STAT

AN EXTENSIVE CONFERENCE OF THE COMMITTEE ON ACOUSTICS OF THE ACADEMY OF SCIENCES, USSR

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~~AN~~ EXTENDED^ive^ ~~CONSULTATION~~ Conference OF THE COMMI~~SSION~~ttee ON ACOUSTICS OF THE ACADEMY OF SCIENCES USSR

From 1 to 3 February of this year, an extended consultation of the Commission on Acoustics of the Academy of Sciences USSR, devoted to the problems of physical and mensuration acoustics, took place in Leningrad. The agenda of the consultation was rather broad: 26 reports and communications were read — part of them in the plenary session, part of them in the sessions of the sections devoted to piezoelectricity and electro-acoustical apparatus and measurements. More than 115 people participated in the consultation.

In his introductory remarks, N. N. Andreyev, Chairman of the Commission on Acoustics, Corresponding Member of the Academy of Sciences USSR, pointed out the fact that the consultation was opening with the memory still fresh in mind of the untimely death of the President of the Academy of Sciences USSR, Sergey Ivanovich Vavilov, a scientist of wide renown, a man of great public activities, and an organizer of science. He reminded the participants in the consultation that Sergey Ivanovich considered acoustics to be of great importance and promoted its development. "It is impossible to forget," said N. N. Andreyev, "that Sergey Ivanovich was the first president of the Academy; under him acoustics began making great progress."

The assembly honored the memory of the famous scientist and physicist by rising.

The first plenary session was devoted principally to reports pertaining to the field of physical acoustics.

Corresponding Member of the Ukrainian Academy of Sciences A. A. Kharkevich, in his report entitled "Spectra and Analysis", gave a brief resume of the contents of a book under the same title now ready for publication. The author emphasized the necessity for incorporating the theory of spectra with the theory of the physical methods of harmonic analysis, in connection with the development of a series of special branches of industry. He dwelt briefly on some selected problems, such as the connection between the duration of the signal and the width of its spectrum band, pertaining to the theory of spectra; on resonance in the presence of varying frequency of the compelling force; and on the analysis of single impulses with the aid of resonators, pertaining to the theory of analysis.

Among other things, the speaker noted the inaccuracy of the conventional treatment of the frequency modulation altitude finder, pointing out that the spectral ranges of the broadcast and the reflected signal are the same, as a result of which it is impossible to obtain a gradually changing differential frequency.

In the discussion that followed the report, G. S. Gorelik and others disagreed with the opinion of the speaker concerning the inaccuracy of the conventional treatment of the operating principle of the altitude finder, having observed the slow rate of frequency modulation as compared to the change in the deviation of frequency. A. A. Khar'kevich argued by pointing out that, although there is no sharp contradiction between the existing theory and the empirical data available, the theory is still wrong in principle. The radio altitude-finder furnishes not a continuous, but a staggered reading of frequency, which cannot be explained by elementary theory.

In a report on the "Analysis of Oscillations," A. V. Rimskiy-Korsakov posed the problem of determining the characteristics of the spectral composition of the non-periodicity oscillation processes.

The speaker suggested the introduction of the concept of the so-called "flowing spectrum," which represents a spectral function of the oscillating process, which elapsed from the beginning to the moment of observation, having indicated that, theoretically, such a definition of the spectral function permits the establishment of full conformity between the Fourier, Bromwich, and Duhamel integrals. Practically, such a condition determines the applicability limit for analyzers of various systems for the purpose of the analysis of non-periodicity processes. Thus, a real resonance system with losses registers only some fraction of the flowing spectrum, corresponding to some part of the duration of the entire process. This duration of spectrum registration depends on the character of the entire process, and can only be approximately evaluated for the given type of the resonance analyzer. The magnitude of the spectrum registration time can be made definite, if a diffraction grid is used for the analysis. Ideally, this should consist of a ~~relay~~ Rayleigh grid with the number of periods in proportion to the duration of the spectrum registration. However, other errors linked to the resolving power will develop.

