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MEASUREMENT OF ONE-SPIN ASYMMETRIES IN INCLUSIVE π^0 AND η PRODUCTION AT 90^0 cms IN THE REACTIONS $\pi^- p_\uparrow \to \pi^0(\eta) + X$ AT 40 GeV/c

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Abstract

Apokin V.D. et al. Measurement of One-Spin Asymmetries in Inclusive π^0 and η Production at 90° cms in the Reactions $\pi^- p_\uparrow \to \pi^0(\eta) + X$ at 40 GeV/c: IHEP Preprint 89-37. - Serpukhov, 1989. - p. 21, figs. 10, tabl. 3, refs.: 17.

The one-spin asymmetries of π^0 and η produced by the 40 GeV/c negative pion and kaon beams on the polarized propane-diol target have been measured in the region $|x| < 0.2$ and $1.6 < p_T < 3.2$ GeV/c. A sizable asymmetry of π^0's has been observed which amounts up to (40-50)% at $p_T \simeq 2.4$ GeV/c. An evidence has been obtained for similar behaviour of polarization asymmetry in η production.

Аннотация

Апокин В.Д. и др. Измерение односпиновых асимметрий в инклюзивном образовании π^0- и η-мезонов под углом 90° в с.ц.м. в реакциях $\pi^- p_\uparrow \to \pi^0(\eta) + X$ при 40 ГэВ/с: Препринт ИФВЭ 89-37. - Серпухов, 1989. - 21 с., 10 рис., 3 табл., библиогр.: 17.

Измерены односпиновые асимметрии в образовании π^0- и η-мезонов на поляризованных протонах и дейтронах отрицательными пионами и каонами при импульсе 40 ГэВ/с в области $|x| < 0,2$ и $1,6 < p_T < 3,2$ ГэВ/с. Наблюдается значительная асимметрия в образовании π^0-мезонов, достигающая (40-50)% в области $p_T \simeq 2,4$ ГэВ/с. Получено указание на аналогичное поведение асимметрии в образовании η-мезонов.

Introduction

A large one-spin asymmetry at 90^0cms was discovered in the reaction $pp_{\uparrow} \to \pi^0 + X$ at 24 GeV/c [1]. It was negative and was on the level of tens per cent in the region $p_T > 1{,}8$ GeV/c. But the error bars in that experiment were too large, so the results were considered as an evidence for possible large asymmetry in hard pion production. That was in contradiction with the conventional models for hard scattering which predicted zero one-spin asymmetry.

Recently new results were published in refs. [2,3]. Inclusive production of protons and pions by polarized proton beam was studied at 13,3 and 18,5 GeV/c. A fairly large asymmetry (up to 25%) was observed in π^+ production. The proton production exhibited small asymmetry (about 5%), and no asymmetry for π^- production was established within the errorbars.

At the same time, the "raw" asymmetry in π^0 production by π^- beam on polarized propane-diol at 40 GeV/c was published in ref. [4]. In the region of $x \approx 0$ and $p_T \approx 2$ GeV/c it was equal to ~3%. The estimations of the dilution factor showed that the "pure" asymmetry could be on the level of 20÷30%.

In this paper we present the final measurements of the one-spin asymmetries in inclusive production of π^0 and η mesons by the 40 GeV/c π^- and K^- beams on the transversely polarized proton and deuteron targets. The investigations were performed by the Serpukhov-Dubna-Tbilisi collaboration on the Serpukhov accelerator in 1986÷88. The following reactions were studied:

$$\pi^- p_\uparrow \to \pi^0 X, \qquad (1)$$

$$\pi^- D_\uparrow \to \pi^0 X, \qquad (2)$$

$$\pi^- p_\uparrow \to \eta X, \qquad (3)$$

$$\pi^- D_\uparrow \to \eta X, \qquad (4)$$

$$K^- N_\uparrow \to \pi^0 X \qquad (5)$$

in the kinematic region $|x|<0,2$ and $1,6<p_T<3,2$ GeV/c. In (5) the symbol N means that the results were obtained by weighting the propane-diol and deuterium data.

1. Experimental Set-up.

The experimental set-up consisted of the following principal parts (see fig.1):

- beam apparatus/5/;
- polarized propane-diol/6/ and deuterium/7/ targets;
- two electromagnetic calorimeters of the GAMS/8/ type;
- electronics and data acquisition system.

The negative beam particles were focused on the polarized target. It was monitored by the telescope of counters S1.S2.S3.A0. The type of each particle was determined by three threshold Cerenkov counters C1,C2,C3, and the incoming angle of a particle in the target was measured by two two-coordinate hodoscopes H1 and H2 with 0,4 mrad accuracy.

Two polarized targets were used in the experiment: proton target (propane-diol $C_3H_8O_2$) and deuterium target ($C_3D_8O_2$), both with frozen polarization, and horizontal cryostat. The mean target polarizations measured by the NMR (Nuclear Magnetic Resonance) method were equal to ≈75% and ≈35% for proton and deuterium targets, respectively. The related accuracies in measurements of the target polarizations were 3 and 6 per cent.

The gamma pairs from π^0 and η decays were detected by two identical electromagnetic calorimeters positioned 2 m down the target at the angles $12,3^0$ and $-12,3^0$ with the beam line in the horizontal plane. Each calorimeter consisted of 144 lead glass counters with 38x38x450mm^3 size. The radiation length of glass used was equal to 2,5 cm. The signals from the counters were measured by the 10-byte ADC/9/. The calorimeters were calibrated by the 10 GeV/c electrons twice each accelerator run: at the beginning and at the end of measurements. The energy resolution of the measurements was $\Delta E/E=0,15/\sqrt{E}$. The time resolution was due to the signal lengths permitting the coding in ADC, and it was equal to 60 nsec. The gain stability in each channel was controlled with LED's each time per accelerator spill.

