plasma travel time (t_{bc}). When the delay t_{ab} is changed from 300 to 100 μsec, the plasma velocity changes from 3×10^5 to 3×10^6 cm/sec and more. For argon, the maximum velocities correspond to energies exceeding 100 eV. The particle velocities and the duration of the overlap signal ($t \approx 100$ μsec) were used to estimate the total amount of plasma $N \gtrsim n_{cr}sut \approx 10^{16}$ particles.

The absence of a magnetic field decreased the velocity and amount of plasma. Without a field, the plasma was not registered in the far window, but gave a noticeable signal in the middle window. Deterioration of the vacuum in the chamber, from 10^{-5} to 10^{-2} mm Hg, greatly decreased the amount of plasma arriving at the far window. The arrival of the gas front at the far window was registered by an ionization manometer after a millisecond.

The experiments performed can be used to produce and accelerate a pure hot plasma, to investigate high-temperature processes in the presence of a gas density gradient, to fill traps, to obtain fast neutrals (including excited ones), for the investigation of vacuum ultraviolet and for obtaining very high temperatures in a light spark [5 - 6], etc. Besides admission with a valve, it is possible to obtain a gas cloud by evaporating a target with a laser, but if it is necessary to work with simple or heavy types of hydrogen, a valve does not require any cryogenics and is simpler.

In conclusion, the authors are grateful to A.V. Sapozhnikov for help in constructing the apparatus.

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MEASUREMENT OF THE MAGNETIC MOMENT OF THE Λ^0 HYPERON

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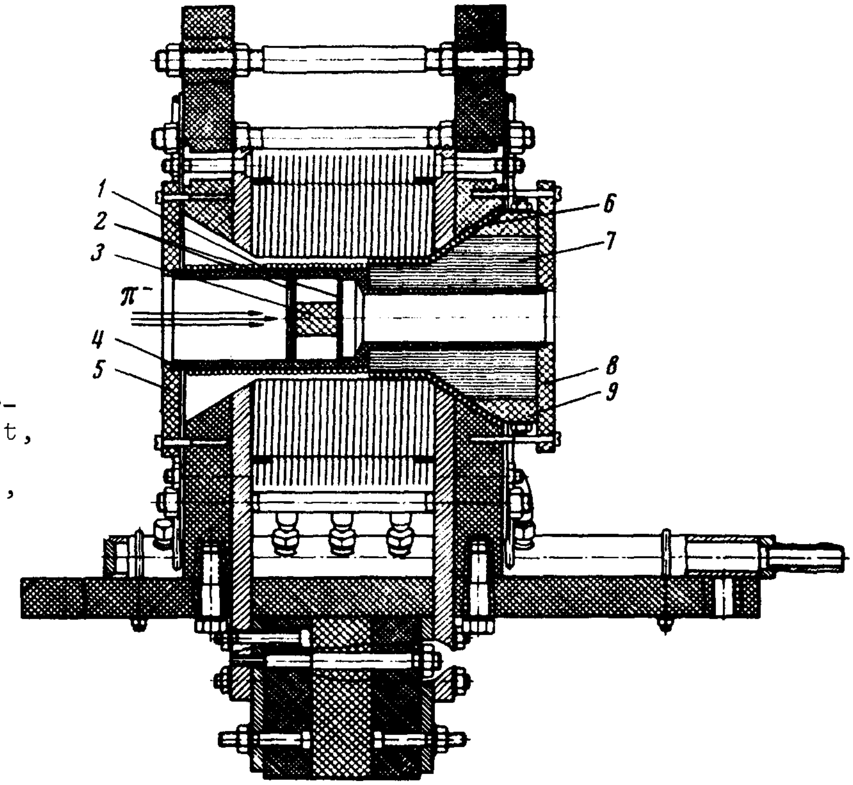
Submitted 10 June 1971
ZhETF Pis. Red. 14, No. 2, 93 - 97 (20 July 1971)

The determination of the magnetic moment of the Λ^0 hyperon was carried out in a number of investigations [1 - 5], in which the magnetic moment was determined by measuring the angle of the hyperon spin precession in a magnetic field.

The average value of the magnetic moment of the Λ^0 hyperon, obtained in these investigations, agrees with the predictions of the theory of unitary symmetry [6, 7]. However, different variants of breaking of SU(3) symmetry cannot be chosen at the existing accuracy of the measurements.

In the present paper we present preliminary results and a new measurement of the magnetic moment of the Λ^0 hyperon.

