

Tensor Analyzing Powers of pd Radiative Capture

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In our previous measurement of pd radiative capture at $E_d = 196$ MeV [1], we found an interesting fact that the measured tensor analyzing powers show the relation $A_{xx} \approx A_{yy}$ although calculated A_{xx} and A_{yy} are apparently different, $A_{xx} \neq A_{yy}$. The measured A_{yy} is fairly well reproduced by 3N calculations, and there is a large disagreement between the measured A_{xx} and calculated A_{xx} . The disagreement can not be explained by inclusion of 2π exchange three-nucleon force. The relation $A_{xx} \approx A_{yy}$ has been found also at $E_d = 17.5$ MeV [2]. Theoretical calculations predict $A_{xx} \approx A_{yy}$ below $E_d = 50$ MeV and $A_{xx} \neq A_{yy}$ above 50 MeV.

Hence we have made another measurement of A_{xx} and A_{yy} of pd capture at $E_d = 137$ MeV. The experimental method was similar to that at 196 MeV. A vertically polarized d beam was incident on a liquid hydrogen target of 9.6 mg/cm² (=1.2 mm) in thickness having thin aramide window foils of 0.6 mg/cm² (=4.4 μ m) in thickness, and ^3He recoils in whole the angular distribution were detected using a large acceptance spectrometer. At 0 degree ^3He recoils in the vertical plane were detected to measure A_{xx} , and ^3He recoils at 1.3 deg-5 deg in the horizontal plane were detected to measure A_{yy} and A_y . Polarization of d beam was always measured by a beam-line polarimeter using pd scattering.

Data analysis is in progress with great care since the capture cross section is small as about 0.1-0.4 mb/sr and there were lots of backgrounds. The preliminary data support the $A_{xx} \approx A_{yy}$ relation.

The $A_{xx} \approx A_{yy}$ relation and discrepancy in A_{xx} between experiment and calculations are discussed in connection with three-nucleon forces. The present data are also compared with other data at 130-180 MeV [1,3].

[1] T. Yagita et al., Mod. Physics Letters A18 (2003) 322

[2] H. Akiyoshi et al., Phys. Rev. C64 (2001) 034001

[3] A.A. Mehmandoost-Khajeh-Dad et al., Phys. Lett. B617, 18 (2005)