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STUDY OF THE REACTION $\bar{D}P \longrightarrow \bar{P}P\bar{N}$ AT 12 GeV/c AND $\bar{N}P$ ELASTIC SCATTERING AT 6 GeV/c

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1. INTRODUCTION

In this paper we present results of an analysis of the antideuteron breakup reaction and $\bar{n}p$ elastic scattering extracted from it at 6.1 GeV/c per nucleon.

The data have been obtained by processing about 70 K pictures of the 2m HBC "Ludmila" exposed to an RF-separated antideuteron beam [1] with a 12.2 GeV/c momentum at the Serpukhov accelerator. Some details of the experiment are given in ref. [2].

The possibility of reliable registration of $\bar{p}$-spectators is an important advantage as compared to $\bar{p}d$ experiments. Moreover, nowadays there exist very few data on $\bar{p}n$ elastic scattering. Data between 1.8 and 5.5 GeV/c [3] show somewhat distinct features from $\bar{p}p$ ones. So, an experimental study of $\bar{n}p$ elastic scattering is also an important problem.

Questions concerning the event selection and cross section determination of the reaction $\bar{d}p \to \bar{p}p\bar{n}$ are discussed in the following section. The 4-momentum transfer squared distribution of the antideuteron breakup reaction is compared with simple Glauber calculations [4] (section 3). The extraction of $\bar{n}p$ elastic interactions is described in section 4. The results are compared with $\bar{p}n$ and $\bar{p}p$ data at similar energies.

Main conclusions of this paper are presented in the last section.

2. $\bar{D}P \to \bar{P}P\bar{N}$ EVENT SELECTION AND CROSS SECTION DETERMINATION

As the hadron contamination in the antideuteron beam was $\sim 40\%$ [2], the events of the reaction

$$\bar{d}p \to \bar{p}p\bar{n} \qquad (1)$$

were extracted by the adopted [5] kinematic program HYDRA containing three mass hypotheses for beam particles: $\bar{d}$, $\bar{p}$ and π^-. This led to a large number of ambiguities ($\sim 75\%$ of all the events). Thus selecting the events, we took into account a possible presence of contamination and the passage of events (1) through other channels, mainly OC fit,

$$\bar{d}p \to \bar{p}pMM. \qquad (2)$$

The 1C hypothesis

$\pi^- p \to \pi^- p \pi^\circ$ (3)

was a main competitor for the reaction (1).

About 93% of all ambiguities in the reaction under study were the events having unresolved hypotheses (1) and (3). It should be stressed that in our case there is no mixing with elastic interactions and coherent processes, which is a common difficulty for target deuteron experiments because of a significant difference in the laboratory momentum of negative secondaries in these channels.

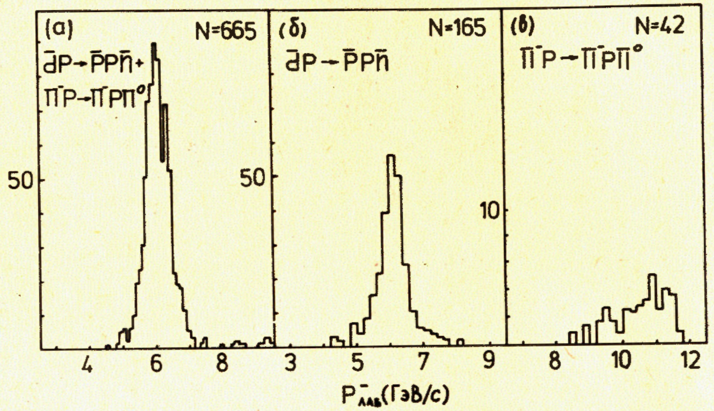

Fig.1. The laboratory momentum distribution of negative secondaries for ambiguities $\bar{d}p \to \bar{p}\bar{p}\bar{n}/\pi^- p \to \pi^- p \pi^\circ$ *(a), pure* $\bar{d}p \to \bar{p}\bar{p}\bar{n}$ *events (b) and pure* $\pi^- p \to \pi^- p \pi^\circ$ *events (c).*

In Fig.1 is shown the P_{lab} distribution of negative particles for the events having the two unresolved hypotheses (1) and (3) (a), only the hypothesis (1) (b) and only the hypothesis (3) (c). One can see that the distribution of unresolved events is very similar to the hypothesis (1) with a maximum at $P_{beam}/2$. Vice versa, events (3) are concentrated in a large P_{lab} region. Moreover, it is known that the cross section of the reaction $\pi^- p \to \pi^- p \pi^\circ$ is (0.5 ± 0.1) mb at 12 GeV/c [6]. So, even though the beam contamination consists completely of π^--mesons, we obtain that the $\pi^- p \to \pi^- p \pi^\circ$ contamination in the reaction (1) does not exceed 0.8% taking into account pure events (3). The value of mutual mixing of the channels (1) and (2) can be evaluated from the missing mass distribution (fig.2a). Using the probability cut for 1C fit events, $P(\chi^2) \geq 0.5\%$, which was put in the kinematic program, only 0.6% of events from the overlapping region remained unresolved.