Fig. 1. Arrangement of the emulsion stack and the target in the pulsed magnet: 1, 2 - fastening of the target, 3 - polyethylene target, 4 - centering tube, 5, 8 - flanges, 7 - emulsion stack, 9 - jaws clamping the emulsion stack.



1.07-GeV/c π^- mesons extracted from the internal target of the ITEF (Institute of Theoretical and Experimental Physics) accelerator were used to obtain polarized Λ^0 hyperons in the reaction

$$\pi^- + p \to \Lambda^{0\prime} + K^0 .$$

The hyperons produced in a polyethylene target of 20 mm diameter and 30 mm length traveled in a longitudinal magnetic field of intensity 220 kG and their decays were detected in an emulsion stack. Figure 1 shows the coil of the pulsed magnetic field [8, 9] with the target and emulsion stack located in it. The construction of the stack makes it possible to have a large transmission and in the case of uniform scanning to eliminate the error connected with the dependence of the scanning efficiency on the orientation of the Λ^0 decay fork in the emulsion layer. The magnetic field in the pulsed magnet was obtained by discharging a capacitor bank [10]. The magnetic-field pulse had the shape of half a sinusoid with duration 6.7 msec. The duration of the pulse of particles from the accelerator and the instability of the drop caused a time inhomogeneity of the magnetic field of ∿1.5%, and the absolute value of the magnetic field, measured at the center of the magnet, amounted to 220 ± 10 kG. We irradiated a total of four emulsion stacks at the two polarities of the magnetic field.

The final direction of the polarization of the Λ^0 hyperons was determined by observing in the emulsion the angular distribution of the π^- mesons of the decay $\Lambda^0 \to p + \pi^-$. Owing to violation of spatial parity in Λ^0 decay, this angular distribution is of the form

$$f(\theta) = \frac{1 + \alpha\cos\theta}{2} ,$$

where θ is the c.m.s. angle between the direction of the polarization vector of

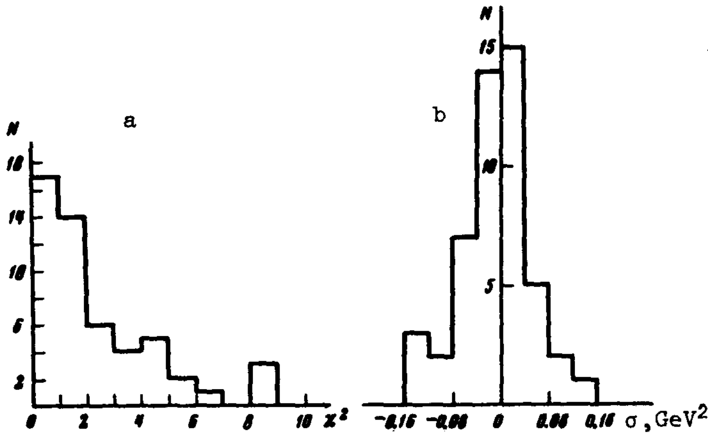


Fig. 2. a - χ^2 distribution, b - distribution of $\delta = M_X^2 - M_{K^0}^2$.

Λ^0 and the momentum of the π^- meson of the decay, and a is the asymmetry coefficient (a = αP).

In the area scanning, we selected 350 V-events satisfying the preliminary selection criteria for the Λ^0 decay cases. These events were then measured with a measuring microscope to determine the spatial and kinematic characteristics of the tracks. On each track of the V-event we measured the density of the grains to within 5% and determined the energy of the proton and of the π^- meson from the calibration curve of the dependence of the grain density on the velocity. For tracks with large ionization density, the particle energy was determined from the range. We then calculated the value Q_{exp} of the reaction and ΔQ, and determined the direction of flight of the Λ^0 and the average coordinate of the point of production of Λ^0 in the target.

