Yu. N. Pariiskii. *Preliminary Results of an Extreme-Depth Sky Survey at 7.6 cm.* The RATAN-600 radio telescope and a new 7.6-cm radiometer cooled by a closed-cycle helium machine have been used in an extremely deep survey of a narrow strip of the sky at declination $\delta_{1950} = 4°53'$, $0 < \alpha < 24^h$. Several hundred radio sources of nature as yet unknown were recorded during twenty-four hours. Averaging of the data over a one-month cycle of observations brought out thousands of new objects. The curve of the number of sources plotted against flux density ($\log N - \log S$), which was constructed for the first time for flux ranges $0.86\,{}_mJ_y - 15\,{}_mJ_y$, showed an unusual "depression" with the approach to the level $I\,{}_mJ_y$ (slope smaller than 0.3). The cause of the sharp decrease in the surface density of the weak radio sources remains unknown, although a simple approach to the "particle horizon" in Friedmann models of the Universe is sufficient to explain the behavior of the $\log N - \log S$ curve. In addition to the USSR Academy of Sciences, organizations of the Ministry of the Electronics Industry and the Ministry of Chemical Machinery took part in the experiment.

G. A. Smolenskiĭ, V. V. Lemanov, A. B. Sherman, A. A. Dobrovol'skiĭ, Yu. M. Gal'perin, and V. P. Kozub. *Acoustoelectronic Interaction in a Piezoelectric-Secondary Electron System.* Experimental and theoretical research on the interaction of surfaced acoustic waves (SAWs) in ferroelectrics and piezoelectrics with secondary electrons produced above their surfaces is being pursued at the USSR Academy of Sciences Physico-Technical Institute. This is work in the field of acoustoelectronics—the division of solid-state physics concerned with study of the piezoelectric interaction of acoustic waves with free carriers. The acoustoelectronic interaction was at first studied for acoustic waves propagating in the volume of a piezosemiconductor, but later the research was extended to the case of SAWs, where extensive implementation of a proposal of Yu. V. Gulyaev and V. I. Pustovoit concerning the use of layered piezoelectric-semiconductor structures significantly broadened the usefulness of acoustoelectronics both in physical research and from an engineering-applications viewpoint. Study of the interaction of SAWs in a piezoelectric with secondary electrons produced in a vacuum above its surface is, in a certain sense, the next logical step in the development of acoustoelectronics. (We should note that the actual idea of performing experiments of this kind was advanced some time ago—S. Ya. Sokolov.[1]) This interaction, like the ordinary acoustoelectronic interaction with free carriers in piezoconductors, results in spatial redistribution of the electrons, in additional damping (but under certain conditions even amplification) of the SAWs, and in a strong nonlinear effect, but, at the same time, it has been found to involve a fundamentally new mechanism that has no analog in traditional acoustoelectronics. Secondary electrons knocked out of the piezoelectric's surface by the primary electron beam return to the surface, moving ballistically and without colliding with each other. The piezoelectric fields of the SAWs act on the secondary electrons, changing their velocities and paths. As a result, the flux density of the secondary electrons returning to the surface is modulated by the field of the wave, and capture of these electrons by surface traps results in the production of an electrostatic "imprint" of the SAW on the surface in the form of a spatially nonuniform electron-charge distribution. Strong variations of the velocities and paths of the secondary electrons under the action of the SAW piezofields result in distinct nonlinear effects, which are manifested in the generation of higher harmonics of the SAWs, in the interaction of several SAWs with one another, etc.

All the effects enumerated above have been observed and investigated in detail in experiments. Most of the work has been done for quartz and lithium niobate crystals under the following experimental conditions: SAW frequencies from 10 to 100 MHz, primary-electron energies up to 1 keV, current densities from 10 mA/cm^2 to 3 A/cm^2, current-pulse durations from 10^{-9} to 10^{-5} sec.

The experiments demonstrated the possibility of recording SAWs with long-term memory (sometimes many weeks) owing to the capture of secondary electrons in deep surface traps. Aspects of the recording and reading of SAWs were studied in linear and nonlinear interaction regimes, which correspond to the conditions $e\varphi < E$ and $e\varphi > E$, respectively, where φ is the piezoelectric potential of the SAW and E is the kinetic energy of the secondary electrons.

Nonlinear effects were investigated in the case of degenerate interaction of two colliding SAW's with formation of a spatially homogeneous electrical signal at the doubled frequency. The experiments showed that the nonlinear coefficient describing this interaction is 3–4 orders of magnitude larger than the corresponding nonlinear coefficients in layered piezodielectric-semiconductor structures.

It was shown that the effects studied can be used to design storage devices and devices for correlation processing of radio signals with parameters significantly higher than those of layered-structure acousto-electronic devices, and that information can be read into and out of the storage devices by various methods with appropriate shaping of the primary electron beam.

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[1]S. Ya. Sokolov, Zh. Tekh. Fiz. 19, 271 (1949).