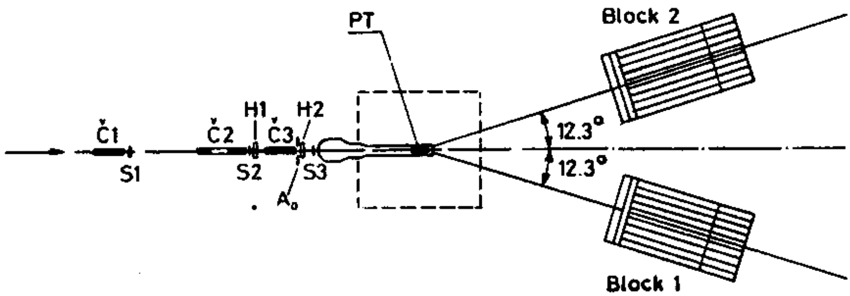

Fig. 1. The layout of the experimental facility.

The background induced by nuclei in polarized targets was measured on the carbon target whith the size and weight which were equivalent to the unpolarized content of the polarized targets.

Due to the fact of strong p_T-dependence of the cross sections in reactions (1÷5) the specific trigger was created to remove events with p_T<1,5 GeV/c and to increase the calorimeter efficiency for high-p_T events. The summary anode signals of the vertical sets of elements (columns) were summed with certain weights, depending on the resistors of the summation device. The resistors were chosen to set the contribution of each column into the sum to be proportional to

$E \cdot \sin\theta$. Here θ is the mean scattering angle and E the energy deposition in a given column. The summary signal from the calorimeter was detected by a discriminator with controlled threshold, and the signal of the presence of a high-p_T particle was created. The final trigger was obtained by crossing this signal with one of the chosen beam particle. The value of p_T-threshold (1,5 GeV/c) was chosen to limit the quantity of the read-out information during one accelerator spill by the size of the buffer memory.

The data acquisition and the on-line data handling were performed on the two-computer complex CM-4/CM-1420 with the operation system RSX11M. The buffer memory was located in the dynamic region of the CM-4 memory of 90 Kbytes, so that some hundreds of events per spill were accepted. The accepted information was written on magnetic tapes and partly on disks of the CM-1420 during the time between spills (~7sec). The disk data was handled on-line to estimate the quality of incoming information, to control the long-time stability of all the elements and to get some preliminary results.

2. Data reduction and analysis

First of all the parameters of all electromagnetic showers (energy and coordinates) were determined for both calorimeters. The parameters for overlapped showers were restored using the well known iteration procedure/10/. The energies and coordinates of the reconstructed gammas were written on the Data Summary Tape. About 30% of the total statistics consists of events with three or more gammas, but their contribution to π^0 mass spectrum was about 5% due to the huge combinatorial background. So only the two-gamma events (~50% of the total statistic) were analysed. "Good" events were selected under the following conditions:

- the energy of gamma-pairs was in the range 5÷15 GeV;
- the effective two-gamma mass was chosen in the range 70÷220 MeV for π^0 and 480÷660 MeV for η. The effective

two-gamma mass distributions are shown in fig.2. The background under π^0 peak was, in general, p_T-dependent: from about 10% at p_T=1,8 GeV/c it increased up to 20% at p_T=3,0 GeV/c. Under η-meson peak the background was on the level of ~50%;

- $|\cos\theta^*|<0,8$ for π^0 and $|\cos\theta^*|<0,6$ for η, where θ^* is the decay angle of the meson in its rest frame. The $\cos\theta^*$ distributions are plotted in fig.3a.

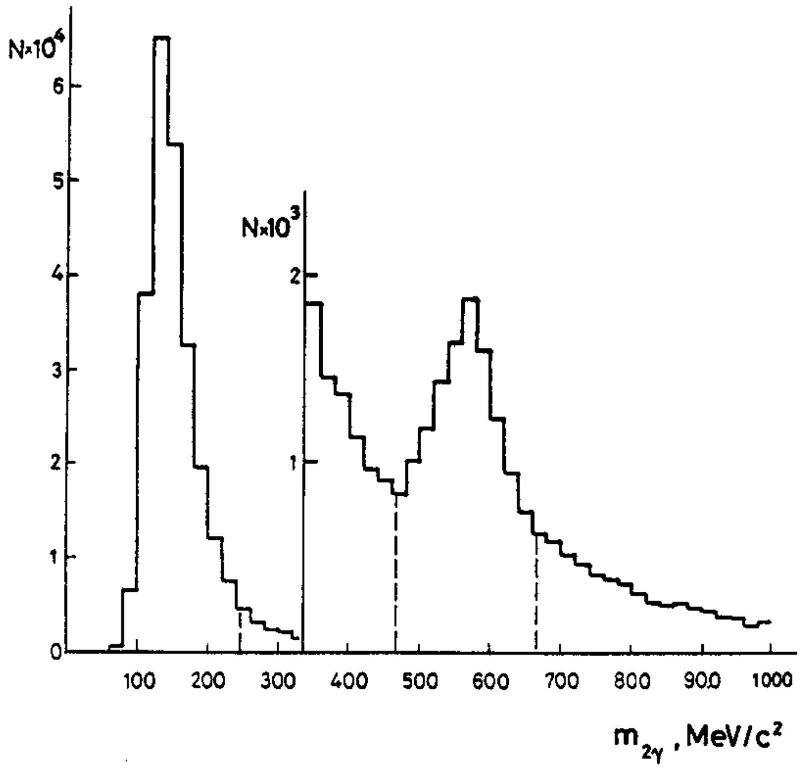

Fig. 2. The two-gamma effective mass distributions for π^0 and η mass regions.