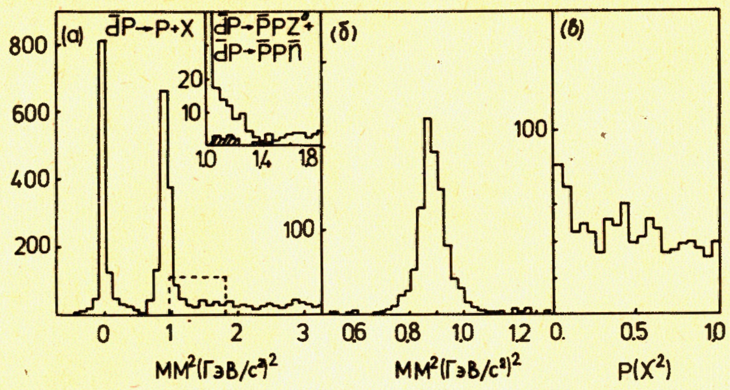

Fig.2. a) MM^2 *distribution for 2-prong events* $\bar{d}p \to p + X$, *b)* MM^2 *distribution for selected events* $\bar{d}p \to \bar{p}\bar{p}\bar{n}$, *c)* $P(\chi^2)$ *distribution for selected events* $\bar{d}p \to \bar{p}\bar{p}\bar{n}$.

From the above considerations all events, having the hypothesis (1) with $P(\chi^2) \geq 0.5\%$ and P_{lab} of negative secondary <8.2 GeV/c, were assumed to belong to the studied class and were taken with weight 1. The MM^2 and $P(\chi^2)$ distributions for events (1) thus selected are presented in fig.2b,c. The value of $(\overline{MM^2})^{1/2} = (940.2 \pm 1.9)$ MeV/c^2 coincides with the antineutron mass with a good accuracy.

Thus, 629 fitted events (1) were selected from 2428 2-prong $\bar{d}p$ interactions. To determine the cross section of the reaction $\bar{d}p \to \bar{p}\bar{p}\bar{n}$, the following corrections were introduced:

(i) scanning efficiency of 2-prong events ($W_s = 1.021$),

(ii) losses of the events with short steep proton tracks ($\overline{W_\theta(t)} = 1.037$),

(iii) the total program processing efficiency ($W_p = 1.242$).

The weights $W_\theta(t)$ were determined from the requirement of isotropy of the azimuthal angle distributions of protons for various 4-momentum transfer intervals (fig.3). Using all these corrections, the total number of weighted events (1) is equal to $N_W(\bar{d}p \to \bar{p}\bar{p}\bar{n}) = 834 \pm 33$ and* $\sigma_{breakup}(\bar{d}p) = (10.4 \pm 0.7)$ mb.

3. T-DISTRIBUTION AND COMPARISON WITH GLAUBER THEORY

We compare the measured differential cross section of the reaction (1) with Glauber theory for spinless particles. Ac-

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* We normalized our data to the $\bar{d}p$ inelastic cross section $\sigma_{in}(\bar{d}p) = \sigma_{in}(\bar{p}d) = \sigma_{tot}(\bar{p}d) - \sigma_{el}(\bar{p}d) = (89.8 \pm 4.1)$ mb [2].

cording to [4],

$$\left(\frac{d\sigma}{d\Omega}\right)_{breakup} = \left(\frac{d\sigma}{d\Omega}\right)_{sc} - \left(\frac{d\sigma}{d\Omega}\right)_{el} , \qquad (4)$$

where $(d\sigma/d\Omega)_{sc}$ is the total scattering cross section on deuteron without new particle production. The corresponding formulae for expression (4) are given in the Appendix.

