The field intensity (12 kOe) was limited for the time being by the relatively large ampoule dimensions.

As can be seen from the foregoing data, the destruction fields are very large for freshly condensed beryllium films, and $dH_c/dT \sim (32-34) \times 10^3$ Oe/deg. This apparently is a property of all strongly distorted metallic films (for example, Tl)[4].

It is interesting to note, however, that dH_c/dT of beryllium turns out to be independent of the film thickness (at least in the investigated range of thicknesses and temperatures). At the same time, in thallium deposited under analogous conditions, dH_c/dT is just as large, but decreases rapidly with increasing film thickness. The apparent reason for this is that beryllium obtained under such conditions is in a different modification[3], whereas films of thallium, judging from the known data [4,5], have no special modifications.

It can be noted that dH_c/dT of beryllium films is much larger than that of high-temperature superconductors such as Nb_3Sn (16,000 G/deg).

Unfortunately, in the case of superconducting beryllium films it is impossible to consider a comparison with existing[6] theoretical results for the critical fields, since the latter are expressed in terms of the magnetic field for the bulk metal, which is not realizable for beryllium.

The metal in the beryllium film is apparently in the maximally disordered state, i.e., for this film the smallest parameter (for example l, the electron mean free path) entering into the theoretical analysis is smaller than the investigated film thickness.

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ELASTIC SCATTERING OF 3.5-BeV/c π^- *MESONS BY PROTONS*

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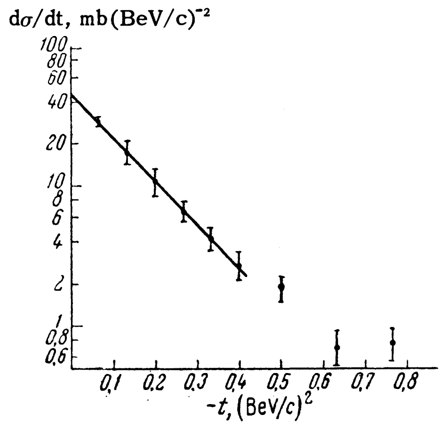
THE study of elastic scattering at high energies in the region of the diffraction maximum has gained in interest recently in connection with the verification of the asymptotic expressions obtained by calculating the Regge-pole trajectories. We have investigated the elastic scattering of 3.5-BeV/c π^- mesons by protons. The measurements were made with the aid of a liquid-hydrogen bubble chamber 25 cm in diameter, placed in a 14 kOe magnetic field.

A π^--meson beam from the internal target of the proton synchrotron was analyzed in the field of the deflecting magnet and guided through a system of two collimators to the entrance window of the liquid-hydrogen bubble chamber. The momentum scatter in the primary beam was $\sim 1\%$. A total of 40,000 photographs was obtained with an average load of 10—15 π^- mesons per chamber expansion. The photographs were scanned twice. The selected two-prong stars were processed with the automatic measuring unit of the Institute of Theoretical and Experimental Physics. The data obtained were fed to an electronic computer. The error in the measurement of the space angles was $\pm 40'$. The error in the measured momentum corresponded to an error $\pm 50\,\mu$ in the measured deflection in the chamber. The elastic scattering was identified by comparing the emission angles and the momenta of the secondary particles with the values expected from the kinematics of elastic scattering. The number of elastic scattering events so selected was 540.

The figure shows the dependence of the differential cross section $d\sigma/dt$ on t, the square of the four-momentum transfer. The momenta for small angles were corrected for the azimuth-angle dependence of the efficiency of observing the events. The total cross section for scattering in the backward hemisphere is $50 \pm 20\,\mu$b. If only the trajectory of the vacuum pole is taken into account, the scattering amplitude has the asymptotic form (see, e.g., [1])



Differential cross section of elastic π^-p scattering.

$$T_p \sim i\sigma_{\text{tot}}\, s^{\alpha(t)}, \tag{1}$$

where s is the square of the total c.m.s. energy and $\alpha(t)$ is the trajectory of the vacuum pole. Taking into account the optical theorem we obtain

$$\frac{d\sigma}{dt} = \left(\frac{d\sigma}{dt}\right)_{t=0} s^{2[\alpha(t)-1]} = \left(\frac{d\sigma}{dt}\right)_{t=0} e^{2\ln s[\alpha(t)-1]}. \tag{2}$$

In the region of small t, recognizing that $\alpha(0) = 1$ and assuming that $[d\alpha(t)/dt] = \epsilon$, we get

$$\frac{d\sigma}{dt} = \left(\frac{d\sigma}{dt}\right)_{t=0} e^{2\varepsilon t \ln s} = \left(\frac{d\sigma}{dt}\right)_{t=0} e^{A(s)t}. \tag{3}$$

The values of A(s) determine the width of the diffraction maximum. It follows from (3) that the A(s) should increase with increasing s logarithmically, corresponding to a contraction of the diffraction maximum with increasing s.

The calculation of A(s) from the results presented in the figure leads to a value $A = 7.36 \pm 0.44$ $(\text{BeV/c})^{-2}$, which agrees well both with data at higher energies (see [2-6]) and at lower ones (see [2,7-10]). The energy interval investigated in these references is 1.5—16 BeV (s ranges from 3 to 30 BeV^2). The average of A(s) in the 1.5—16 BeV interval is 7.61 in accord with the data of [2-10] and the present work. If we assume that A(s) does not vary in the investigated interval of s and is equal to 7.61, then $\chi^2 = 13.1$ for this hypothesis at 12 degrees of freedom (40% confidence level), i.e., the use of the χ^2 criterion does not contradict the assumed constancy of A(s). For pp scattering, as is well known, a clear-cut narrowing of the diffraction maximum is observed with increasing s. Thus, the assumption that πp and pp scattering are determined by the contribution of the vacuum pole only contradicts the aggregate of the available experimental data.

In conclusion we consider it a pleasant duty to express deep gratitude to S. Ya. Nikitin for continuous interest in the work and to R. S. Guter for carrying out the calculations. The work was greatly helped by the painstaking work of the data-reduction group headed by D. I. Tumanova, to whom we express our sincere gratitude.

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SEARCH FOR ANTIMATTER IN COSMIC RAYS

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We placed on the second space ship (August 19, 1960) a stack of 489 type BR 10 by 10 cm pellicles 400 μ thick. The stack was exposed beyond the limits of the atmosphere at an approximate altitude of 300 km for about a day. After it was returned to earth and chemically developed, the stack was