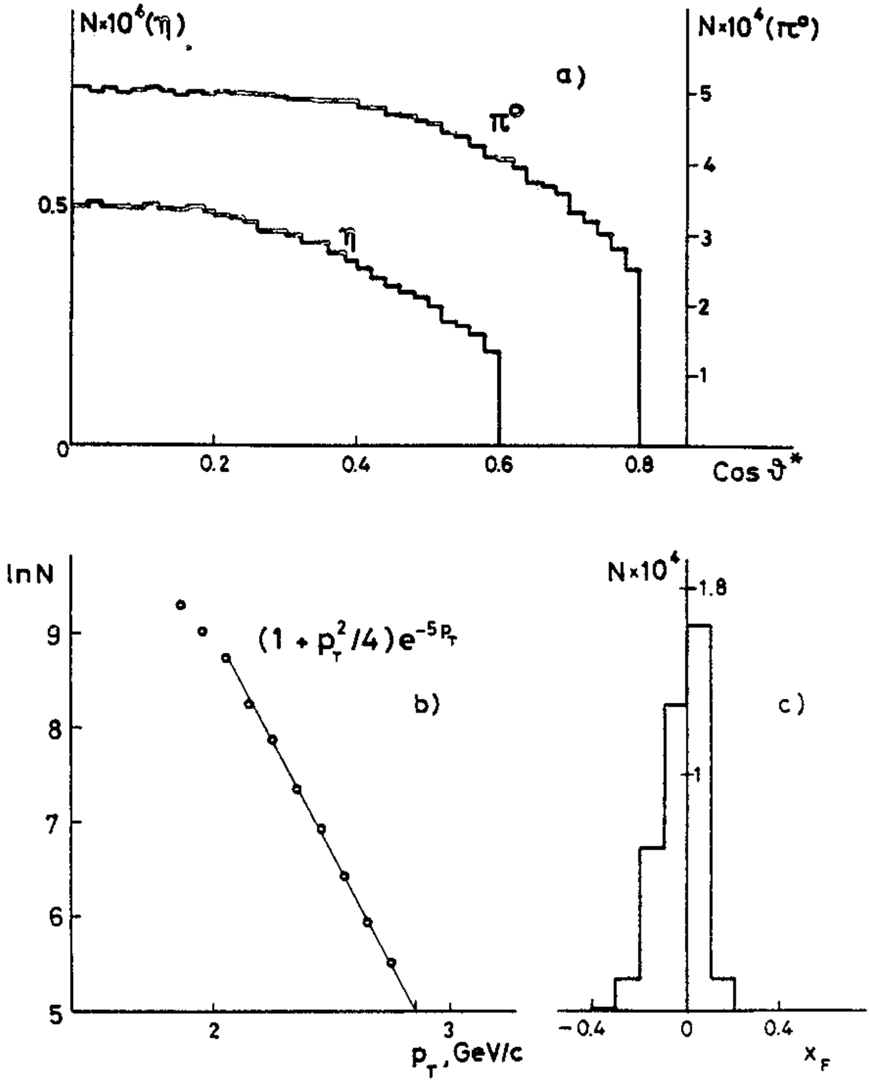

Fig. 3. The $\cos\theta^*$-distribution (see text) for π^0 and η a); p_T-distribution for reaction (1) b); x-distribution for reaction (1) c).

After all selections the total statistics was about $2,2\times10^5$ π^0's produced on the proton target and $2,8\times10^5$ π^0's produced on the deuterium target, both at $p_T>1,6$ GeV/c. The statistics for reactions (3), (4) and (5) was $1,2\times10^4$, 3×10^4 and 7×10^3, respectively. From these data the two-dimensional distributions in x and p_T for inclusive π^0 and η were measured apparently for polarized targets with positive and negative polarizations and for a carbon target. The p_T- and x-distributions for inclusive π^0 production are shown in Figs.3b and 3c.

The one-spin polarization asymmetry $A(x,p_T)$ was determined as follows:

$$A(x,p_T) = \frac{1}{P_{Targ}F}\,\frac{\int E d\sigma_{\uparrow} - \int E d\sigma_{\downarrow}}{\int E d\sigma_{\uparrow} + \int E d\sigma_{\downarrow}}.$$

Here $Ed\sigma_{\uparrow(\downarrow)}$ denotes the invariant inclusive cross section at a fixed direction of the target polarization. P_{Targ} is a mean value of the target polarization. The quantity F is the ratio of events produced on the free polarized protons (or deuterons) inside the target. The dilution factors D=1/F are shown in Fig.4 for two polarized targets.

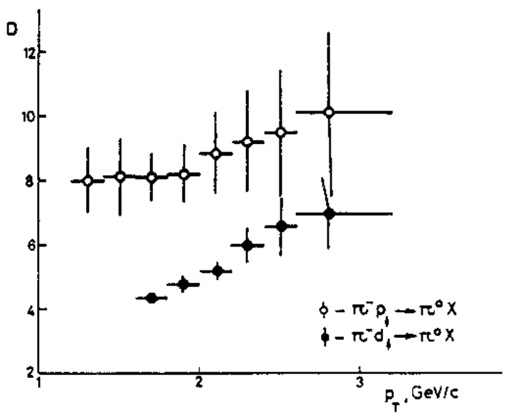

Fig. 4. p_T-dependence of the dilution factors.