For calculations, we have used three types of form factors [7,8]:

a) exponential form factor (GAUSS):

$$S(\vec{q}) = e^{-33.7 q^2} , \qquad (5)$$

b) form factor obtained in [7] from the Bressel-Kerman deuteron wave function (ABB):

$$S(\vec{q}) = 0.698 e^{-64.6q^2} + 0.339 e^{-12.3q^2} - 0.037 e^{-1.87q^2} , \qquad (6)$$

c) "relativistic invariant" form factor ("Rell"):

$$S(\vec{q}) = 0.34 e^{-141q^2} + 0.58 e^{-26.1q^2} + 0.08 e^{-15.5q^2} . \qquad (7)$$

The elastic $\bar{N}p$ amplitude was parametrized in the standard form:

$$f_{\bar{N}p}(\vec{q}) = \frac{P \cdot \sigma_{\bar{N}p}}{4\pi} (i + \rho_{\bar{N}}) e^{-\frac{1}{2} b_{\bar{N}} q^2} , \qquad (8)$$

where the quantities

$\sigma_{\bar{p}p} = 61.3 \pm 0.8$ mb $\qquad \sigma_{\bar{n}p} = 58.7 \pm 1.0$ mb

$\rho_{\bar{p}} = 0.0 \qquad b_{\bar{p}} = 12.6 \pm 0.3$ $(GeV/c)^{-2}$

were taken from the known $\bar{p}p$ and $\bar{p}n$ data at 6.1 GeV/c [9,10] and unknown quantity $\rho_{\bar{n}}$ was assumed to be equal to $\rho_{\bar{p}}$.

The measured differential cross section of the reaction (1) is compared with theoretical predictions in fig.4. The curves correspond to formulae (A.2). The parameters fitted under various assumptions of the slope parameter $b_{\bar{n}}$ are presented in the Table. As is seen, our statistics is insufficient to draw a reliable conclusion concerning the choice of form factor.

Table

Fit results of the $\bar{d}p \to \bar{p}p\bar{n}$ differential cross section by formulae (A.2) with various types of ground state antideuteron form factor

	$b_{\bar{p}} = 12.6$ $(GeV/c)^{-2}$			$b_{\bar{n}} = b_{\bar{p}} \equiv b_{\bar{N}}$		
S(q)	$b_{\bar{n}}$ $(GeV/c)^{-2}$	χ^2/ND	σ(mb)	$b_{\bar{N}}$ $(GeV/c)^{-2}$	χ^2/ND	σ(mb)
(5)	13.8±1.0	17/12	8.8±0.2	13.2±0.4	16/12	8.6±0.2
(6)	20.2±4.4	48/12	9.8±0.5	14.6±0.4	51/12	10.2±0.3
(7)	26.3±8.1	72/12	10.3±0.6	15.3±0.5	25/12	10.8±0.3

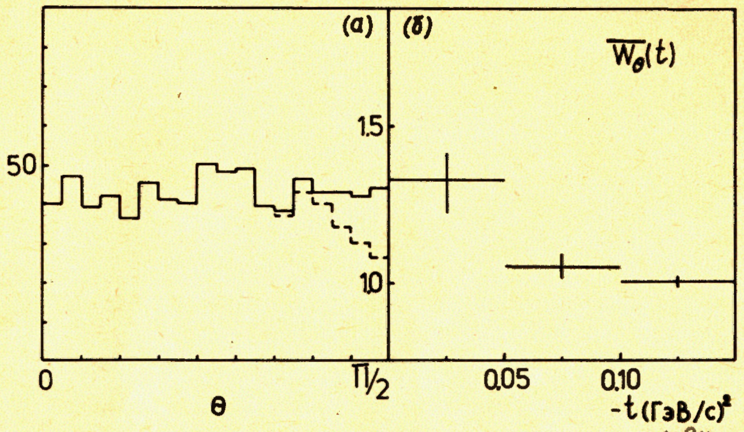


Fig.3. a) Azimuthal angle distribution for recoil protons from $\bar{d}p \to \bar{p}p\bar{n}$ events in the normal plane to the beam direction, b) t-dependence of weight $\overline{W}_\theta$ averaged over azimuthal angle θ.

4. ELASTIC $\bar{n}p$ SCATTERING

The elastic $\bar{n}p$ interaction can be studied directly with the help of the events of reaction (1) containing an antiproton spectator: $\bar{d}p \to \bar{p}_s p\bar{n}$. The problem of spectator selection in the reactions with target deuteron breakup has been discussed in detail in [3]. As compared to these reactions, the use of an antideuteron beam allows us to select a rather large number of elastic $\bar{n}p$ events since we are not limited by $p_{sp} > 0.1$ GeV/c.

