

Model-independent Spin-parity Determination by the (d, ^2He) Reaction and a Possible Indication of 0^- State in ^{12}B

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A method of model-independent spin-parity determination is proposed for the (d, ^2He) reaction by using the tensor analyzing power A_{zz} at $\theta = 0^\circ$, which shows extreme values for some states, i.e. $A_{zz} = -2$ for 0^- and $A_{zz} = +1$ for natural-parity states, solely by the parity-conservation. It has been applied to the $^{12}\text{C}(d, ^2\text{He})^{12}\text{B}$ reaction at $E_d = 270$ MeV using the polarized deuteron beam from the RIKEN ring cyclotron. The facility is unique in its capability for rotating the polarization axis to arbitrary angles. Owing to an enhanced sensitivity to A_{zz} achieved by aligning the polarization axis parallel to the beam, a possible indication of 0^- state has been found at $E_x = 9.3$ MeV in ^{12}B for the first time (Figs. 1 and 2). Also the bump at $E_x = 7.5$ MeV is found to be dominated by 2^- states rather than 1^- states, confirming the result in our previous publication¹.

1 H. Okamura et al., Phys. Lett. B345 (1995) 1.

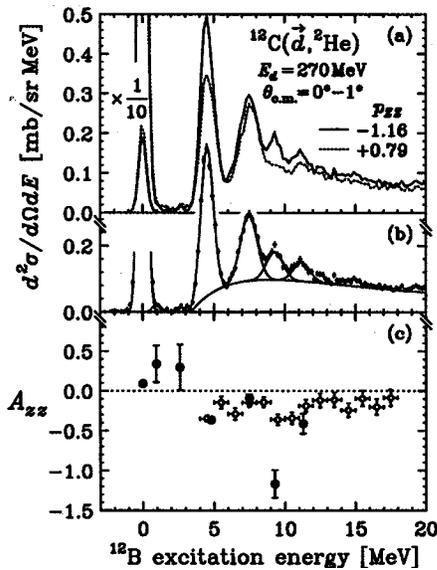


Figure 1: ^{12}B excitation energy spectrum at $\theta=0^\circ-1^\circ$ (a), a result of peak-fitting (b), and the corresponding A_{zz} spectra (c).

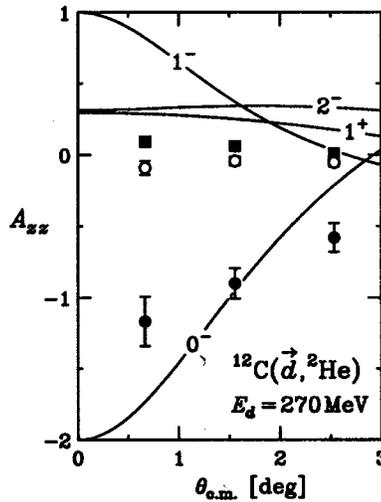


Figure 2: A_{zz} angular distributions for the ground (closed square), $E_x = 7.5$ MeV (open circle), and $E_x = 9.3$ MeV (closed circle) states.