In a report entitled the "Visualization of Space-Modulated Waves," S. N. Rzhevkin submitted the theory of the various types of space-modulated waves, pointing out the analogy between the space-modulation of waves in a pipe of rectangular cross section and waves emitted by a flat diffraction grid. He cited the results of a computation of the distribution of an energy current in the field of a diffraction grid, indicating the presence of energy concentrations in a series of planes at certain predetermined distances from the grid, the case being that the increase in the intensity in these planes is alternate on the lines lying opposite first to the non-permeable, then to the permeable parts of the grid. During the experiments with supersonic waves conducted as far back as 1939 by the author together with S. I. Krechmer, photographs of such images of the diffraction grid were obtained. The locations of these images were in agreement with the theory developed.

The report of ~~the~~ L. M. Brekhovskikh ~~couple~~, "On the Theory of Complete Internal Reflection," contained the findings of the author pertaining to the displacement of sonic (or light) ~~ray~~ bunches ~~clusters~~ in ~~the presence~~ case of complete internal reflection. Particularly, the effect of the displacement of the rays upon the complete internal reflection of a spherical wave was analyzed. It was ascertained that in this case a concentration of sonic energy occurs along some surface (caustic). Some new data were reported pertaining to the reflection of sonic waves from a heterogeneous layer in ~~the presence of~~ sliding incidence. It was pointed out that in this case some substantial additions are required in the conventional diagram of the refraction of rays.

In the discussion that followed, N. N. Andreyev noted that the conventional treatment of the phenomena of reflection and refraction always contained an element of critical doubt which, however, was constantly suppressed by tradition, and only now are some theses appearing which give a correct physical explanation of these phenomena.

L. A. Chernov reported on the "Diffusion of Sound on Fluctuations," pointing out that in pure media on adiabatic fluctuations no diffusion occurs, while isobaric fluctuations are the cause of the diffusion of sound.

The speaker also cited the results of a computation for the diffusion of sound upon the isobaric fluctuations of concentration in solutions close to the critical temperature of the coalescence of liquids and dispersion systems. Diffusion in pure media, solutions, and heavy suspensions is much the same: in all cases the diffused sound represents the superposition of the isotropic and dipolar emission. The intensity of the diffused sound is inversely proportional to the fourth power of the wave length. The deviations from the Rayleigh law of diffusion occur in pure media near the critical state, where they are stipulated by the statistical ratio of fluctuations. In heavy suspensions, the deviations are stipulated by relaxation processes. Diffusion has particularly simple (isotropic) characteristics in the instance when the dispersed substance and the filler differ greatly in compressibility only.

The physico-chemical and biological effect of ultrasounds was described by I. E. Elpiner, who presented a summary of the results of experimental research of the effect of ultrasound upon living matter. He pointed out that supersonic waves induce momentary breaks in animal and vegetable cells and in microorganisms; these are accompanied by the extraction from the cells into the surrounding media of biologically-active substances: ferments, toxins, etc. However, with more protracted effects of ultrasound these extracted substances themselves disintegrate. Under the effect of supersonic waves, the large molecular albumin compounds are disaggregated and disintegrated into individual amino acids, which are parts of the albumin molecule. Investigations (together with I. V. Zborskiy) revealed that amino acids of cyclic structure are primarily disintegrated. During the ultrasound treatment, transitions of some amino acids into others were observed (asparaginic acid was discovered in a histidine solution), also the dipolymerization of nucleinic acids, which are highly important to the matabolism of the cells. Research conducted in collaboration with Blyumenfel'd and Krasovitskiy revealed the disintegration of porphyrinic nuclei, as a result of which cimerubin, ciliverdin, and individual nitrols appeared in the solution subjected to attack by ultrasound. In the opinion of the speaker, the supersonic waves induce oxidation and reduction processes, the case being that in the presence of oxygen, oxidation processes predominate, while in the case of saturation of the sound-attacked solution with hydrogen, reduction processes will take precedence. The chemical effect of the supersonic waves is, obviously, governed by the appearance in the solution of valency-unsaturated free radicals and atomic hydrogen -- the products of fission of the molecules of water. The fission is induced by the ionization of the molecules with free charges evolved in the cavitated nodules.

