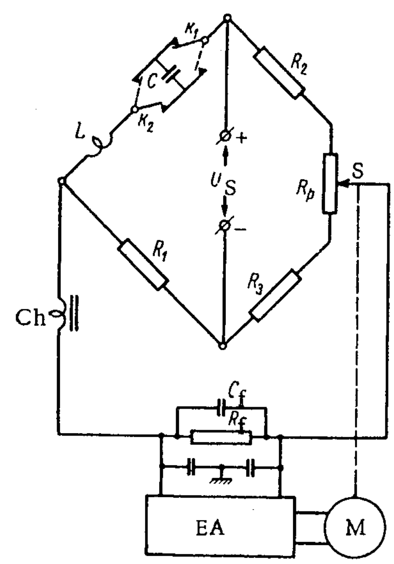


Fig. 1.

In experimental investigation of high speed machines, it is often necessary to make precision measurements and recordings of the rotation speeds of shafts for small variations of these speeds. One of the circuits which provide a high precision of measurement and an easy recording is the balanced bridge circuit with a commutated capacitor. Figure 1 is the schematic of an automatic tachometer bridge with a commutated capacitor. The bridge is fed with voltage U_s from a d.c. source. Commutators K_1 and K_2 are connected to the shaft whose speed of rotation it is required to measure. The number of their switchings per unit of time is proportional to the measured speed of rotation.

Calibration of a PIU-1 Accelerometer, P. N. Agaletskii, p. 362.

In recent years, the piezoelectric accelerometer PIU-1 has been fairly widely used for measuring vibration accelerations. It is a direct-reading instrument. Its scale is calibrated in acceleration units g ($g = 9.81$ m/sec^2); however, it is not stated whether these notations refer to peak or effective values of vibration accelerations. The dynamic measurements laboratory of the VNIIK (All-Union Scientific Research Institute of the Committee of Standards, Measures, and Measuring Instruments) has established that the manufacturer of accelerometers PIU-1 has calibrated them incorrectly and the instrument readings contain considerable ($\sim$30%) systematic errors.

The PIU-1 instrument measures effective (not peak) values of output voltages. Therefore, it can only be calculated in effective values of vibration accelerations received by the transducer. In calibrating accelerometers by means of sinusoidal vibrations whose amplitude A is determined by means of a reference accelerometer or measured indirectly and calculated from

$$A = 4\pi^2 f^2 D$$

where D is the amplitude of vibration displacements, and f is the frequency of vibrations, the effective value of acceleration A_{eff} for a sinusoidal form is found by multiplying the amplitude A by a factor of 0.707.

Accelerometer PIU-1 is calibrated in amplitude values of vibration accelerations of a sinusoidal shape, and its readings are correct only if the measured vibrations have a strictly sinusoidal shape. If this condition is not met (and in practice it is hardly ever observed) the instrument readings become erroneous. Hence, accelerometer PIU-1 readings should be multiplied by 0.707 and considered to be effective values of the measured vibration acceleration.

Nature of Dynamic Errors in Measuring Pulsating Temperatures of a Gas Flow with a Pulsating Speed, A. N. Gordov and B. I. Kovshev, pp. 363–366.

1) The displacement of the mean level in the synchronous oscillations of temperature with respect to heat exchange is due to the thermal inertia of the body. The displacement increases with rising thermal inertia. As a working hypothesis, it can be assumed that, in the same manner as the quenching of the amplitude of temperature oscillations is determined by the product of $\epsilon\omega$, the nature of the displacement also depends on the value of this product.

2) If the value of $\epsilon\omega$ remains in the range of $0.003 < \epsilon\omega < 0.5$, the relative displacement of the mean level of temperature oscillations in heat collectors increases monotonically with frequency. For values of $\epsilon\omega < 0.003$ the value of the relative displacement M/A_1 is, it would appear, so small that it need not be considered in working out the results of the recorded variable temperatures.

3) For values of $\epsilon\omega < 0.5$ the value of M/A_1 becomes independent of frequency. A certain rise observed in all the curves at frequencies of 0.1 and 0.2 cps appears to be due to omitted systematic errors whose values, however, do not exceed the given quadratic mean error.

4) The absolute displacement value depends not only on the oscillation amplitude of temperature and heat exchange (and the value of $\epsilon\omega$) but also on the shape of their curves. For a sinusoidal shape of the heat exchange variations curve, the observed displacement values were smaller than those recorded on the PITT equipment. It follows from the foregoing that the experimental determination of the error in measuring the mean level of temperature oscillations in a gas flow should be carried out with equipment capable of reproducing even approximately the shape of the curve of temperature and heat exchange oscillations which occur in the operating conditions of the heat collector.

Number 6, December 1961

Electroacoustic Gas Thermometer for Low Temperature Range, A. D. Brodskii, pp. 453–455.

