with the electron-hole interaction. The different degree of influence of the magnetic field on the characteristics of the radiation in the two materials can be attributed to the lower mobility of the electrons in CdHgTe, and indicates that the magnetic field plays a secondary role in the instability mechanism. The fact that excitation of coherent radiation in CdHgTe is accompanied by a noticeable change of the sample resistance (which is manifest in distortion of the current and voltage pulse wave forms) indicates a high intensity of the microwave oscillations of the electron-hole plasma in the interior of the crystal, and the low power of the observed radiation, which is evidence of a low coefficient of conversion of the oscillations into electromagnetic ones, is apparently due to the potential character (small wavelength $k >> \omega/c$) of the plasma oscillations.

Further investigations of the microwave radiation of CdHgTe crystals with different component ratios will probably make it possible to draw more definite conclusions concerning the nature of the described phenomena, including the most obscure question, that of the mechanism ensuring coherence of the microwave radiation.

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PRODUCTION OF $\pi^+2\pi^-$ SYSTEM OF NUCLEI AT SMALL MOMENTUM TRANSFERS

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The production of a charged system ($2\pi^-\pi^+$) by pions on complex nuclei was investigated at several values of the primary pion momentum [1 - 3]. It was established that coherent production of the indicated system occurs at small values of the 4-momentum transfer to the target nucleus. The cross section of the process decreases with decreasing primary energy. The interesting region below 6 GeV, where coherent generation should gradually attenuate, has hardly been investigated (one event was registered at an input momentum 3.85 GeV/c [4]).

We have observed coherent production of a triplet of pions ($2\pi^-\pi^+$) on light nuclei by negative pions with momentum 4 GeV/c. The work was performed with the aid of the 105-cm bubble chamber of our Institute, filled with a mixture of light freons (chemical composition $C_2F_5Cl_3$). The chamber was exposed to a beam of pions from the proton synchrotron of the Institute of Theoretical and Experimental Physics. The magnetic field in the volume of the chamber was 16 kOe.

We selected 3-prong interactions without a visible disintegration of the recoil nucleus, without evaporation products, and not accompanied by emission of γ quanta and neutral strange particles. A total of 922 events was measured.

A fitting procedure was used to separate the reaction. For the target mass we used the neutron mass, since fitting to a definite type of reaction at small values of the momentum transfer is insensitive to the target mass. At large momentum transfers the neutron mass apparently corresponds more closely to the character of the process [2, 5].

After additional selection by the χ^2 criterion and measurement accuracy, we were left with 281 cases of the reaction π^- + (neutral target) $\rightarrow \pi^+ + 2\pi^- +$

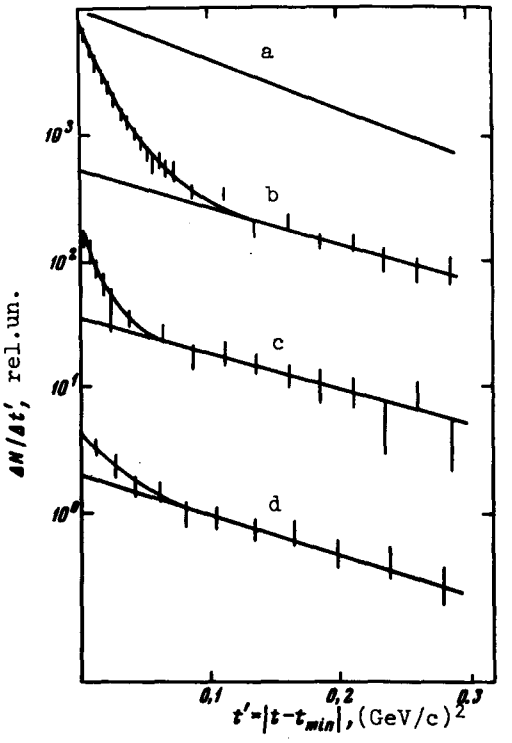

Fig. 1. Dependence of the cross section of the reaction of production of $\pi^+2\pi^-$ on nuclei on the square of the 4-momentum transfer $t' = (t - t_{min})$. The distributions a, b, and c were taken from [1]; a - elastic πN scattering, b - primary momentum 16 GeV/c, c - primary momentum 6 GeV/c, d - our data (281 events with $t' \leq 0.3$ (GeV/c)^2).