Nine reports and communications were heard at the session of the section on electro-acoustical apparatus.

M. A. Sapozhkov touched upon the problem of "Methods for the Mensuration of the Parameters and Characteristics of Telephones, Microphones, and Loringophones." He pointed out that the present evaluation of the non-uniformity of the frequency characteristics about a horizontal line was not representative, and that it is more logical to evaluate the frequency characteristic by its departure from the trend (of the quadratic approximation of the first or second order of magnitude). The speaker suggested the introduction of the concept "optimum trend," to which the frequency characteristic should be brought up. He noted that the conventional method of evaluating the linearity of an electro-acoustical system by the ~~range~~ amplitude characteristic is not sufficiently graphic, and that it should rather be determined by the ratio of the steepness of the ~~range~~ amplitude characteristic to the in~~coming~~put effect. He suggested that the mean values of the "~~return~~ output" be determined in logarithmic scale by both coordinate axes (frequencies and intensities). The discussion brought out the necessity for regulating mensuration methods, and pointed to the well-taken method for measurement of the ~~range~~ amplitude characteristics. The controversial nature of the suggestion for determining the non-uniformity of the frequency characteristic, with relation to the trend, was noted.

I. M. Polkonskiy spoke on the "Use of a Device Equipped with a 'Thermistor' for Measuring the Level of Noises and Speech." He noted that since the human ear reacts to an effective value of sound pressure, it follows that an indicator should be provided for measuring the averaged value of the sound pressure over a relatively protracted time interval (several seconds).

The device developed by the speaker, with the use of a "thermistor," has an adequately high time constant; this circumstance permitted the obtaining of frequency characteristics (with a band filter) of certain noises and speech, averaged in time. Such characteristics, in the opinion of the speaker, characterize the frequency composition of sound in a more reliable manner than the methods used at the present time.

The report by A. G. Muratov, "On the Universal Measuring Installation for the Testing of Electro-acoustic Apparatus," described an electrical diagram permitting a direct count in bars of the mean ~~return~~ output of a loud-speaker, and of the non-uniformity of the frequency characteristic in decibels -- on the scale of a ~~hand~~ indicator. It also permitted the observation of the frequency characteristics of the electro-acoustical apparatus on the screen of a cathode-ray tube.

The apparatus permits the direct measurement of the complete electrical resistance, the mean ~~return~~ output, and of the non-uniformity of frequency characteristic in a predetermined range, and also the measurement of the frequency of the mechanical resonance of the portable loud-speaker system, and of the value of the acoustic coefficient of non-linear distortions.

I. N. Stoykov demonstrated the first experimental model of a noise meter, ~~powered~~ operated by AC line current, with a dynamic range of 35 to 14 decibels, a frequency range of 100 to 10,000 ~~kilohertz.~~ cycles. It was designed by the Central Research Piezoelectric Laboratory.

A report by Yu. M. Sukharevskiy set forth a description of a "New Method of Measuring the Modulus of Elasticity and the Decrement of Attenuation of Materials." In this method, the so-called electromechanical "~~ku~~ Q-meter" permits the determination of these values of the material tested within a range of frequencies up to 100 kilo~~hertz~~ cycles by way of electrical measurements of the capacity and the losses of a piezo-quartz ~~sheet~~ plate, which is in ~~physical~~ mechanical

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contact with the sample of material being tested, or with a mechanical system containing this sample. By the location of the maximum capacitance of the piezo-quartz ~~sheet~~ plate, and by the magnitude of the minimum ~~air caused by superstructuring~~ gap in tuning, the resonance frequency of the entire system, which is linked to the modulus of elasticity of the material being tested, and the loss resistance, which is linked to the decrement of attenuation of the material (δ), is determined.

On a frequency of 20 kilo~~hertz~~cycle, aluminum ($\delta \approx 10^{-4}$), plexiglass ($\delta = 5 \times 10^{-2}$, Young's modulus of longitudinal elasticity 7×10^{10}), and other materials were tested. The modulus of shear G and the decrement of attenuation for the modulus of shear δ_G were measured under various temperatures and pressures, the case being that with a reduction in temperature, the value of G for rubber becomes sharply increased, while a change in pressure within the range of 10 times atmospheric pressure causes no perceptible effect.