3. Results

The results of the asymmetry measurements in reactions (1) and (2) are presented in Tables 1 and 2 and shown in Fig.5. The values of $A(p_T)$ measured on the proton and deuterium polarized targets are the same within the errors. Very large values of the asymmetry were observed at p_T>2,2 GeV/c, but the errorbars are also large. The mean weighted value of $A(p_T)$ for reactions (1) and (2) is equal to -(37±11)% at p_T>2,2 GeV/c. The systematic errors do not exceed 15÷20%.

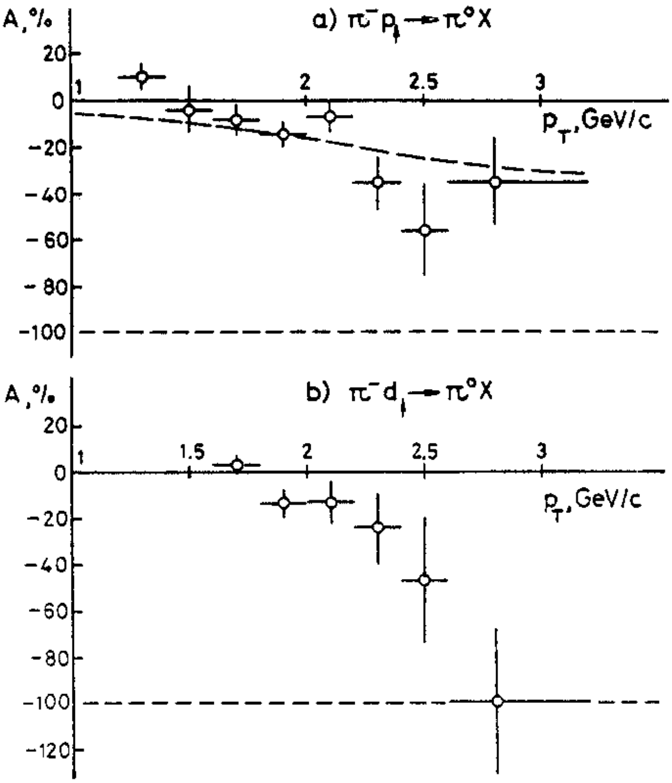

Fig. 5. Measured π^0 asymmetries on the polarized proton and deuterium targets at 40 GeV/c.

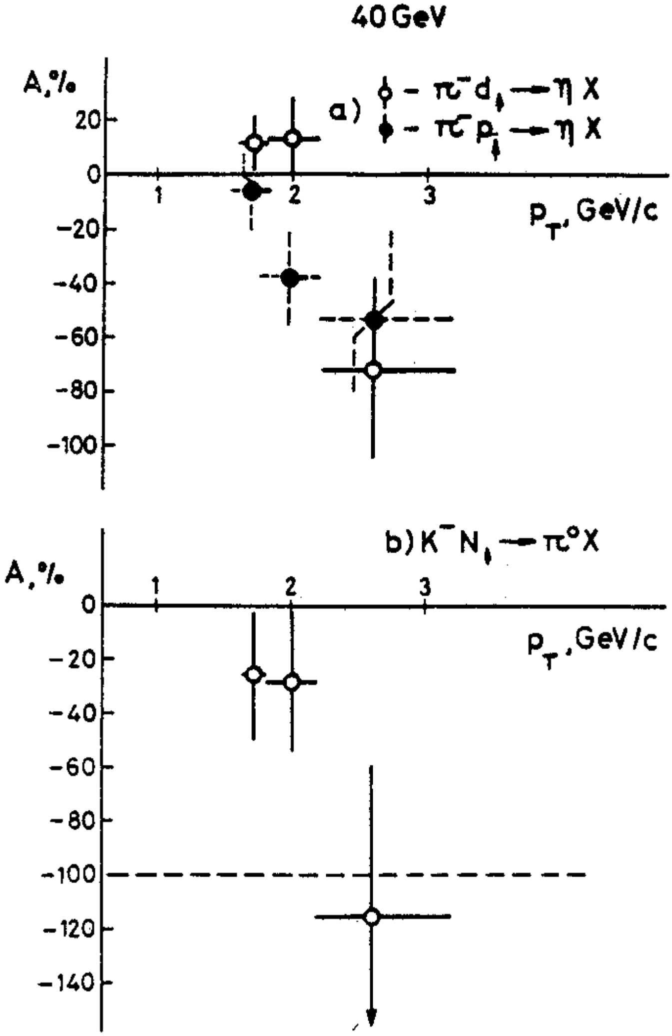

Fig. 6. Measured η asymmetries on the polarized proton and deuterium targets at 40 GeV/c (a); measured π^0 asymmetry induced by K^- beam and weighted over the data on both polarized targets (b).

The "raw" asymmetries for reactions (3÷5) were calculated in the same manner. The dilution factors were taken the same as for reactions (1) and (2). The data on the η asymmetry in reactions (3),(4) and on the π^0 asymmetry in reaction (5) are summarized in Table 3 and shown in Fig.6. An evidence was obtained for sizable asymmetry in all three reactions (3÷5) at $p_T>2,2$ GeV/c. The number of events with $p_T>2,2$ GeV/c in reactions (3),(4) and (5) was equal to 2024, 2791 and 830, respectively. The systematic errors were estimated to be <20%. The p_T-dependences of mean weighted asymmetries for π^0 (averaged over reactions (1) and (2)) and η (averaged over reactions (3) and (4)) are shown in Fig.7. The data display approximately a similar p_T-behaviour for π^0 and η.