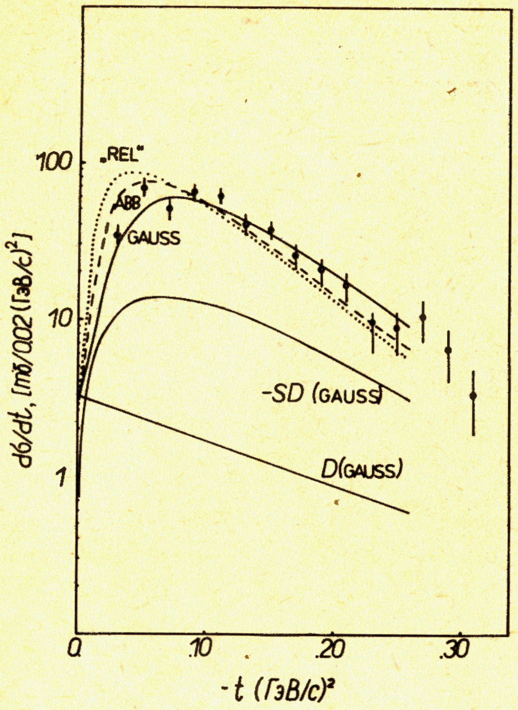
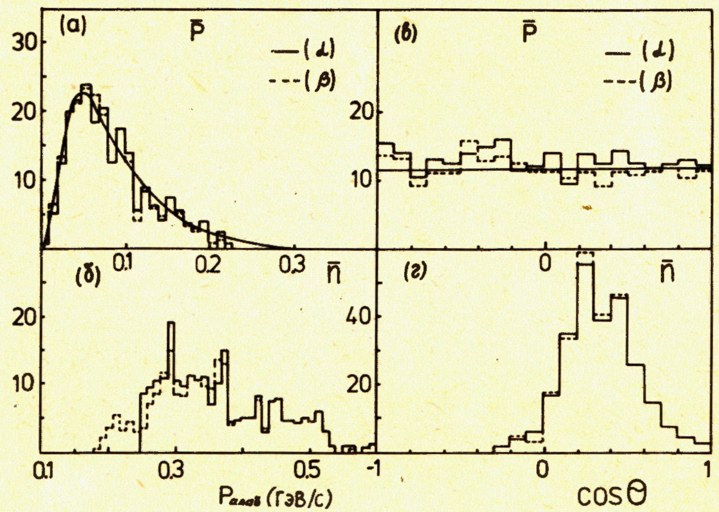


Fig.4. Differential cross section of the antideuteron breakup reaction. The curves correspond to formulae (A.2) with different antideuteron form factor. D and SD represent contributions of double scattering and interference terms, respectively.

Fig.5. Momentum and angle distributions of antiprotons (a,b) and antineutrons (c,d) in the $\bar d$ rest frame for $\bar d p \to \bar p_s \bar p n$ events extracted by method (α) (solid lines) and method (β) (dotted lines). Curve in fig.5a represents the calculation using the Hartenhaus-Moravscik wave function [11].



Following ref.[3], we have used two different methods for the selection of elastic $\bar n p$ events:

α) All events with $p(\bar p) < 0.22$ GeV/c and $p(\bar n) > 0.25$ GeV/c in the antideuteron rest frame have been selected;

β) The events satisfying the condition $R = \frac{w_{\bar n}}{w_{\bar n} + w_{\bar p}} < 0.15$ have been selected. Here $w_{\bar N}(p_0) = \int_{p_0}^{\infty} |\psi(\vec p)|^2 d\vec p$ with the wave function $\psi(\vec p)$ taken from ref.[11].

We have selected 256 and 237 events with the help of the methods α) and β), respectively.

We have checked our selection procedure comparing the momentum and angular distributions of the spectator with the distributions calculated from the deuteron wave function[11] (see fig.5). Note that the spectator angular distribution should be isotropic when neglecting the effect of flux factor and energy dependence of $\sigma_{el}(\bar n p)$ [12]. The agreement between theoretical predictions and the data indicates correctness of our selection procedure.

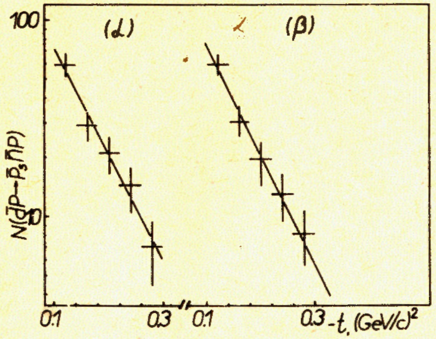


Fig.6. 4-momentum transfer distribution of $\bar n p$ elastic events extracted by methods (α) and (β).

