REPORTS ON RESEARCH:

Measurement of the pd $\rightarrow$ ^{3}Heπ^0 and pd $\rightarrow$ ^{3}Hπ^+ Reactions. Investigation of Isospin Symmetry Breaking

The GEM Collaboration

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An interesting aspect of the influence of the nuclear environment on the fundamental pion production process NN $\rightarrow$ NNπ is the possibility to test the charge symmetry hypothesis in system involving both nucleons and π mesons [1]. In the proton-deuteron interactions a suitable experiment to test the isospin symmetry is to obtain the ratio R = dσ(pd $\rightarrow$ ^{3}Hπ^+)/ dσ(pd $\rightarrow$ ^{3}Heπ^0), which should be equal 2 if electromagnetic interactions are neglected. The existing experimental data for reactions leading to pion production in the 3-nucleon system comprise differential cross sections measured predominantly in the Δ-resonance region between 300 and 600 MeV [2]. For energy parameter $\eta = p_\pi^{cm}/(m_\pi c)$ between 0.4 and 0.8 no experimental data exist [3].

Our measurements were performed using the GEM detector. This detector consists of two parts. The zero-degree detector is the magnetic spectrometer BIG KARL. The second part which is called the Germanium Wall (GeW), is a stack of annular detectors made of high purity germanium. In the center of each detector there is a hole corresponding to the acceptance of the magnetic spectrometer BIG KARL placed behind of the Germanium Wall. This allows reaction products emitted at small angles with respect to the beam axis as well as primary beam particles not reacting with the target, to enter the magnetic spectrometer without impinging on the Germanium Wall [4].

We have measured simultaneously the pd $\rightarrow$ ^{3}Hπ^+ and pd $\rightarrow$ ^{3}Heπ^0 reactions at proton momenta 700, 767, and 825 MeV/c to complete the data in the energy region of 0.4 $\leq\eta\leq$ 1.2. Our preliminary results of pd $\rightarrow$ ^{3}Heπ^0 and pd $\rightarrow$ ^{3}Hπ^+ are in agreement with part of existing data [5-8]. The analysis is still in progress. Additional measurements for other beam energies are still necessary. Such experiments will be performed in spring 1999 for several proton beam momenta from 900 to 1150 MeV/c.

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