STUDY OF DEUTERON STRUCTURE IN QUASIELASTIC BREAK-UP REACTION pd→ppn IN COMPLETE KINEMATICS AT 1 GeV

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A good way to study deuteron structure is through experimental investigation of the deuteron break-up reaction at intermediate energy. In Impulse Approximation (IA) the differential cross section of the reaction can be written as

$$d\sigma/d\Omega_1 d\Omega_2 dp_1 = KIN \cdot (d\sigma^*/d\Omega) \cdot |\Phi(k)|^2, \text{ where}$$

KIN is a 3-body kinematical factor,
$d\sigma^*/d\Omega$ is the center of the mass nucleon-nucleon cross section,
$\Phi(k)$ is the deuteron wave function (DWF) in momentum space,
k is the internal nucleon momentum in the deuteron.

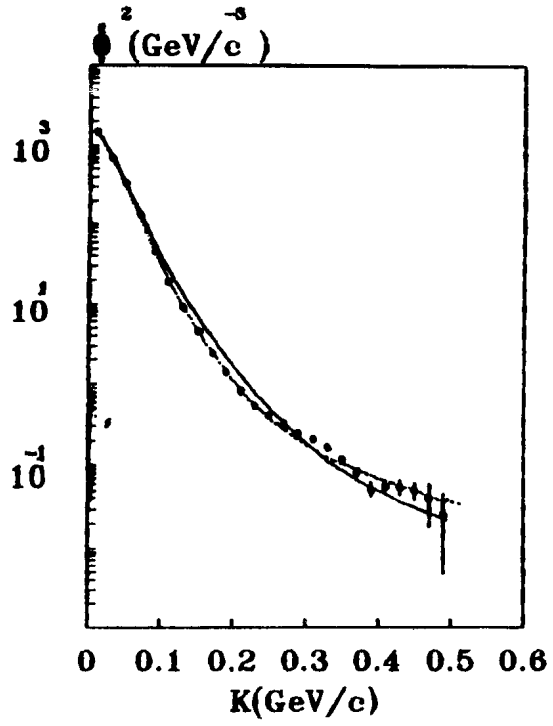

Fig. Nuclear momentum distribution in deuteron $|\Phi(K)|^2$ from PD→PPN at 1 GeV/c. Theoretical curves are explained in text

Thus, the function $|\Phi(k)|^2$ which stands for the nucleon momentum distribution in the deuteron can be measured in this experiment. Note, that $|\Phi(k)|^2 = U(k)^2 + W(k)^2$, where $U(k)$ and $W(k)$ are S and D state deuteron wave functions.

Most of the deuteron break-up experiments show that the IA calculation with realistic nonrelativistic DWFs (Paris, Reid, etc.) are adequate up to $k \cong 250$ MeV/c. At larger k values some experimental results show a noticeable deviation from IA [1 — 3]. In ref. [4] this discrepancy has been regarded as an indication of a six quark bag admixture to DWF. On the other hand the electrodisintegration data agree with IA predictions up to 500 MeV/c [5].

We present here the results of the investigation of the PD→PPN reaction performed at the 1 GeV proton beam of the LNPI synchrocyclotron using a liquid deuterium target and a two arm spectrometer. The protons emitted from the target at $\Theta_1 = 20.2°$ were detected by a magnetic spectrometer [6] in coincidence with a large acceptance ($\Delta\Theta = \pm 4.6°$, $\Delta\varphi = \pm 3.7°$) scintillation counter system situated at $\Theta_2 = 60.2°$.

Our results for $|\Phi(k)|^2$ are shown in fig. The solid line is calculated in IA with Paris DWF, the dotted line is the same with double scattering effects included. As one can see the experimental data are somewhat higher than the theoretical curves in the region of $k \cong 0.3$ GeV/c. However, in general the data are well described by the IA with double scattering corrections in the k region under investigation up to 0.5 GeV/c.

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