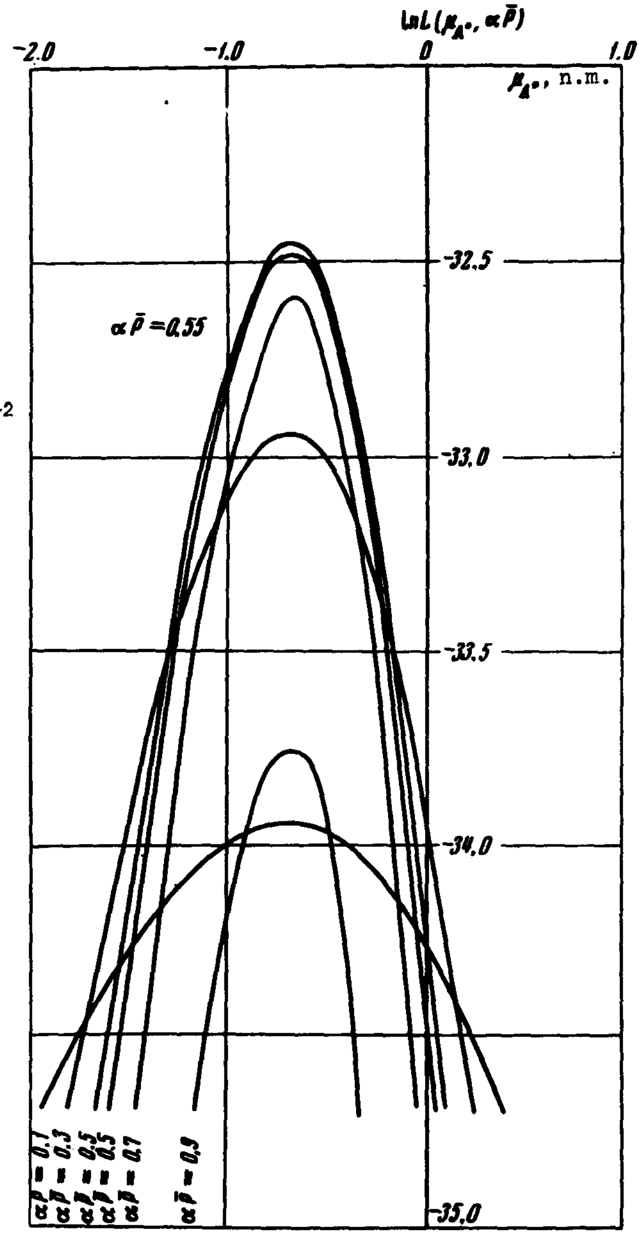


Fig. 3. Logarithm of the maximum likelihood function.

Figure 2a shows the distribution

$$\chi^2 = \left\{ \frac{Q_{exp} - Q_{theor}}{\Delta Q} \right\}^2$$

for 52 events passing through the target and having $\chi^2 < 9$. For the same 52 events we then constructed the distribution of the δ-difference between the square of the missing mass of the reaction $\pi^- + p \rightarrow \Lambda^0 + x$ in the square of the mass of the K^0 meson. The obtained distribution (Fig. 2c) agrees with the expected distribution for the events of the reaction $\pi^- + p \rightarrow \Lambda^0 + K^0$.

From the 49 events having $|\delta| < 0.16$, we determined by the maximum-likelihood method the values of the magnetic moment μ_{Λ^0} and of the coefficient a. The likelihood function is written in the form

$$L(\mu, a) = \prod_i \left\{ \frac{1 + a\cos\theta_i(\mu)}{2} \right\},$$

where $\theta_i(\mu)$ is the c.m.s. angle of the Λ^0 hyperon between the direction of the emission of the π^- meson of the decay and the direction of the polarization vector at the instant of the decay, calculated under the assumption that the magnetic moment of the Λ^0 hyperon is equal to μ. It follows from Fig. 3 that

$$\mu_{\Lambda^0} = (-0.67\,^{+0.31}_{-0.37})\ \text{n.m.}, \quad a = 0.55\,^{+0.23}_{-0.24}\ .$$

The indicated error corresponds to the decrease of the logarithm of the likelihood function by 0.5.

It should be noted that the presented preliminary results correspond to a reduction of a small fraction of the available irradiated material.

In conclusion, the authors are grateful to A.O. Vaisenberg, L.L. Gol'din, and V.A. Smirnitskii for help and useful discussions, to the crew of the ITEF accelerator for help with the performance of this work, and also to A.M. Alpers, Z.S. Galkina, and M.I. Ovsyannikova for help in the scanning of the experimental material.

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TRANSITIONS OF ELECTRONS BETWEEN EXCITED STATES OF DONORS IN GERMANIUM

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Submitted 14 June 1971
ZhETF Pis. Red. 14, No. 2, 98 - 101 (20 July 1971)

The structure of excited states of shallow impurities in semiconductors is usually investigated by methods of long-wave infrared spectroscopy. The measurements are based either on the absorption of the radiation that effects the transitions of the electrons from the ground state of the impurity to the excited states [1], or on the change of the conductivity when such transitions are accompanied by a subsequent thermal emission of electrons into the conduction band [2]. Electron transitions between the states 1s - np of the donors in germanium were investigated in this manner. In the wavelength band 90 - 250 μ there were observed lines not narrower than 0.06 meV, which are connected