A. N. Poloskin communicated some data on the "Method of Automatic Plant Control of Microphones and Telephones," developed by the Department of Physics of the Molotov State University on the basis of the progress attained by ~~automatic machine~~ remote wireless telegraphy.

For rapid gaging and inspection, furnishing rapid and precise answers as to the proper suitability of the product being tested, a comparison with the calibrated standard is made. The amplitude ~~range~~ of the electric signal at the outlet of the electro-acoustical track ~~pathway~~ containing the specimen under test is compared with the amplitude ~~range~~ of the calibrated standard signal which is fed to the inlet of the same electro-acoustical track ~~pathway.~~ The juxtaposition of the signals of the specimen being tested and of the calibrated standard is effected in time, i.e., the signals from the inlet and outlet of the electro-acoustical track ~~pathway~~ continuously and successively ~~alternately~~, one following the other, enter into the same testing and amplifying portion of the device. The counting relay in the device records the conclusion as to the suitability of the specimen being tested, following a certain number of individual readings, each of 0.2 seconds duration.

I. I. Slavin reported on "Objective Noise Meters Equipped with a scale of Natural Power-Level ~~Audibility~~." He pointed out that the decibel scale in existing noise meters does not reflect the essence of the subjective perception of power-level ~~audibility~~, and is incomprehensible to the great majority of laymen. As a unit of the power-level ~~audibility~~ scale, the speaker suggested using the level of 40 phones. The report also indicated that the presence in conventional noise meters of only three audio-frequency characteristics results in substantial errors of mensuration. He described noise meters designed by the Laboratory for the Combat of Industrial Noises at the Leningrad Workers' Protection Institute of the VTsSPS; these meters are equipped with a natural audibility scale and audio-frequency characteristics, varying with each 10-decibel interval. I. I. Slavin also demonstrated a specimen of a noise

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meter designed by LIOT [Leningrad Workers' Protection Institute], which was distinguished from foreign makes by its greater compactness and precision.

In the discussion that followed the reading of the report, Yu. S. Bykov expressed his doubts as to the expediency of the transition to the new ~~audibility~~ power level scale. However, the majority of the participants in the discussion favored the introduction of such a new scale, regardless of its incomplete reflection of the auditory characteristics.

In a report entitled "The Problems of Measuring the Microphonic Effect of Coal Powders," V. N. Fedorovich described some original methods for measuring the parameters of coal powder -- methods which determine directly its function in microphones: its electrical resistance, its coefficient of modulation of mechanical resistance, and its own noise. The author pointed out the ration between the mechanical resistance of the powder and the ~~range~~ amplitude of oscillations, and the effect of this ratio upon the properties of the microphones (the lower curvature of the ~~range~~ amplitude characteristic, the ~~diminution~~ lowering of resonance frequency and the increase in sensitivity, with the increase in sonic pressure). By means of preliminary investigation of these parameters, their connection with the structural state of the powder, with its degree of moisture content, and with other factors, has been established.

Thus, the possibility was demonstrated of direct experimental investigation of factors such as electro-acoustical transformations, which determine the function of the coal powder. The report was followed by a lively discussion.

The section on piezoelectricity heard five reports.

P. A. Anan'yev reported on a "Piezometric Gage Microphone" equipped with a crystal of ~~single-decomposition~~ [mono substituted] ammonium phosphate "PIEM-3" (piezoelectric gage standard microphone, model 3). The microphone has an absolute sensitivity of 24 microvolts per bar, with a non-uniformity within the range of 30 to 16,000 ~~hertz~~ [cycles], in an axial direction, of ± 1 decibel. The diameter of the receiving part is 15 millimeters; hence, up to audio-frequencies of 8 to 10 kilo~~herts~~ [cycles], the microphone may be considered as a ~~punctate~~ [point] source. The thermal gaging range is from minus 30 degrees Centigrade to plus 50 degrees Centigrade.