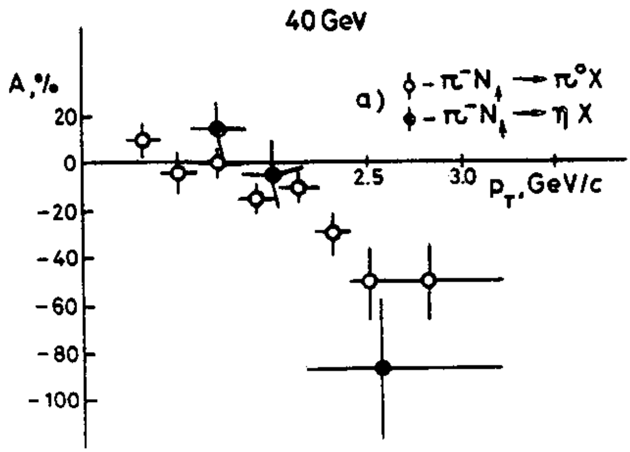

Fig. 7. p_T-dependence of asymmetry in the reactions $\pi^- N_\uparrow \to \pi^0 X$ (open circles) and $\pi^- N_\uparrow \to \eta X$ (full circles), averaged over the data on the proton and deuterium polarized targets at 40 GeV/c.

Our choice of the coordinate axes is connected with the following sign convention: the negative sign of asymmetry means that when the target polarization vector is directed up, the number of particles scattered to the left is less than the number of particles scattered to the right.

4. Systematic errors

The crucial point is the estimation of systematic errors leading to false asymmetry. The main source of the false asymmetry was instability of the calorimeter energy scale. As mentioned above, the pulsed LED's were used to control the stability. The time shift of the LED system resulted in the raw false asymmetry which did not exceed 1%. Corrected by the factor D/P_{Targ}, that gave the estimation of the false asymmetry ~10%.

The estimation of the effects of time instability was made using the sample of continious measurements obtained at fixed direction of the target polarization. The sample was divided into two equal parts with the opposite signs of P_{Targ} assignement and the procedure of asymmetry calculation was applied to it. "Asymmetries" for reactions (1) and (2) obtained in that fashion were less 20%.

The false asymmetry was also estimated by a use of the two-gamma events with the effective mass between π^0 and η masses. Presumably they were treated as smooth unpolarized continuum. The asymmetry of such gamma-gamma pairs calculated in the interval $2,2<p_T<3,2$ GeV/c is plotted in Fig.8a. For comparison the asymmetry for gamma-gamma pairs with the effective masses in the accepted π^0 and η mass regions (see sect.2) is shown. The false asymmetry p_T-dependence is shown in Fig.8b. These data do not exhibit any sizable background asymmetry. Other uncertainties, connected with measurement inaccuracy of the target polarization and the dilution factor, were found less than 10%.

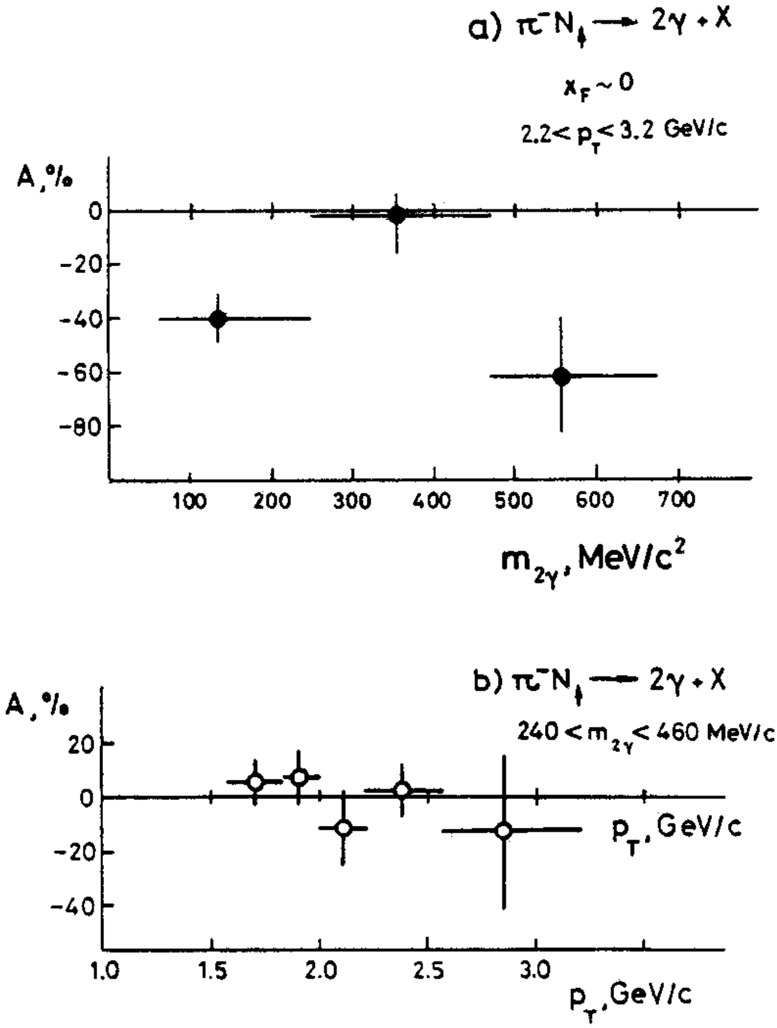

Fig. 8. The two-gamma asymmetries integrated over the region $2.2 < p_T < 3.2$ GeV/c versus effective mass a); the two-gamma asymmetries for effective masses between π^0 and η (false asymmetries) b).

5. Discussion

In Fig.9 we compare our results in the reaction $\pi^- N_{\uparrow} \to \pi^0 X$ (Fig.9c) with the experimental data on the reaction $p_{\uparrow} p \to \pi^+ + X$ at 13,3 and 18,5 GeV/c /2,3/ on the polarized proton beam (Fig.9a) and in the reaction $p p_{\uparrow} \to \pi^0 + X$ at 24 GeV/c /1/ on the polarized proton target (Fig.9b).

