transit time of a phonon across the crystal, i.e., of the order of $10^{-6}-10^{-7}$ sec) and, consequently, the effect can be used for high-frequency modulation of x-ray and, in particular, γ-ray radiation.

[1] V. I. Pustovoĭt and Yu. P. Mukhortov, ZhETF Pis. Red. 13, 211 (1971) [JETP Lett. 13, 149 (1971)]; Fiz. Tverd. Tela 13, 3059 (1971) [Sov. Phys.-Solid State 13, No. 10 (1972)]; Yu. P. Mukhortov and V. I. Pustovoĭt, Zh. Eksp. Teor. Fiz. 61, 1157 (1971) [Sov. Phys.-JETP 34, 617 (1972)].
[2] A. Hojo and S. Tanaka, Proc. Intern. Conference on Physics of Semiconductors, Boston, USA, 1970, p. 241.
[3] V. I. Pustovoĭt, Zh. Eksp. Teor. Fiz. 62, 746 (1972) [Sov. Phys.-JETP 35, 395 (1972)].

L. V. Dubovoĭ, A. G. Smirnov, V. G. Smirnov, D. I. Stasel'ko. The Use of Holography for Investigating Processes in a Thermonuclear Plasma and in a Moving Arc Discharge. Interest in ultrahigh-speed heavy-current discharges has grown considerably in recent years, since it is comparatively easy to produce with the aid of such discharges dense, high-temperature plasmas with thermonuclear parameters[1]. However, the study of the dynamics of the development of such discharges is made highly complicated by the absence of sufficiently simple methods of plasma diagnostics, which would have provided information about the space-time development of the processes under investigation. The necessary data on the space-time structure of a plasma can be extracted with the aid of the methods of holography[2].

In the report we present the results of work done on the construction of a holographic apparatus for plasma diagnostics, as well as results of the use of the apparatus for the investigation of fast processes in a heavy-current Z-discharge and in a fast-moving electric arc. The investigated Z-discharge was characterized by a small ($\sim 1\ \mu$sec) time of rise of the discharge current to a peak value of 270 kA, which allowed the realization of a stable regime for the heating up of the plasma. The experimental setup included a discharge chamber with an arrangement for shaping the heavy-current ultrafast discharge, a pulsed, single-mode ruby laser, a holographic chamber, and a control and synchronization unit. Using the methods of holographic interferometry, we obtained a number of interference patterns corresponding tc the shaping and maximum compression phases of the current filament, and to the dispersion phase of the plasma. From the holographic-interferogram data we determined a number of important plasma characteristics: the transverse dimension of the current filament at the moment of maximum compression (about 8 mm), the maximum value of the electron concentration ($N_{e\,max} = 1.2 \times 10^{17}$ cm^{-3}), as well as the radial plasma-density distribution, which turned out to be close to the distribution anticipated for the case of a stable discharge with a slightly diffused boundary. The value of the gas-kinetic pressure determined from the pressure balance equation under the conditions of the experiment was 10^{21} eV/cm^3, which corresponded to a plasma temperature of about 10^4 eV.

As a result of an holographic investigation of an electric arc that moved over the electrodes of the spark gap with supersonic velocity, we have established that the discharge process has the character of a single-channel process, and we have also determined the velocity of translation of the discharge channel (420 m/sec) and its transverse dimensions. We have constructed on the basis of these results a simple but reliable spark gap with a high charge-transmitting capacity which is being widely used at present for current commutation in "Tokamak" installations.

The results obtained show that the holographic methods of plasma diagnostics enable us to measure accurately and comparatively simply three-dimensional plasma-density distributions. Further progress in the development of the holographic methods of diagnostics is tied up with the working out of methods of and the development of a camera for high-speed holographic filming, as well as with the introduction into practice of the investigations of the holographic-interferometric methods involving the use of several wavelengths[3].

[1] L. V. Dubovoĭ, A. V. Komin, and V. P. Fedyakov, Zh. Eksp. Teor. Fiz. 62, 1335 (1972) [Sov. Phys.-JETP 35, 703 (1972)].
[2] F. G. Jahoda, R. A. Jeffries, and G. A. Sawyer, Appl. Opt. 6, 1407 (1967).
[3] G. V. Ostrovskaya and Yu. I. Ostrovskiĭ, Zh. Tekh. Fiz. 40, 2419 (1970) [Sov. Phys.-Tech. Phys. 15, 1890 (1971)].

JOINT SCIENCE SESSION OF THE DIVISION OF GENERAL PHYSICS AND ASTRONOMY OF THE USSR ACADEMY OF SCIENCES, THE ACADEMY'S SCIENCE COUNCIL ON THE PHYSICS AND CHEMISTRY OF SEMICONDUCTORS, AND THE NUCLEAR PHYSICS DIVISION OF THE ACADEMY

(May 24–25, 1972)

Usp. Fiz. Nauk 108, 598–604 (November, 1972)

A joint science session of the Division of General Physics and Astronomy of the USSR Academy of Sciences, the Academy's Science Council on the Physics and Chemistry of Semiconductors, and the Nuclear Physics Division of the Academy was held on May 24 and 25, 1972, in the Conference Hall of the P. N. Lebedev Physics Institute. The following papers were presented at the session:

1. Zh. I. Alfërov. Semiconductor Devices with Heterojunctions.
2. V. S. Vavilov and E. A. Konorova. Semiconductor Diamonds.
3. L. N. Kurbatov. Photoelectric Solid-State Receivers and New Methods of Optical-Radiation Reception.
4. S. M. Ryvkin. Solid-State Nuclear-Radiation Counters.
5. V. L. Ginzburg. Gamma Astronomy and Cosmic Rays*).
6. N. A. Dobrotin, V. M. Maksimenko, Yu. A. Smorodin, and S. A. Slavatinskiĭ. On the State and Prospects of the Study of Particle Interactions at Ultrahigh Energies.

*An expanded text of V. L. Ginzburg's report is published in Usp. Fiz. Nauk, 108, 273 (1972).