The original so-called "vacuum" capsule of the microphone is moisture-proof, and provides for a high degree of continuous insulation and stability in operation. The microphone is equipped with control plates providing for electrical control, with the aid of the "coefficient of piezoelectric bond," of the sensitivity and non-uniformity of the ~~audio~~-frequency characteristic of the microphone within the entire frequency range. Non-linear distortions are practically absent, and it is possible to gage sonic pressures of the order of several million bars.

The speaker pointed out that the microphone "PIEM-3" may be considered as a ~~prime~~ [first] standard, the absolute sensitivity of which can be determined directly by the estimate of the piezoelectric constants of the crystal. The deficiency of this microphone is its low sensitivity (0.3 to 0.5 of a bar) and the necessity of connecting it to an ~~for setting it up together with~~ the amplification cascade.

A report by V. A. Krasil'nikov summarized the results of "Measurings of the Young's Moduli in Bars of Seignette's Salt (potassium sodium tartrate) in a Dynamic Cycle," conducted in the Acoustics Laboratory, NIIFMGU by the author in collaboration with L. A. Shuvalov and A. S. Sheyn by means of the sectional rod method. New data was obtained on the velocity of propagation of longitudinal waves and on the values of the elasticity constants of Seignette's salt. This data will be published in the near future.

In a communication pertaining to the "Acoustical Method of Vibration Measurement," V. N. Fedorovich described the method of measuring the velocity of a vibration by way of the acoustical sounding of the sonic pressure stipulated by this vibration. In order to prevent the transfer of the oscillations to the microphone, and also in order to provide a close fit to the surface of the oscillating body, a flexible adapter is slipped over the tube of the sounding device. An important advantage of such a gaging method is the possibility of utilizing the sonic pressure graduations for the determination of the sensitivity of the acoustical sounding device, which is intended for the measuring of vibration.

The author cited the well-conciding frequency characteristics of the sensitivity of the acoustical sounding device — the vibrometer; one of the characteristics is obtained with the aid of a mechanical oscillation generator, and the other is computed on the basis of the acoustical sounding device graduations which are worked out with relation to sonic pressure. The frequency characteristic of the sensitivity of the "acoustical vibrometer" is adequately uniform in the wide frequency range from 100 to 5000 ~~hertz~~ cycles.

In the report by M. A. Chernyshova on the "Dome-shaped Structure of Seignette's Salt Crystals," accompanied by a microcinematic film showing, it was shown that in cooling below 24 degrees Centigrade, the symmetry of the crystals of Seignette salt is transformed from rhombic to monoclinic, the case being that the monocrystal is transformed into a polysynthetic twin crystal, the components of which are the dome-shaped crystal faces of two orientations. Under the effect of a concentrated load (pressure exerted by a sphere), there evolve in the crystals of Seignette's salt either elastic or wedged mechanical twin formations, depending upon the magnitude of the force applied. The superposition of a direct-current electrical field upon a twin crystal transforms the latter into a monocrystal, the orientation of which depends on the algebraic sign of the field and corresponds, in the presence of different directions of the field, to the orientation of either one or the other component of the twin crystal.

V. P. Konstantinova demonstrated "Oscillations of Lamina

Made from Piezoelectric Textures" actuated by a sound generator. Clear chladnitic ~~outlines~~ figures formed upon the resonance frequencies of the oscillating lamina from the quartz sand thrown onto them.

The report also touched upon the method of preparation of piezoelectric texture lamina from Seignette's salt.

"The Effect of Ultrasound upon the Process of Crystallization" was studied by A. P. Kapustin in numerous tests. The speaker explained that with the aid of a priming tube a great number of new crystallization nuclei are evolved in a supercooled molten mass under the effect of ultrasound, and that with the attainment of the "lower threshold" of ultrasound intensity, the rate of the crystallization front progress is increased hundreds of times.

The increase in intensity beyond the limits of the "highest threshold" has no effect upon the further increase in the rate of crystallization. The substance which crystallizes in a supersonic field has a finer grain structure and a greater crushing strength.