The 4-momentum transfer squared distributions for elastic $\bar n p$ events are plotted in fig.6. The lines represent the fits by the expression $(\frac{d\sigma}{dt}) = A e^{b_{\bar n} t}$ in the region $0.10 \le -t \le 0.30$ $(GeV/c)^2$. The fitted values of the slope parameter $b_{\bar n}$ coincide, within errors, for both groups of events: $b_{\bar n}^{(\alpha)} = (12.4 \pm 1.4)$ $(GeV/c)^{-2}$ and $b_{\bar n}^{(\beta)} = (13.0 \pm 1.3)$ $(GeV/c)^{-2}$. As final results, we take an average value $b_{\bar n}$ of (12.7 ± 1.3) $(GeV/c)^{-2}$. This result is compared with other $\bar p n$[3] and $\bar p p$[13] data in fig.7a. As an additional check of our selection procedure, we extracted elastic $\bar p p$ events and obtained $b_{\bar p} = (12.9 \pm 1.3)$ $(GeV/c)^{-2}$ in agreement with the world data at $P_{lab} = 6$ GeV/c.

Our value of $b_{\bar n}$ as well as the value obtained at 1.8 GeV/c agree with the corresponding slope values for $\bar p p$ scattering but disagree with $\bar p n$ data at 5.55 GeV/c. It is seen from fig.7a that the slope parameters obtained for the reactions $p^{\pm} p$ and $p^{\pm} n$ at $<t> \approx -0.2$ $(GeV/c)^2$ (and also for $K^{\pm} p$ and $\pi^{\pm} p$) are well described by the universal function[13]:

$$b_{h^{\pm}p}(p,t) = b_h(t) \mp \frac{b'_{h^{\pm}p}(t)}{p^q} + 2\alpha'_P \ln p \qquad (9)$$

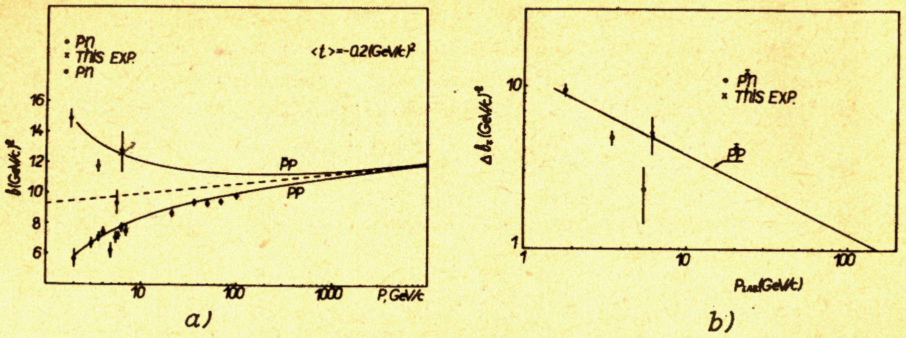


Fig.7. a) Energy dependence of the slope parameter b *at* $\langle t\rangle = -0.2\ (GeV/c)^2$ *for* np *and* $\bar{p}n$ *elastic scattering. Curves - fit of the* pp *and* $\bar{p}p$ *data by expression* (9)[13]. *b) Energy dependence of* $\Delta b_{\mp}$ *. Solid line - fit of the* $p^{\mp}p$ *data by expression (10)* ($q = 0.52\pm0.02$).

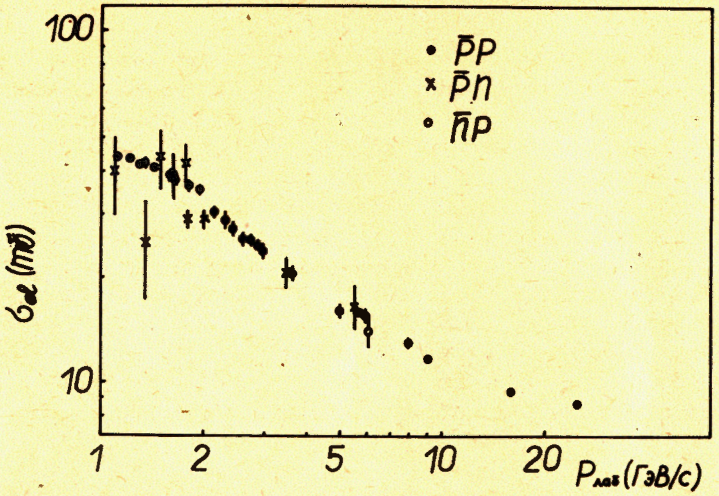


Fig.8. P_{lab} *-dependence of elastic cross sections for* $\bar{p}p$; $\bar{p}n$ *and* $\bar{n}p$ *interactions.*

