SINGLE-SPIN ASYMMETRY OF π^0-MESONS PRODUCED AT $x_F = 0$ IN 70 GEV $pp_\uparrow$ COLLISIONS

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Physics motivation. Long history of single-spin asymmetry A_N measurements begins with the experiment of L.Dick et al. [1] in 1980 (CERN). In 1989 such experiment was carried out at IHEP with 40 GeV π^--beam [2]. A significant left-right asymmetry for π^0-mesons was observed with polarized target used.

In experiments with polarized proton beam of energies 13-40 GeV [3,4] A_N was measured in the central region too, and asymmetry for π^+-mesons has a similarity with π^0-data. But the experiment E704 [5] with 200 GeV polarized beam protons shows zero asymmetry within measured errors in the p_T-region up to 4 GeV/c. So measurements at 70 GeV were of a great interest.

We measured p_T-dependence of π^0-mesons produced at x_F=0 in collisions of 70 GeV beam protons with transversely polarized target protons. The production asymmetry was determined as follows

$$A_N = (n^+ - n^-)/(n^+ + n^-) \cdot D/P_T,$$

where $n^+(n^-)$ is a normalized number of events for target spin up (down), D is a target dilution factor and P_T is a mean value of target polarization.

Apparatus. The setup shown in Fig.1 includes a beam telescope counters S1-S3, beam hodoscopes H1, H2, a polarized propane-diol target PPT and an electromagnetic calorimeter EMC. A description of the apparatus is given in detail elsewhere [6]. The high p_T-trigger (with threshold $\sim$1 GeV) was used to reject low p_T-events.

Data analysis. Energy and space uncertainties of gamma-showers in EMC are $\sigma(E)/E = 0.01 + 0.06/\sqrt{E}$ and $\sigma_x = \sigma_y = \pm 1.5$ mm, respectively. The main criteria to select π^0 candidates from all gamma-pairs are: a) energy of a shower is $E_\gamma > 0.75$ GeV; b) distribution of beam particles on a target is R $<$ 7.5 mm.

Typical two-photon mass spectra are presented in Fig.2 at $p_T = 1.7$, 2.0 and 2.5 GeV/c. The mass resolution of the spectrometer is $\sigma = 11$ MeV/c^2.

Results. Asymmetry for π^0 is presented in Fig.3 as a function of x_T. Errors shown are only statistical. We see the nonzero effect in the p_T-range 1.9 - 3.0 GeV/c. Asymmetry is negative and equals to $-(12.6 \pm 5.5)\%$ in this p_T region. It changes sign near $p_T = 1.8$ GeV/c. At values of p_T less than 1.6 GeV/c high-p_T trigger jitter might distort asymmetry. We estimated $A_N(\pi^0)$ from BNL data [3] by averaging of $A_n(\pi^+)$ and $A_N(\pi^-)$ according to a parton model. Our data within errors agree with these estimations. x_T-scaling seems is observed in pp-interactions up to $\sqrt{s} = 11.5$ GeV.

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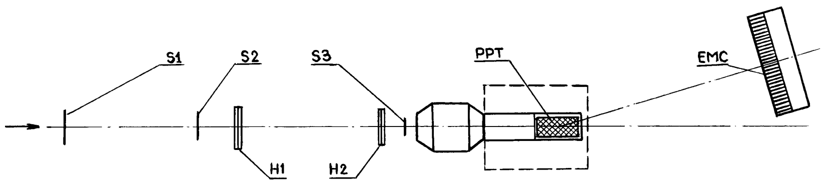

Figure 1: The schematic layout of PROZA-M spectrometer.

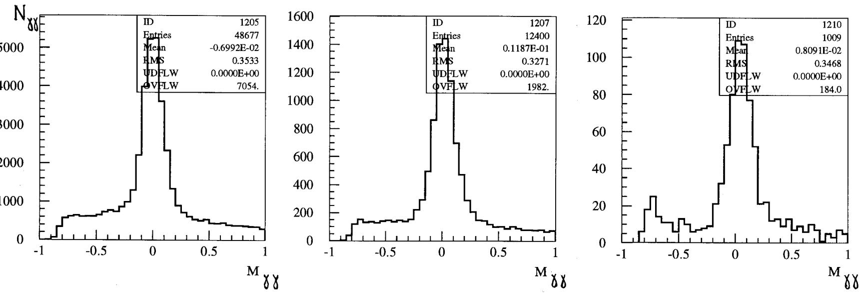

Figure 2: Two-gamma mass spectra at p_T = 1.7, 2.0 and 2.5 GeV/c.

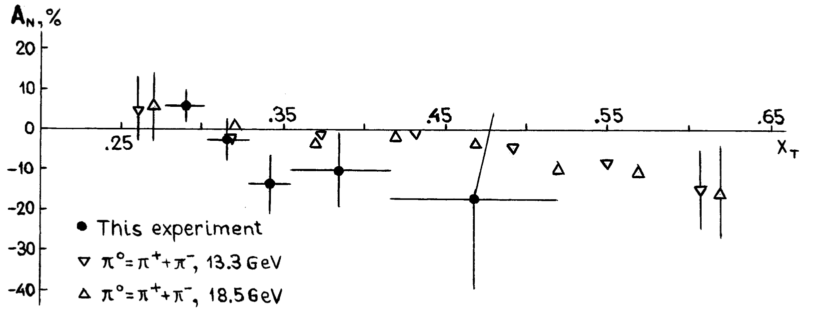

Figure 3: $A_N(\pi^0)$ vs. x_T at 70 GeV. $A_N(\pi^0)$ from data[3] (shown with a reversed sign) is found as $(A_N(\pi^+) \cdot R + A_N(\pi^-))/(R+1)$, where R is a ratio of π^+ production cross section to π^-'s.