At the beginning of the plenary session, G. A. Gol'dberg read a communication on "The ~~Labors~~ Works of the Prominent Soviet Inventor, Doctor of Arts and Sciences Yevgeniy Aleksandrovich Sholpo," who died in 1950. The idea to which Sholpo devoted 25 years of his life was the development of an apparatus and methods that would make it possible for the musician to prepare directly a synthetic phonogram without playing the music into the microphone. Synthetic recording of music would open up tremendous, practically unlimited opportunities for the expansion of the means of musical expression, but it initially involves a number of serious difficulties. The Sholpo device — the "variophone" — is a camera for optical recording, within the limits of a sound track of a cine-film, of several narrower sound tracks to correspond to the number of voices (or instruments) involved in the music. Two diaphragms are placed in the path of a ray from a continuous source of light. One of these is a screen with a triangular cut-out which, in shifting, induces changes in the intensity of the ray, and can be utilized for volume regulation. The second diaphragm is in the form of a serrated disk, the continuous rotation of which induces a periodicity change in the length of the stroke and, conformably, a transversal recording of the sonic oscillations. The oscillation frequency is determined by the velocity of the disk rotation; the oscillation form is determined by the configuration of the disk serrations. The rotation velocity of the film in recording is substantially (10 to 20 times) lower than in playing back, due to which it becomes possible for the operator, by slowly manipulating the various handles of the apparatus, to exercise a smooth and sensitive control over the properties of the recorded oscillations, or to momentarily interrupt the recording and resume it at any point. The apparatus is equipped with a series of additional devices: ~~range~~ amplitude modulation (crescendo and diminuendo of the sound), frequency modulation (vibration), and the like.

E. A. Sholpo also completed an interesting ~~thesis~~ work on the objective analysis of musical performance. In music there is a macrostructure created by the composer, and a microstructure created by the performing artist. While the theory of composition has a long history of devlopment and has been worked out in detail, the theory of musical performance is only in its embryonic stage. The synthetic recording of music, which is a recording of its microstructure, is not possible without the knowledge of the objective procedures of musical performance, and the lack of this knowledge, naturally, limits the possibility of creating artistic recordings at the present time. The important thing is that the very method of synthetic recording is an invaluable means to the objective study of musical performance.

Of particular interest is the synthetic recording made by E. A. Sholpo by means of the "variophone." This recording ~~generates~~ repeats the performance ~~by the~~ according to data of its analysis. Such a recording clearly demonstrates the possibility for the synthetic creation of expressive music. The further development of efforts in the field of the physical analysis of music, endeavors first begun by E. A. Sholpo, will provide the opportunity for filling a blank page in the science of music, and will enrich the musical field with new technical means of performance.

S. Ya. Lifshits analyzed the problem on the "Standardization of the Audibility Threshold." In connection with his investigations on sensory discrimination, the phenomenon of accumulation, etc, he proposed standardizing the duration of the sonic impulse, of the break between the impulses, and of several other magnitudes in the impulse measurements of the audibility threshold.

Proceeding from the phenomenon of fluctuation of the audibility threshold, the author proposed the acceptance of a level at which 20 percent of the impulses ~~are not discernible as~~ will [illegible] the audibility threshold.

In another communication, S. Ya. Lifshits told of his research into the "Discriminating Capacity of Sensations in the Modalities of Hearing and Touch," noting that the discriminating capacity of sensations is determined by the second integral law of hearing, the phenomenon of accumulation, and fluctuations of the audibility threshold. At first, these phenomena were related to hearing only, but further research established that they also occur in the sensory modalities of touch and vision.

By applying the statistical method to the quantitative measurements of the sensory threshold fluctuations, the number of elements of sensations requisite for a threshold sensory perception can be established. This number, in the case of the above two sensations, was 8.

In a report on "Sound Transition Layers," B. D. Tartakovskiy brought out the results of the theoretical and experimental investigation on the propagation of ~~flat~~ plane, in particular, sonic waves through flat-heterogeneous media, and the computation of apparatus providing for the complete transition of the sonic waves across the boundaries of the media with various acoustical parameters.

Such apparatus was suggested by the author for the increase in the efficiency of deflectoscopes, supersonic lenses, and other supersonic technical instruments.