taking into account a power law dependence of the slope parameter at low energy. From (9) it follows that the difference of the slope parameters for the differential cross sections of particle and antiparticle vanishes as a power of laboratory momentum

$$\Delta b_{\mp} = b_{\bar{h}p} - b_{h^+p} = \frac{\mathrm{Const}}{p^q}, \qquad (10)$$

where $q = 0.52\pm0.02$ for $p^{\pm}p$[13]. This difference is plotted in fig.7b for the $p^{\pm}p$ and $p^{\pm}n$ data as a function of laboratory momentum. The b values for the np data are taken from[14,15]. We see that our point as well as the point at 1.8 GeV/c lie on the line describing the $p^{\mp}p$ data.

We have also estimated the elastic cross section using optical theorem and assuming pure imaginary forward $\bar{n}p$ scattering amplitude:

$$\sigma_{el}(\bar{n}p) = \frac{\sigma^2_{tot}(\bar{n}p)}{16\pi(\hbar c)^2 b_{\bar{n}}} = (13.9\pm1.5)\ \mathrm{mb},$$

where $\sigma_{tot}(\bar{n}p) = \sigma_{tot}(\bar{p}n) = (58.7\pm1.0)$ mb was interpolated from the $\bar{p}n$ data[10] (see fig.8). If we use the extrapolated value of $\sigma_{el}(\bar{p}n) = (15.0\pm2.1)$ mb[10], then we get $(1+\rho^2_{\bar{n}}) = 1.08\pm0.17$, where $\rho_{\bar{n}} = \mathrm{Re}f_{\bar{n}p}(0)/\mathrm{Im}f_{\bar{n}p}(0)$.

CONCLUSIONS

We have done a first study of the antideuteron breakup reaction $\bar{d}p \to \bar{p}p\bar{n}$ at 12.2 GeV/c. The cross section of this reaction is equal to (10.4 ± 0.7) mb. This value agrees, within errors, with the theoretical prediction obtained in terms of Glauber formalism for spinless interacting particles. The differential cross section also agrees with the model prediction.

Elastic $\bar{n}p$ scattering has been studied with the help of events selected from the channel (1). The slope parameter of the differential cross section was determined in the region $\langle t\rangle = -0.2\ (GeV/c)^2$, $b_{\bar{n}} = (12.7\pm1.3)\ (GeV/c)^{-2}$ and the elastic cross section was estimated to be $\sigma_{el}(\bar{n}p) = (13.9\pm1.5)$ mb. The values of $b_{\bar{n}}$ and $\sigma_{el}(\bar{n}p)$ agree, within errors, with the $\bar{p}p$ data at similar energies.

APPENDIX

In the case of spin-independent interaction one can write the differential cross section of $\bar{d}p \to \bar{p}p\bar{n}$ as[4]:

$$\left(\frac{d\sigma}{d\Omega}\right)_{breakup} = \left(\frac{d\sigma}{d\Omega}\right)_{sc} - \left(\frac{d\sigma}{d\Omega}\right)_{el} = \left(1 - S^2\left(\frac{\vec{q}}{2}\right)\right)\left(|f_{\bar{n}}(\vec{q})|^2 + |f_{\bar{p}}(\vec{q})|^2\right) +$$

$$+ 2\mathrm{Re}f_{\bar{n}}(\vec{q})\, f^*_{\bar{p}}(\vec{q})\left(S(\vec{q}) - S^2\left(\frac{\vec{q}}{2}\right)\right) - \frac{1}{\pi k}\mathrm{Im}\left\{f^*_{\bar{n}}(\vec{q})\cdot\int\left[S\left(\vec{q}\,' - \frac{\vec{q}}{2}\right) - S\left(\frac{\vec{q}}{2}\right)\cdot S(\vec{q}\,')\right]\times\right.$$