Comparing the asymmetry signs in various experiments, one should remember that in refs. /2,3/ the choice of the coordinate axes corresponds to the kanonic helicity frames. In our experiment this choice corresponds to the Basel convention as in ref /1/. In the kanonic helicity frames all values of $A(p_T)$ in Figs.9b and 9c will have the opposite sign. Hence all asymmetries presented in Fig.9 will be positive at $p_T > 1,5$ GeV/c. The two features of the data presented in Figs.9a,b,c should be stressed:

- a sizable increase of the absolute value $|A(p_T)|$ with increasing p_T (at $p_T > 1$ GeV/c);
- the asymmetries change the sign or go to zero in p_T-interval between 1 and 2 GeV/c.

It is interesting to study the energy dependence of the crossing point p_T^0 where $A(p_T^0)=0$. It can be connected with the energy dependence of the phase difference between spin-flip and non-flip amplitudes. In Fig.10 the energy dependences of p_T^0 and $x_T^0 = 2p_T^0/\sqrt{s}$ are plotted. To determine them we have performed a linear fit over the data presented in Fig.9. It is seen that in the energy range $5 < \sqrt{s} < 10$ GeV x_T^0 does not depend on $\sqrt{s}$. The asymmetry changes its sign at $x_T^0 = 0.40 \pm 0.03$.

The experimental results discussed above allow us to regard large single-spin asymmetries in the central region as established ones. From the theoretical point of view, the discovery of large single-spin effects in inclusive hadron-hadron reactions means, that the conventional hard-scattering models with a trivial non-coherent dynamics are now not fully valid in the quark phenomenology.

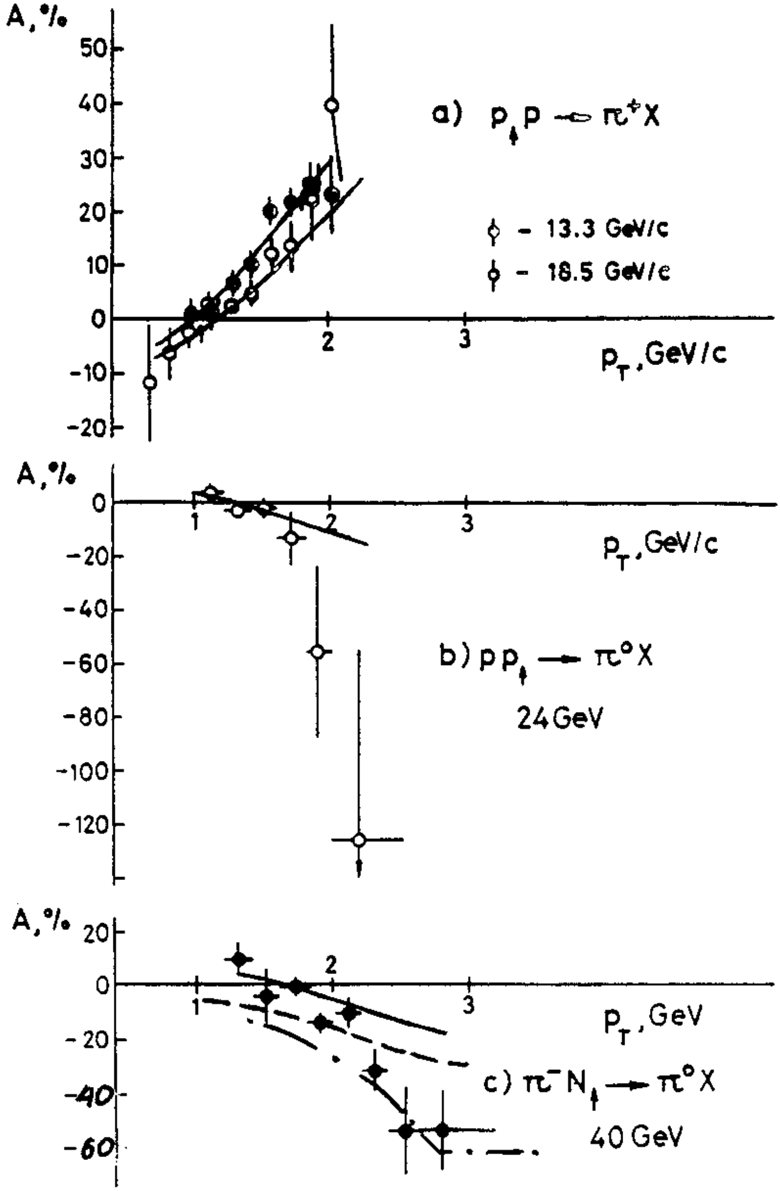

Fig. 9. The existing world data implying large one-spin asymmetries in π^+ and π^0 inclusive production at 90°cms. Model predictions: formula (7) - solid lines, ref./16/ - dashed line, ref./17/ - dotted-dashed line.

Since the polarization effects are connected with long distances, the constituent quark models must, in general, reflect the main features of the effects. In ref./11/ H.Fritzsch have studied this point in the frame of SU(6) symmetry and its possible connection with the gluon anomaly contribution.

