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Sezione di Pisa

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A. Bigi, R. Carrara and D. Zanello: DIFFERENTIAL CROSS SECTION OF THE $\pi^- p \rightarrow \pi^0 n$ PROCESS AT 960 MeV.

We present the results of a bubble chamber experiment for the study of the

$$\pi^- + p \rightarrow \pi^0 + n \qquad (1)$$

angular distribution at an incident π^- kinetic energy of 960 MeV.

The forward differential cross section is compared with the value predicted by Cronin[1] on the basis of dispersion relations and charge independence hypothesis. Satisfactory agreement is obtained.

For the experiment the Ecole Polytechnique 1 m propane bubble chamber, provided with a 17. 5 kgauss magnetic field, was exposed to a π^- beam from the Saturne protosynchrotron (Saclay). A total of 45000 useful pictures, with an average beam intensity of 7 tracks/photo, were obtained.

The film was scanned for events in which two electron pairs point to a π^- interaction with no visible secondaries. The 735 events so obtained come from single and multiple π^0 production in hydrogen and carbon.

Measurements of the γ-rays and incident π^- directions and of conversion electron momenta have allowed to select a sample of 98 events of reaction (1) in free hydrogen, in a restricted fiducial volume.

Each event was corrected for its detection efficiency given by the formula

$$(1 - \exp(-L_1/\lambda_1))\,(1 - \exp(-L_2/\lambda_2))$$

in which L_i and $\lambda(E)$ are the γ-rays potential path and materialization lenghts.

Fig. 1a shows an hystogram of the corrected π^0 angular distribution in the c. m. $\pi - p$ system.

TABLE I

	A_0=0.248	A_1=0.960	A_2=0.497	A_3=-3.842	A_4=0.480	A_5=3.370
		0.0085	0.0049	-0.0484	-0.0127	0.0496	0.0072
		0.0049	0.1676	-0.0105	-0.6730	0.0069	0.5920
$\overline{\Delta A_i \Delta A_j}$		-0.0484	-0.0105	0.5549	-0.0965	-0.6745	0.1631
		-0.0127	-0.6730	-0.0965	3.5198	0.1515	-3.3883
		0.0496	0.0069	-0.6745	0.1515	0.9041	-0.2689
		0.0072	0.5920	0.1631	-3.3883	-0.2689	3.4683

The angular distribution, normalized to a total cross section of 6.4 mb[2], has been fitted to a polynomial of the form

$$\left(\frac{d\sigma}{d\Omega}\right)_{cm} = A_o + A_1 \cos\theta + \ldots$$

Table I shows the coefficients A_i and their error matrix for the best fit (fifth order polynomial).

Our results are consistent with those obtained at the same energy by Weinberg et al.[2] (Fig. 1b).

The forward differential cross section

$$\left(\frac{d\sigma(0^o)}{d\Omega}\right)_{cm} = (1.71 \pm 0.45)\ \text{mb/sr}$$

agrees, within the errors, with the value (2.4 ± 0.9) predicted by Cronin[1].

Acknowledgments

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REFERENCES

(1) - J. W. Cronin, Phys. Rev. 118, 824 (1960).
(2) - A. Weinberg, A. E. Brenner and K. Strauch, Phys. Rev. Letters 8, 70 (1962).

