Understanding effect of tensor interactions in light nuclei via high-momentum one-neutron-transfer reaction

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Search for evidence of tensor-force effect

$^{15}\text{O}$ level scheme

\[ \Delta J=0, \Delta L=\Delta S=2 \]

Ground-state of $^{16}\text{O}$:
mixing of 2p-2h configuration **

Selection Rule: $\Delta J=0$, $\Delta L=\Delta S=2$

* J.L. Snelgrove et al., PR 187 (1969) 1246
** T. Myo, private communication
Possible Signature of Tensor Forces

- CDCC-BA calculation with known spectroscopic factors:
  ✓ qualitatively agree with ratios for the neutron-hole states (3/2- to 1/2-)
  ✓ cannot explain the ratios for the positive-parity state (1/2+ or 5/2+ to 1/2-)

- Two(Multi)-step process does not help

- TOSM-type momentum wave functions that include high-momentum components “fit” the data well.

HJO, IT et al., PLB 725, 277 (2013)

Issues to be addressed...

(p,d) at finite (≥10 deg) scattering angle

reaction mechanism effect at finite angle

⇒ 0 degree measurement

• (p,d) at 0 deg with 400-MeV proton @ RCNP, Osaka

• (p,d) at 0 deg with 400~1200-MeV proton to cover 2 fm⁻¹ @ GSI, Darmstadt

ambiguity of contributions from p-n and/or n-n pairs

⇒ (p,dp) and (p,dn) measurements

• (p,dp), (p,dn) at finite angles with 400-MeV proton to study p-n and n-n correlations @ RCNP

• Planned (p,dp), (p,dn) at higher energy to cover 2 fm⁻¹ @ GSI/FAIR, Darmstadt

Talk on July 28 (Session J2) by Isao Tanihata
Effect of reaction mechanism is negligible

\[ \text{Angular distribution in Lab} \]

- 0 MeV, 1/2-
- 5.2 MeV, 1/2+, 5/2+
- 6.18 MeV, 3/2-

\[ \text{Preliminary} \]

\[ \text{(dσ/dΩ)}_\text{ex} / (dσ/dΩ)_\text{gs} \]

\[ q \text{ (fm}^{-1}) \]

\[ 0 \sim 10 \text{ deg} \]

\[ \text{Preliminary} \]
(Preliminary) Results for $^{16}$O(p,d) @ 400 MeV/u

Ratios consistent with RCNP data

Conclusion:
Effect of reaction mechanism is negligible