The possibility of using the relation between temperature and the speed of sound propagation has been investigated previously. At present a new method has been developed of determining temperature by measuring the frequency of oscillations of a sound wave in an acoustic tubular resonator which forms a component part of an electromagnetic oscillations generator with an acoustical feedback. The basic property of such a generator consists in the relation of its oscillating frequency to the temperature of the acoustic resonator. If the tubular resonator is filled with an "ideal gas" (in our case with chemically pure helium), it becomes possible to determine the speed of sound propagation in gas at various temperatures by measuring the frequency of the generator. Modern methods of frequency measurements provide great precision (of the order of 10^{-8}), and, hence, a high accuracy in measuring the thermodynamic temperature. The theory of the electroacoustic gas thermometer is based on the well-known laws of thermodynamics.

Testing Equipment for Determining the Parameters of Heat Radiation Receivers, A. F. Mal'nev and L. S. Kremenchugskii, pp. 458–463.

The main difficulty in developing testing equipment for determining parameters of heat radiation receivers consists in designing circuits which would operate in the infra-low frequency range recording signals of the order of 10^{-10} v, which are obtained from low resistance receivers. It is impossible to amplify these signals directly using electron tubes; moreover, the tube internal noises increase rapidly at low frequencies. Miniature step-in transformers are, therefore, used for these purposes. The object of the transformer consists in matching the equivalent noise resistance of the receiver under investigation (or the bridge in which the receiver operates) with the equivalent input noise resistance of the first tube such that the noise of the receivers could be observed in the measuring circuit over the whole operating frequency range.

The equipment described here provides a relatively simple means for measuring the basic parameters of heat radiation receivers and for choosing optimum conditions of their operation. By means of this equipment, it is possible to determine the quadratic mean value of noise, the sensitivity to radiant power in modulated irradiation, the threshold sensitivity, the time constant, the spectral density of noise, and the current noises of the receiver. Low resistance metallic bolometers and thermocouples, as well as semiconductor bolometers and photovaristors, can be tested with this equipment.

Number 7, December 1961

Raised Sensitivity of Tuned Circuits in Instruments with Reactive Transducers, M. L. Shchupak, pp. 549–556.

The modern development of measurement technology is characterized by the application of electrical equipment for measuring practically any physical quantity, including nonelectrical quantities (temperature, humidity, mechanical quantities, etc.).

Instruments whose measuring systems employ tuned circuits are being used increasingly for testing nonelectrical quantities. In these circuits the measured capacitance or inductance forms part of an oscillatory circuit which operates under conditions of resonance or approaching resonance. The variations in capacitance (inductance) lead to variations in the natural resonant frequency of the circuit, thus making it possible to evaluate the measured quantity. Normally the scale of the indicating instrument is calibrated in units of the measured nonelectrical quantity. Tuned circuits are used both for fixed and variable operating frequencies.

In this article we deal with tuned circuits without losses which operate on the fundamental frequency and are formed by reactive transducers only and a transmission line connecting the transducer with the measuring circuit.

Inductances, Loss Resistances, and Q-Factors of Induction Coils, P. M. Todorov, pp. 562–567.

The new method which is suggested for determining L_c, R_c, and Q_c is applicable to all direct and indirect methods of measuring inductances. Since the values of the latter are very close to each other and are determined in a relatively narrow frequency band by means of the same measuring device, their relative errors $\Delta L_1/L_1$ and $\Delta L_2/L_2$ are of the same order and according to given equations will not have an appreciable effect on the value of $1-K^2$.

For coils with cores whose permeability varies with frequency, the ratio $n = f_2/f_1$ should be selected such that in the measured frequency range the permeability would remain practically unchanged. For coils with cores whose permeability does not vary with frequency, n can be chosen so as to obtain values of L_1 and L_2 suitable for measuring purposes.

The new method requires only one additional measurement of the coil inductance and is simpler than any other method. Providing all the forementioned conditions are observed and a measuring generator whose $\Delta f_1/f_1 \approx \Delta f_2/f_2$ is used, this method can provide a far more precise determination of L_c, R_c, and Q_c.

SOVIET PHYSICS—SOLID STATE (Fizika Tverdogo Tela). Published by American Institute of Physics, New York

Volume 3, Number 7, January 1962

Influence of Electric Field on Electron Temperature, Electrical Conductivity, and Thermionic Emission of Semiconductors. IV. Low Lattice Temperatures, I. M. Dykman and P. M. Tomchuk, pp. 1393–1399.

The method developed in another paper is extended to the case of low lattice temperatures. It is shown that in the region of impurity scattering the electron-electron interactions substantially influence not only the symmetric but also the asymmetric part of the scattering function. More general formulas are obtained for the determination of electron temperature and conduction current by taking into account the forementioned variation of the asymmetric part of the distribution function.