In general the polarization effects (A) are considered as a convolution of amplitudes describing the interactions at short (S) and relatively long (L) distances: $A \sim S \otimes L$. The comparison of the interaction pictures with spin-flip and without one at large and at short distances can be found, for example, in ref./11/. We assume that the proton spin structure is described in the constituent quark model proposed by Fritzsch/11/ where the gluon contribution to the proton polarization can be sizable. We also assume that the polarization asymmetry of a produced meson arises only if a polarized quark from the polarized proton contributes to the production process. At large distances a proton is viewed as three constituent quarks. Each constituent quark can be regarded as a light "current" quark effectively weighted by its own gluon cloud. Masses of the constituent quarks are not small and the spin-flip occurs in scattering processes. At small distances the internal structure of constituent quarks starts to play a certain role.

The quark helicity amplitudes $L_{\lambda\mu}$ and $S_{\lambda\mu}$ can be defined as the amplitude components which describe the scattering of a constituent quark as a whole and the scattering of a light quark, respectively. Helicities λ and μ refer to a polarized quark from the polarized proton after and before quark scattering, respectively. Other helicities are omitted because they are always under summation. The quark helicity amplitudes are simply related to the six conventional amplitudes $\Phi_1,\ldots,\Phi_6$ for spin1/2+spin1/2 scattering. Particularly $S_{++}=\Phi_1+\Phi_3$.

Is the p_T-dependence of the amplitude $S_{\lambda\mu}$ defined by the lowest order of QCD? As is seen in Fig.3b, the differential cross section $dN/dp_T \sim |M_{++}|^2 + |L_{-+}|^2$ monotonously decreases. Here M_{++} denotes the sum $(S_{++}+L_{++})$. Since the condition $|M_{++}| << |L_{-+}|$ (and the reversed one) leads to negligible polarization effects (see below), we deduce from the monotonous behaviour of dN/dp_T that M_{++} and L_{-+} have approximately a similar p_T-dependence in the high p_T region. It is also true for S_{++} and L_{++}. This dependence is expressed by $\sim\exp(-5p_T)$ which is intermediate between the exponential behaviour $\exp(-ap_T^2)$ at small momentum transfers and the behaviour of p_T^{-n} in the pertubative QCD. The experimental similarity of the p_T-dependences of the amplitudes $S_{\lambda\mu}$ and $L_{\lambda\mu}$ is not clear. Probably it takes place at our not high energies ($\sqrt{s}$<10 GeV), and it will disappear at higher $\sqrt{s}$. Alternatively one could assume that the proposed decomposition with $S_{\lambda\mu}$ and $L_{\lambda\mu}$ is not relevant.

The modified constituent approaches cannot give a full agreement with the EMC results/12/. This problem is discussed by H.Fritzsch in ref./11/. It is connected with the gluon anomaly contribution to the non-conserved quark axial vector current as has been shown by Efremov and Teryaev/13a/ and by Altarelly and Ross/13b/.

The spin-flip alone does not lead to polarization effects. It is necessary to have non-zero phase difference between M_{++} and L_{-+}. We give below a simple phenomenological expression for $A(p_T)$ supported by connection with the classical transparency of the proton. The main assumption is that the phase difference between amplitudes $S_{\lambda\mu}$ and $L_{\lambda\mu}$ arises when a scattered quark is leaving the confinement region in the process of hadronization. The characteristic length for this process is $l \sim E(p_T)/m^2$. Supposing that the absorption in gluon medium is described by the eikonal factors of amplitudes, it would be reasonable to assume that the phases of the amplitudes $S_{\lambda\mu}$ and $L_{\lambda\mu}$ are proportional to l. As the lengthes

1 in $S_{\lambda\mu}$ and $L_{\lambda\mu}$ are different, it gives the nonzero phase difference $\Phi_l \sim E(p_T)$. Classically it can be treated as an absorption in a dense gluon matter. This picture is somewhat similar to that of Szwed[14], in which a massive quark becomes polarized due to a multiple scattering from a static colour field. Then the phase is ruled by $\Phi_l \sim E(p_T)/\eta(s)$, where $\eta(s)$ is the transparency of the gluon matter. It can be identified with the classical proton transparency depending on the imaginary part of the eikonal. Analyses in the eikonal models (see ref.[15] and refs. therein) show that $\eta(s)$ increases in the momentum interval $p_{Lab} \sim 20 \div 100$ GeV/c. This increase is consistent with the behaviour of $\sim\sqrt{s}$ within the errorbars. At the ISR energies $\sqrt{s} = 20 \div 60$ GeV the value of $\eta(s)$ is approximately constant. Therefore the phase difference between flip and non-flip scattering can be written as follows:

$$\Phi_l(p_T) = \begin{cases} \alpha\, x_T + \beta, & s < 200\ \mathrm{GeV}^2, \\ a\, p_T + b, & s > 200\ \mathrm{GeV}^2. \end{cases} \qquad (6)$$

The coefficients a and b can be related to α and β on the boundary between the two energy intervals: $b = \beta$ and $a = 2\alpha/\sqrt{200}$. Hence at our initial energies the phase changes between β and $\alpha+\beta$. The condition

$$\sin \Phi_l(p_T) = 0$$

gives the values of $p_T = p_T^0$, where the asymmetry goes to zero. In this context the experimental results presented in Fig.10 are naturally explained.

In the spirit of the conventional parton model the polarization asymmetry is given by the formula:

$$A(x, p_T) = \frac{\sum_{a,b} \int dx_a dx_b\, q_a(x_a) \Delta q_b(x_b) (-2\mathrm{Im}\, M^*_{++} L_{-+}) D(z)/z}{\sum_{a,b} \int dx_a dx_b\, q_a(x_a) q_b(x_b) (|M_{++}|^2 + |L_{-+}|^2) D(z)/z},$$

where x_a, x_b and z denote the usual values. The summation over omitted quark helicities is assumed. The functions $q(x) = q_+(x) + q_-(x)$ and $\Delta q(x) = q_+(x) - q_-(x)$ are the quark densities and the net quark helicities at the given x of those quarks in the proton, which fragment into produced meson. The $q_\pm(x)$ are the quark densities with the definite helicities.

