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September 2012

THE DIFFERENTIAL CROSS-SECTION ON
DP-ELASTIC SCATTERING AT 880 MEV OBTAINED AT
NUCLOTRON
The purpose of DSS (Deuteron Spin Structure) project is broadening of energy and angular ranges of measurement of different variables in processes including 3-nucleon systems. The main aim of offered experiment program is extraction of information from spin depending part of 3-nucleon processes.

DSS project experimental program includes 2 experiments, one of them is the experiment of $dp$-elastic scattering study. During it will be done measurement of cross-section, vector $A_y$, tensor $A_{yy}$ and $A_{xx}$ analyzing powers in $dp$-elastic scattering in the range of 300 and 1000 MeV of the deuteron kinetic energy.

The main aim of present investigation is to measure the cross-section of $dp$-elastic scattering at the energy 880 MeV using kinematical coincidences of deuteron and proton with simple plastic scintillation counters and CH$_2$ and C targets at the internal target station at the Nuclotron. This is needed for an experiment to measure analyzing powers for the $dp$-elastic scattering.
Internal Target Station
Scheme of the experiment

P and D - proton and deuteron detectors (dp-elastic scattering)

PP-L and PP-R – proton detectors (pp-quasi elastic scattering)

M_{1-6} - monitor counters.
Experimental setup at the Internal Target Station

Counter #2 for P and D detectors

- Scintillators:
  1) 20*25*5 mm or 10*25*5 mm (counter #1)
  2) 20*25*20 mm (counter #2)
Data handling

The results obtained at 880MeV deuteron beam on polyethylene target: a) deuteron energy losses, b) proton energy losses, c) correlation of proton and deuteron energy losses, d) time difference between the signals for deuteron and proton detectors.
Data handling

TDC SPECTRA FITTING

880 MeV
CH2 target
60 deg. c.m.
deuteron scattering

TDC spectra with gates

TDC spectra with gates

880 MeV

TDC (Channels)

N events

' + 4*Sigma
APPLYING ADC GRAPHICAL CRITERIA

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ADC CORRELATION
GRAPHICAL CRITERIA

ADC correlation
with TDC gates
Getting normalization coefficient fitting the time difference spectra

Time difference spectra obtained on polyethylene (a) and carbon (b) targets.

\[ K = \frac{\text{const}_{\text{CH}_2}}{\text{const}_C} \]
CH$_2$-C time difference spectra subtraction

Time difference distribution for $dp$-elastic events obtained from CH$_2$-C
Event yield of $dp$-elastic scattering $T_d=880$ MeV

Event yield $= \frac{N_{dp\text{-elastic}}}{N_{pp\text{-quasielastic}}}$
Cross section in $dp$- elastic scattering at 880 MeV

- The results of the multiple scattering model are in agreement with the cross section data in the range 30 - 130°.
- Double scattering dominates over single scattering at the angles larger than 70°.
- Deviation of the data on the calculations at backward angles are related with the s-type of the FM 3NF.
- Is the deviation on the data from the calculations around 90° manifestation of 3N SRC?

Red circles are the preliminary LHEP-JINR results.

World data:

Relativistic multiple scattering model calculation:
Conclusions

The following results has been obtained:

- The procedure of the $dp$-elastic scattering cross-section measurements at internal target station at Nuclotron using CH$_2$-C subtraction has been established.
- The first results of the cross-section measurement in $dp$-elastic scattering at the energies of 880 MeV have been obtained. The results show the reasonable behaviour as the function of the scattering angle.
- The goal for the nearest runs is to measure the cross-section of $dp$-elastic scattering reaction in wide deuteron energy range with the step not more than 100 MeV in the region from 500-1000 MeV.
Collaboration

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THANK YOU!

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