Approximate Calculation of the Average Group Velocity of Phonons in Cubic Lattices, B. Ya. Moizhes, R. V. Parfen'ev, F. A. Chudnovskii, and A. L. Efros, pp. 1409–1414.

In order to calculate, from thermal conductivity, the mean free path and the cross section of phonon scattering by impurity according to the Debye formula, one must know the average phonon group velocity, which can differ by several factors from the longitudinal acoustic velocity, customarily used in similar calculations. In this paper the mean phonon velocity is calculated for germanium and NaCl crystals by a method analogous to that of Houston from the spectrum obtained by neutron diffraction for a direction of high symmetry. A numerical check of the method is carried out in a case when the spectrum (calculated) is known in the entire Brillouin zone.

Conclusion: Comparison of the average group velocities calculated from the method of points with the results of methods of averaging in which the dispersion relations are given only in directions of high symmetry (a Houston-type method) gives good agreement in the case of germanium, and agreement accurate to a factor of 1.5 for potassium chloride. The latter, evidently, is related to the fact that the branches of the vibrational spectrum differ greatly in different directions. The agreement of the average and the root mean square value of the group velocity may be regarded as good.

The average group velocities calculated by Houston-type methods from neutron diffraction spectra were found to be less than the average longitudinal velocities (by a factor of 4.5 for germanium and 2.5 for sodium iodide). Thus the mean free path was found to be several times (2–5) greater than that calculated.

These calculations enable us to guess the contribution of the individual vibrational branches to the average group velocity. If germanium has an average velocity of the optical branches which is less than that of the acoustical, in sodium iodide they are almost identical.

When calculating the group velocities of phonons, the Houston method for two directions gives satisfactory results.

The temperature variations of θ_D calculated by the Houston method, by the way, for two and three given directions of high system are in good agreement; therefore this method in two directions can be proposed for the calculation of heat capacity.

Optical Absorption of Germanium and Silicon beyond the Main Absorption Edge at High Temperatures, Yu. I. Ukhanov, pp. 1529–1532.

The temperature dependence of absorption in germanium and silicon beyond the main edge (from 1.5 to 13μ) was investigated in the temperature interval from 77° to 740°K for germanium and up to 1000°K for silicon. It was found that the absorption coefficient α in this wavelength region increases on heating of the samples according to the law $\alpha = B_1 \exp(-B_2/T)$, where B_1 and B_2 are certain constants for each semiconductor. The temperature dependence of absorption obtained is explained by the interaction of photons with free charge carriers.

Some Questions on the Photoconductivity of Polycrystalline Samples of Cadmium Selenide, V. V. Serdyuk and T. Ya. Sëra, pp. 1571–1573.

The effect of heat treatment and the introduction of silver and copper impurities on the spectral distribution of photocurrent in pressed samples of cadmium selenide was studied in this work.

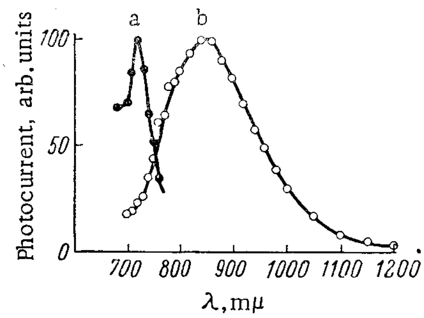


Fig. 1. Spectral distribution of photocurrent for two polycrystalline CdSe samples. a) Deposited layer; b) pressed sample.

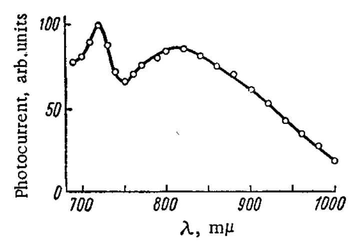


Fig. 2. Spectral distribution of photocurrent for a pressed CdSe sample after brief heating.

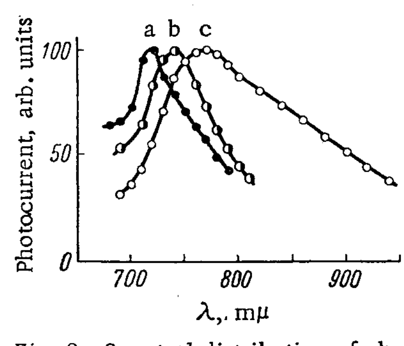


Fig. 3. Spectral distribution of photocurrent in polycrystalline (pressed) CdSe samples with metal impurities. a) "Pure" cadmium selenide; b) cadmium selenide with Ag impurity; c) cadmium selenide with Cu impurity.

Application of the Method of Electric Transport to the Study of Metals and Alloys, M. D. Smolin and I. N. Frantsevich, pp. 1536–1541.

Using an approximate ion theory of electric transport (or transference) and a two-zone model of metals, methods have been developed in this paper for determining the true charges of ions of an alloy's component, the concentration of electrons and