$$\times f_{\bar{n}}\left(\vec{q}\,' + \frac{\vec{q}}{2}\right)\cdot f_{\bar{p}}\left(\frac{\vec{q}}{2} - \vec{q}\,'\right)\cdot d^{(2)}\vec{q}\,' + f^*_{\bar{p}}(\vec{q})\cdot\int\left[S\left(\vec{q}\,' + \frac{\vec{q}}{2}\right) - S\left(\frac{\vec{q}}{2}\right)\cdot S(\vec{q}\,')\right]\times$$

$$\times f_{\bar n}(\vec q\,' + \frac{\vec q}{2})\cdot f_{\bar p}(\frac{\vec q}{2} - \vec q\,')\,d^{(2)}\vec q\,'\} + \frac{1}{(2\pi k)^2}\int [S(\vec q\,' - \vec q\,'') - S(\vec q\,')\cdot S(\vec q\,'')]\times$$

$$\times f_{\bar n}(\vec q\,' + \frac{\vec q}{2})\cdot f_{\bar p}(\frac{\vec q}{2} - \vec q\,')\cdot f^*_{\bar n}(\vec q\,'' + \frac{\vec q}{2})\cdot f^*_{\bar p}(\frac{\vec q}{2} - \vec q\,'')\,d^{(2)}\vec q\,'\cdot d^{(2)}\vec q\,'', \quad (A.1)$$

where $S(\vec q)$ is the form factor of an antideuteron ground state. To a small-angle scattering approximation which is true in our case

$$\frac{d\sigma}{d\Omega} \approx \frac{k^2}{\pi}\frac{d\sigma}{dt} \quad \text{and} \quad q^2 = -t + \frac{t^2}{4M^2} \approx -t.$$

For maximal simplification of the expression (A.1) we use the following approximations:

a) the form factor $S(\vec q) = \sum_i C_i e^{-B_i q^2}$ with normalization $\sum_i C_i = 1$, which is rather general and convenient for an integration expression;

b) the amplitudes $f_{\bar n,\bar p}(\vec q)$ are supposed to be purely imaginary at our energies (for $\bar p p$ this fact is known from experimental data[9]), and exponential parametrization is used

$$f_{\bar N}(\vec q) = i\frac{k\sigma_{\bar N}}{4\pi}e^{-\frac12 b_{\bar N} q^2};$$

c) the parameters $b_{\bar n}$ and $b_{\bar p}$ are assumed to be close so that

$$\exp\{-\frac12(b_{\bar n} - b_{\bar p})\,\vec q\cdot\vec q\,'\} \approx 1$$

(see, for example, ref.[12]).

Using these approximations, we get the formulae convenient for practical purposes:

$$\left(\frac{d\sigma}{dt}\right)_{breakup} = S + SD + D, \quad (A.2)$$

where S and D are the contributions of single and double scattering processes, respectively, and SD is the interference term:

$$S = \frac{1}{16\pi}\{(\sigma^2_{\bar n}e^{b_{\bar n}t} + \sigma^2_{\bar p}e^{b_{\bar p}t})\cdot$$

$$[1 - S^2(\frac{\sqrt{-t}}{2})] + 2\sigma_{\bar n}\sigma_{\bar p}e^{\frac12(b_{\bar n}+b_{\bar p})t}[S(\sqrt{-t}) - S^2(\frac{\sqrt{-t}}{2})]\}, \quad (A.2a)$$

$$SD = -\frac{\sigma_{\bar n}\sigma_{\bar p}}{32\pi^2}e^{\frac18(b_{\bar n}+b_{\bar p})t}(\sigma_{\bar n}e^{\frac12 b_{\bar n}t} + \sigma_{\bar p}e^{\frac12 b_{\bar p}t})\times$$

$$\times\sum_i\frac{C_i\{\exp[\frac{B_i(b_{\bar n}+b_{\bar p})}{4(2B_i+b_{\bar n}+b_{\bar p})}t] - S(\frac{\sqrt{-t}}{2})\}}{(2B_i+b_{\bar n}+b_{\bar p})}, \quad (A.2b)$$

$$D = \frac{\sigma^2_{\bar n}\sigma^2_{\bar p}}{256\pi^3}e^{\frac14(b_{\bar n}+b_{\bar p})t}\{\sum_i\frac{C_i}{(b_{\bar n}+b_{\bar p})(4B_i+b_{\bar n}+b_{\bar p})} - [\sum_i\frac{C_i}{(2B_i+b_{\bar n}+b_{\bar p})}]^2\}. \quad (A.2c)$$

In the calculations we used the known results:

$$\int_0^\infty xe^{-px^2}\cdot I_0(cx)\,dx = \frac{1}{2p}\exp(\frac{c^2}{4p}),$$

where $I_0(cx)$ is a zero-order Bessel function of purely imaginary argument. Eqs.(A.2a-c) were used for fitting the experimental $(d\sigma/dt)$ distribution with $b_{\bar n}$ as a free parameter.