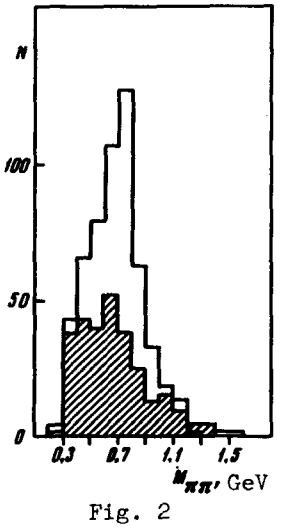

Fig. 2

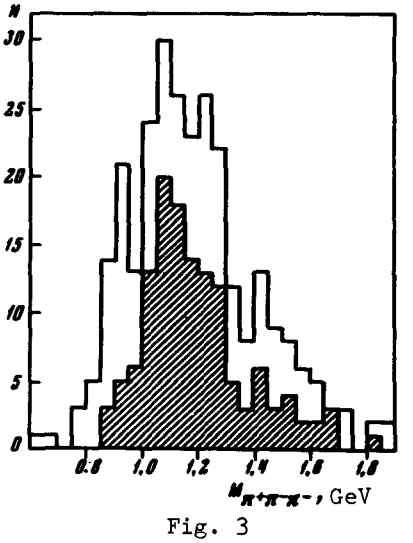

Fig. 3

Fig. 2. Distribution with respect to the effective mass of two pions. Solid histogram - $\pi^+\pi^-$ system (562 combinations), shaded - $\pi^-\pi^-$ (281 combinations).

Fig. 3. Mass distribution of the $\pi^+2\pi^-$ system. Solid histogram - 281 combinations with $t' \leq 0.3$ (GeV/c)^2. Shaded - distribution for events with mass 700 MeV $\leq M_{\pi\pi} \leq$ 830 MeV (133 combinations).

(neutral target) with values $t' = |t - t_{min}| \leq 0.3$ (GeV/c)^2, where t is the square of the 4-momentum transfer to the target and t_{min} is the smallest kinematically possible value of t.

Figure 1 shows the dependence of the yield of the reaction on t'. For comparison are shown also the results of [1]. Fitting by least squares shows that the distribution can be described by a sum of two exponentials. For $t' \geq 0.06$ $(GeV/c)^2$, the cross section plotted logarithmically as a function of t' has a slope $B_1 = 7$ $(GeV/c)^{-2}$, corresponding to πN interaction. The slope determining the behavior of the cross section at small values of t is $B_2 = (41.5 \pm 2.5)$ $(GeV/c)^{-2}$.

The character of the distribution shows that at primary pion momentum values ∿4 GeV/c there is still coherent production of the system $\pi^+2\pi^-$ on the nucleus. The coherent-reaction cross section per effective molecule of the freon mixture is $\sigma_0 = (5.6 \pm 2.7)$ mb/$C_2F_5Cl_3$, corresponding to a cross section per average nucleus ($\bar{A} = 22.5$)

$$\sigma_{nuc} = (0.07 \pm 0.03) A^{2/3} \text{ mb/nucleus}$$

The distribution with respect to the effective masses of the systems $\pi^+\pi^-$ and $\pi^-\pi^-$ for all chosen events are shown in Fig. 2. The character of these distributions is different. For the $\pi^+\pi^-$ system it has a concentration near the mass corresponding to the ρ-meson mass. There is no such grouping for the $\pi^-\pi^-$ distribution. Figure 3 shows the distribution with respect to the mass of three pions. If we choose the value of the $\pi^+\pi^-$-system mass in the interval 700 MeV $\leq M_{\pi\pi} \leq$ 830 MeV, then the corresponding distribution for $(\pi^+2\pi^-)$ becomes narrower and groups near the A_1-meson mass. It should be noted that the mass distributions obtained in the present paper hardly differ from the distributions for higher energies, when the fraction of the coherent reactions is much higher.

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EXPERIMENTAL OBSERVATION OF NONLINEAR OPTICAL ACTIVITY

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A theoretical analysis of the different mechanisms of nonlinear optical activity (NOA) has been carried out in a number of papers [1 - 6]. The nonlinear increment of the angle of rotation of the plane of polarization for the orientational and striction mechanisms is, according to the estimates of [2],

$$\Delta\theta \sim 10^{-12}[\alpha]\ell I, \quad (1)$$

where [α] is the specific rotation, ℓ the length of the region of nonlinear interaction, and I the intensity of the laser pulse; in the case of the thermal mechanism we have [6]

$$\Delta\theta^T \sim 10^{-3}[\alpha]\ell k_\omega \int_{-\infty}^{t} I(r)dr, \quad (2)$$