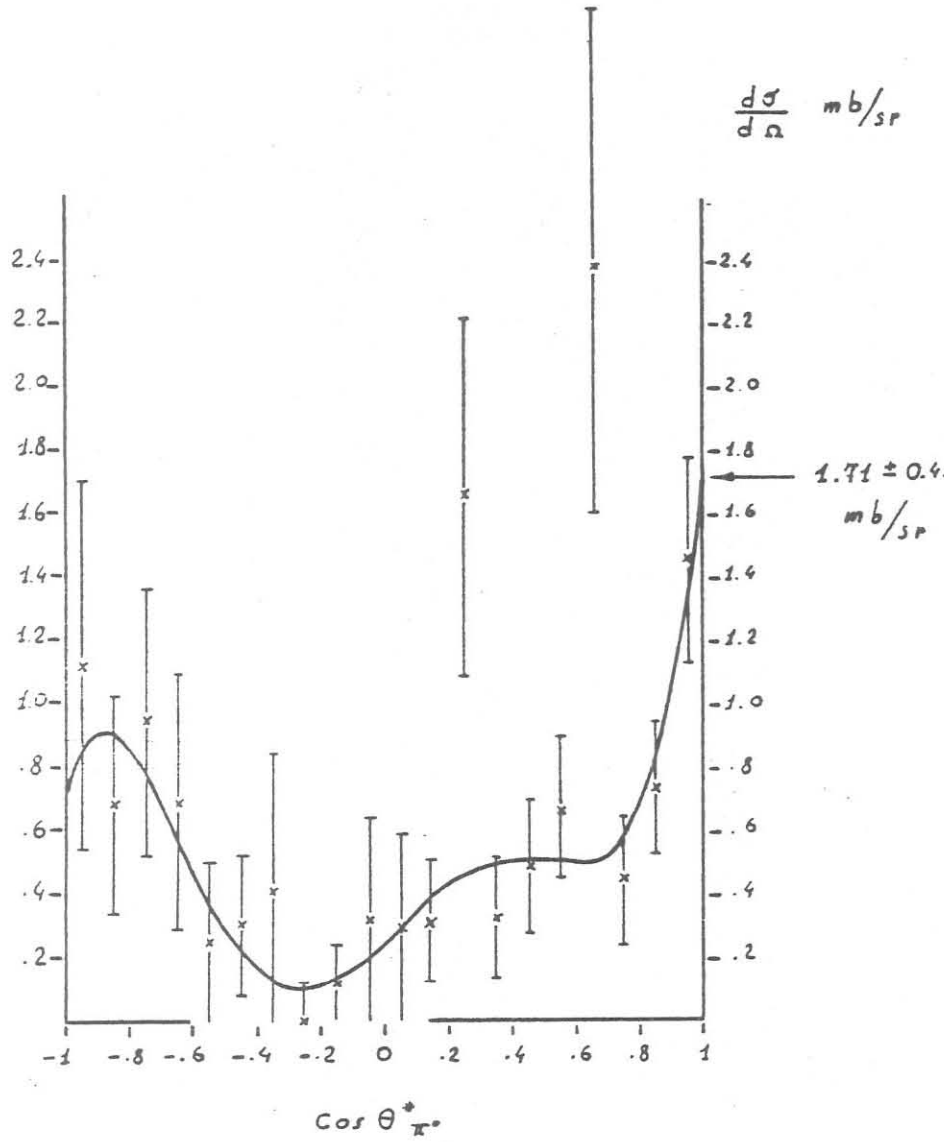

FIG. 1 a)

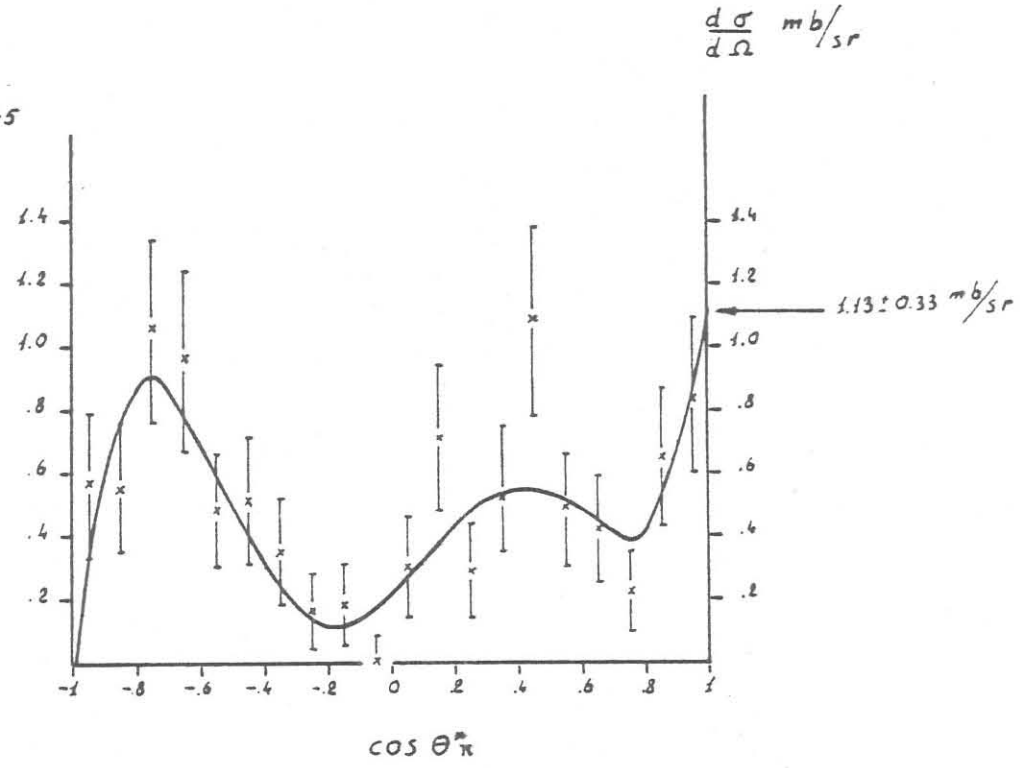

FIG. 1 b)