Tensor Analyzing Powers of pd Radiative Capture

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In our previous measurement of pd radiative capture at E\textsubscript{d} = 196 MeV \cite{1}, we found an interesting fact that the measured tensor analyzing powers show the relation A\textsubscript{xx} ≈ A\textsubscript{yy} although calculated A\textsubscript{xx} and A\textsubscript{yy} are apparently different, A\textsubscript{xx} ≠ A\textsubscript{yy}. The measured A\textsubscript{yy} is fairly well reproduced by 3N calculations, and there is a large disagreement between the measured A\textsubscript{xx} and calculated A\textsubscript{xx}. The disagreement cannot be explained by inclusion of 2\pi exchange three-nucleon force. The relation A\textsubscript{xx} ≈ A\textsubscript{yy} has been found also at E\textsubscript{d} = 17.5 MeV \cite{2}. Theoretical calculations predict A\textsubscript{xx} ≈ A\textsubscript{yy} below E\textsubscript{d} = 50 MeV and A\textsubscript{xx} ≠ A\textsubscript{yy} above 50 MeV.

Hence we have made another measurement of A\textsubscript{xx} and A\textsubscript{yy} of pd capture at E\textsubscript{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/cm\textsuperscript{2} (=1.2 mm) in thickness having thin aramide window foils of 0.6 mg/cm\textsuperscript{2} (=4.4 \textmu m) in thickness, and \textsuperscript{3}He recoils in whole the angular distribution were detected using a large acceptance spectrometer. At 0 degree \textsuperscript{3}He recoils in the vertical plane were detected to measure A\textsubscript{xx}, and \textsuperscript{3}He recoils at 1.3 deg-5 deg in the horizontal plane were detected to measure A\textsubscript{yy} and A\textsubscript{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\textsubscript{xx} ≈ A\textsubscript{yy} relation.

The A\textsubscript{xx} ≈ A\textsubscript{yy} relation and discrepancy in A\textsubscript{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 \cite{1,3}.

\begin{thebibliography}{99}
  \bibitem{1} T. Yagita et al., Mod. Physics Letters A18 (2003) 322
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