Reporting on "The Effect of Atmospheric Turbulence upon the Propagation of Sound," V. A. Krasil'nikov dwelt upon his new experiments in the investigation of the internal structure of atmospheric turbulence, and in the clarification of the ratio between the distance, on the one hand, and the phase fluctuation and signal level fluctuation, on the other hand. The speaker noted that the experimental regularities observed are easily explained by the statistical theory of turbulence, as developed by Kolmogorov and Obrukhov.

In a report by G. S. Gorelik on "Some Problems in Statistical Acoustics," the importance and fruitfulness of the statistical treatment of oscillation processes, particularly acoustical, for purposes of research as well as for the design of new high-efficiency devices, were demonstrated. The method of measuring very small (of the order of magnitude of an angular second) phase shifts ~~transformations~~ (or phase differences ~~differentials~~) of radio-oscillations was described -- the method as developed by I. L. Bernshteyn in the Physico-Technical Institute of the Gor'kiy ~~Gor'kove~~ University -- and the possibility and feasibility for conducting similar tests in the field of acoustics was indicated.

The report was followed by a lively discussion.

E. L. Feynberg pointed out that it is essentially difficult to notice periodicity features in the conventional sonic process, and an expansion into the Fourier integral is, so to speak, an artificial operation justified only by the utilization for analysis of linear electrical systems, while the width of the frequency band of conventional sound coincides in magnitude with the mean frequency of the band and, therefore, the statistical approach to acoustics is practically compulsory. There is a direct link between frequency analysis and statistical analysis, and from the function of correlation the spectral composition of oscillations can be derived. Together with this, as demonstrated by available experience, a systematic treatment, as the more adequate, in a number of cases brings faster results.

I. D. Myasnikov emphasized the importance of the development of statistical methods for acoustical measurements and pointed out that for measuring a signal too weak to be perceived on account of the inherent noise in the amplifier, it is necessary to resort to acoustical modulation.

I. E. Garon spoke on the development of the device for the measurement of small acoustical noises by the method of modulation.

In a communication on the "Statistical Characteristics of the Processes in Architectural Acoustics," S. G. Gershman cited the results she obtained in the experimental determination of the coefficients of auto-correlation of stationary (in the probable sense) noises. She dwelt briefly on the direct-measurement method of the acoustical ratio (the ratio of the intensity of direct sound to the intensity of reflected sound in an enclosure) by means of measuring the coefficient of correlation.

N. N. Andreyev, in summarizing the discussion on the problems of statistical acoustics, pointed out that the methods of statistical physics are as yet inadequately utilized in acoustics. It is important to expand their field of application, since they create the possibility for valuable experimental observations and for obtaining results which are of great importance in the field of engineering. He recommended that the textbooks on acoustics being readied for publication should include the results of the research by Soviet acoustical specialists in the realm of statistical phenomena.

The plenary session accepted a "Resolution on the Problems of the Creation of Electro-Acoustical Apparatuses." This resolution emphasized the merits of the design of the measuring microphone "PIEM-3" built by the NII-100 Ministry of Communications, and the necessity was accepted of submitting the design for analysis to the All-Union Research Institute of Metrology, for the purpose of turning it over for mass production in the event of approval by the above Institute. It was also emphasized that, regardless of the growing demand for measuring acoustical apparatus by research establishments and industrial enterprises, the production and deliveries of the above are not yet organized. Inasmuch as some research establishments arrived at various designs of noise meters, it is necessary that the IRPAMPSS conduct a series of comparative tests with the objective of selecting the models most suited to mass production.

Temporary technical specifications for mass consumption noise meters were confirmed as follows:

(a) effective frequency bands from 60 to 8-10 ~~thousand~~ kc. ~~hertz~~;

(b) simultaneous change in the frequency characteristic with the throw-over switch for various levels (in steps up to 10 decibels);

(c) the range of sonic pressures to be from 35 to 150 decibels.

The desirability was indicated of acoustical calibration, the connection of filters, and the presence in noise meters of a loudness scale along with the decibel scale.

B. D. Tartakovskiy