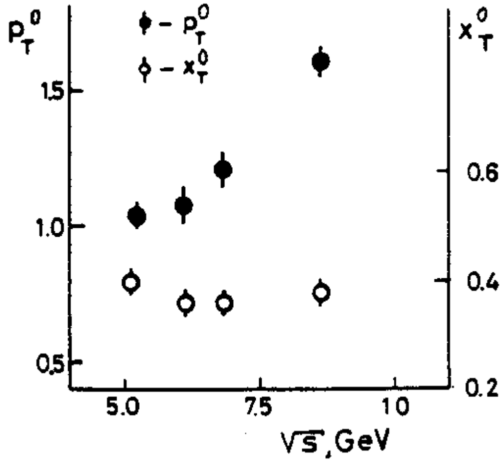

Fig. 10. Energy dependence of p_T^0 and x_T^0 (see text).

Now let $r=r(s,t)$ be the ratio of the flip and non-flip amplitudes, defined as $|L_{-+}|/|M_{++}|\simeq r\cdot p_T$. It is seen from the fit in Fig.3b that the constant value $r=0,5$ GeV^{-1} is relevant. Taking for simplicity the SU(6) constant ratios for $\Delta q/q$, we reduce the above expression to:

$$A(0,p_T) = k \frac{2rp_T}{1+r^2p_T^2} \sin \Phi_1(p_T). \qquad (7)$$

Here $\Phi_1(p_T)$ is given by (6), $k=(n_u\Delta u/u+n_d\Delta d/d)/(n_u+n_d)$ is a weighting coefficient, $n_u(n_d)$ is the number of subprocesses with the valence u(d)-quark producing the observed meson. Formula (7) probably includes all ingredients leading to the one-spin asymmetry: helicity densities Δq, the quark-quark polarization asymmetry and the long-distance phase.

For rough estimations the SU(6) values of $\Delta u/u=2/3$ and $\Delta d/d=-1/3$ were used. The sign of k is defined to be positive for the reaction $p_\uparrow p\to\pi^+X$. Numerically k is equal to 1/2, 1/3 and 1/3 for the inclusive reactions $p_\uparrow p\to\pi^+X$, $pp_\uparrow\to\pi^0X$ and $\pi^-p_\uparrow\to\pi^0X$, respectively.

The fit to the experimental data at 13,3 and 18,5 GeV/c gives the values α=1,22±0,09 and β/α=-0,39±0,04. The results of the fit are plotted in Fig.9 together with the predictions for the reactions $pp_{\uparrow}\to\pi^0+X$ at 24 GeV/c and $\pi^- p_{\uparrow}\to\pi^0+X$ at 40 GeV/c (solid curves). For the last two reactions the sign of eq.(7) has been reversed as mentioned above.

In ref./16/ a phenomenological model is proposed in which the spin-flip arises due to the quark colour magnetic moment. It leads to the observed polarization asymmetry. The prediction of this model is given in Fig.9c by dashed line. The dotted-dashed line in Fig.9c presents asymmetry obtained in ref./17/ by introducing the orbital momentum of gluon clouds into U-matrix.

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Table 1. The raw asymmetry A_r, the dilution factor D and the asymmetry A in reaction (1) at $|x_F|<0,2$ for different p_T-intervals.

p_T, GeV/c	$\bar{p}_T$	$\bar{x}_F$	A_r,%	D	A,%
1,2-1,4	1,29	0,03	1,0±0,6	8,0±1,0	10±6
1,4-1,6	1,49	0,01	-0,4±1,0	8,1±1,2	-4±10
1,6-1,8	1,69	-0,01	-0,8±0,7	8,1±0,7	-8±7
1,8-2,0	1,89	-0,02	-1,3±0,5	8,2±0,9	-14±5
2,0-2,2	2,09	-0,03	-0,6±0,6	8,8±1,3	-7±7
2,2-2,4	2,29	-0,04	-3,0±0,9	9,2±1,6	-35±12
2,4-2,6	2,49	-0,05	-4,6±1,3	9,5±2,0	-56±20
2,6-3,2	2,79	-0,07	-2,7±1,3	10,1±2,5	-35±19

Table 2. The raw asymmetry A_r, the dilution factor D and the asymmetry A in reaction (2) at $|x_F|<0,2$ for different p_T-intervals.

p_T, GeV/c	A_r,%	D	A,%
1,6-1,8	0,2±0,3	4,4±0,1	3±4
1,8-2,0	-1,0±0,4	4,8±0,1	-14±6
2,0-2,2	-0,9±0,6	5,2±0,3	-13±9
2,2-2,4	-1,4±0,9	6,0±0,6	-24±15
2,4-2,6	-2,5±1,4	6,6±0,8	-47±27
2,6-3,2	-5,0±1,3	7,0±1,2	-100±31

Table 3. The asymmetry A in reactions (3-5) at $|x_F|<0,2$ for different p_T-intervals*).

p_T, GeV/c	A ,%(3)	A,%(4)	A,%(5)
1,6-1,8	-5±17	13±9	-25±23
1,8-2,2	-38±17	14±13	-28±25
2,2-3,2	-52±29	-74±33	-116±54

*) The asymmetries for η-production were estimated without corrections for the background under η-signal.

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Измерение односпиновых асимметрий в инклюзивном образовании π^0- и η-мезонов под углом 90 в с.ц.м. в реакциях $\pi^- p_\uparrow \to \pi^0(\eta) + X$ при 40 ГэВ/с.

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