In the case of equal antinucleon-nucleon scattering amplitude approximation

$$f_{\bar n}(\vec q) = f_{\bar p}(\vec q) = i\frac{k\sigma_{\bar N}}{4\pi}e^{\frac12 b_{\bar N}t}.$$

Eqs.(A.2a-c) can be rewritten as:

$$S = \frac{\sigma^2_{\bar N}}{8\pi}e^{b_{\bar N}t}\,[1 + S(\sqrt{-t}) - 2S(\frac{\sqrt{-t}}{2})],$$

$$SD = -\frac{\sigma^3_{\bar N}}{32\pi^2}e^{\frac34 b_{\bar N}t}\cdot\sum_i\frac{C_i\{\exp[\frac{B_i b_{\bar N}}{4(B_i+b_{\bar N})}t] - S(\frac{\sqrt{-t}}{2})\}}{(B_i+b_{\bar N})}, \quad (A.3)$$

$$D = \frac{\sigma^4_{\bar N}}{1024\pi^3}e^{\frac12 b_{\bar N}t}\{\sum_i\frac{C_i}{b_{\bar N}(2B_i+b_{\bar N})} - [\sum_i\frac{C_i}{(B_i+b_{\bar N})}]^2\}.$$

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Батюня Б.В. и др. E1-84-790
Анализ реакций $\bar{D}P \to \bar{P}P\bar{N}$ при 12 ГэВ/с и упругого $\bar{N}P$ -рассеяния при 6 ГэВ/с

В работе проведен анализ реакции развала антидейтрона $\bar{d}p \to \bar{p}p\bar{n}$ и выделенного из нее упругого $\bar{n}p$ -рассеяния при импульсе 6,1 ГэВ/с на нуклон. Экспериментальный материал получен при обработке ~70 тыс. снимков с пузырьковой камеры "Людмила", облученной сепарированным пучком антидейтронов с импульсом 12,2 ГэВ/с на ускорителе У-70 /Серпухов/. Наличие быстрого антипротона-спектатора в лабораторной системе позволило выделить без систематических потерь 834 события реакции $\bar{d}p \to \bar{p}p\bar{n}$, что соответствует сечению /10,4±0,7/ мб. Дифференциальное сечение $(d\sigma/dt)$ развала согласуется с расчетом в рамках формализма Глаубера. Для выделенного из реакции $\bar{d}p \to \bar{p}p\bar{n}$ упругого $\bar{n}p$ -рассеяния определен параметр наклона $b_{\bar{n}}$ = /12,7±1,3/ $(ГэВ/с)^{-2}$ и оценено полное упругое сечение $\sigma_{el}(\bar{n}p)$ = /13,9±1,5/ мб. Эти результаты совпадают в пределах ошибок с $\bar{p}p$-данными при близких энергиях. Проводится также сравнение с имеющимися в литературе $\bar{p}n$ -данными.

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Batyunya B.V. et al. E1-84-790
Study of the Reaction $\bar{D}P \to \bar{P}P\bar{N}$ at 12 GeV/c and $\bar{N}P$ Elastic Scattering at 6 GeV/c

Results of an analysis of the antideuteron breakup reaction and $\bar{n}p$ elastic scattering extracted from it at 6.1 GeV/c per nucleon are presented. The data have been obtained from 70 K pictures of the 2m HBC "Ludmila" exposed to an RF-separated antideuteron beam at a 12.2 GeV/c momentum. The cross section of the $\bar{d}p \to \bar{p}p\bar{n}$ reaction equal to (10.4±0.7) mb is in agreement with Glauber predictions as well as differential cross section $(d\sigma/dt)$ breakup. The slope parameter $b_{\bar{n}}$ = = (12.7±1.3) $(GeV/c)^{-2}$ and the elastic cross section $\sigma_{el}(\bar{n}p)$ = = (13.9±1.5) mb have been obtained for $\bar{n}p$ elastic interactions. The results are compared with $\bar{p}p$ and $\bar{p}n$ data.

The investigation has been performed at the Laboratory of High Energies, JINR.

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