A STUDY OF THE REACTION ^{2}H(e,e'p) IN THE Δ RESONANCE REGION

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The nuclear response in electron-scattering experiments at energy transfers beyond the quasi-elastic peak is dominated by subnucleonic interaction effects like Meson Exchange Currents (MEC) and Δ excitation. The deuteron disintegration reaction ^{2}H(e,e'p)n provides a powerful tool to investigate these effects in the most basic nuclear system, where one does not have to deal with the problems and approximations of many-particle systems, which may complicate the interpretation of subnucleonic effects in heavier nuclei. Theoretical calculations have shown that the exclusive ^{2}H(e,e'p)n cross section in the Δ-resonance region is largely determined by the nuclear structure functions f_T and f_{TT}, which in turn are driven by a reaction mechanism in which Δ excitation is followed by a ΔN —> NN reaction[1]. Hence, measurements of the ^{2}H(e,e'p)n cross section and in particular of the separated structure functions are expected to provide interesting information on the underlying ΔN and NN interactions. Moreover, such measurements are of relevance for the interpretation of (e,e'NN) measurements in complex nuclei.

With the extracted beam from the Amsterdam Pulse Stretcher (AmPS) at NIKHEF the ^{2}H(e,e'p)n reaction has been studied at kinematical conditions optimized for Δ excitation. The measurements were performed at a beam energy of 525 MeV, a beam current of about 2-3 μA and a duty factor of about 50%. A newly built cryogenic liquid deuterium target was used. The scattered electrons were detected at 30^0 in the QDQ spectrometer and the energy transfer was ω = 311.5 MeV. These values correspond to a three-momentum tranfer |q| = 356.6 MeV/c and a relative energy of the *np*-system E_{np} = 280 MeV. The emitted protons were detected in a new 500 msr plastic scintillator array (Hadron-4), consisting of 94 scintillators. It accepts protons in the range 25-160 MeV. The cross section was measured over the proton angular range $79^0 < \theta_p^{lab} < 136^0$. It was possible to determine the f_{TT} structure function in this angular range as the hodoscope of the Hadron-4 detector enables the measurement of the cross section up to out-of-plane angles $\phi = \pm 22^0$, with a resolution of 2.2^0. In fig.1 a preliminary missing energy spectrum corresponding to 2% of the data is shown. The contribution to this spectrum of scattering from the target walls has not yet been subtracted and corrections for radiative effects have not yet been made. At the conference the measured cross sections and structure functions will be presented and compared with theoretical calculations [1].

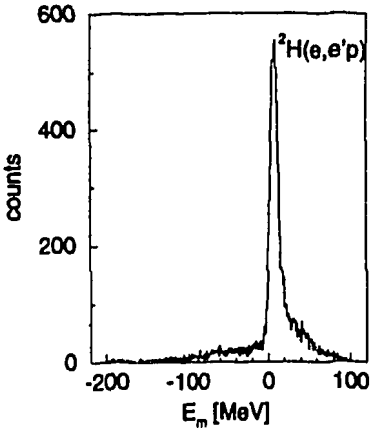

Fig.1 Missing energy spectrum for the reaction ^{2}H(e,e'p)

[1] H.Arenhövel, W. Leidemann and E.L. Tomusiak, Phys. Rev. C46 (1992) 455