A

t

$\xi_A(\mathbf{r}_{34}, \mathbf{r}_{56}, \mathbf{r}_{34\text{-}56})$

B

1 2 3 4

$\mathbf{r}_{A2}$

$\mathbf{r}_{p1}$ t

$\mathbf{r}_{tA}$

A

p

$\mathbf{r}_{pA}$

5 6

1 2 $\mathbf{r}_{A2}$ 3 4

t

$\mathbf{r}_{tA}$

B

A

p

$\mathbf{r}_{pB}$

5 6

$\mathbf{r}_2$

$\mathbf{r}_1$

p

1 }
2 } n } t

3
4 } nucleons
5
6

$v(r_{pi})$: two-body proton-neutron interaction

$$\underbrace{t \; + \; A}_{\text{entrance channel}} \longrightarrow \underbrace{p \; + \; B}_{\text{exit channel}}$$

$$\frac{d\sigma}{d\Omega} = \frac{\mu_i \mu_f}{(4\pi\hbar^2)^2} \frac{k_f}{k_i} \left| T^{(1)}(\theta) + T^{(2)}_{succ}(\theta) - T^{(2)}_{NO}(\theta) \right|^2$$

$$\phi_t(\mathbf{r}_{p1}, \sigma_1, \mathbf{r}_{p2}, \sigma_2)\chi^{1/2}_{m_s}(\sigma_p)\psi_A(\xi_A)\chi^{(+)}_{tA}(\mathbf{r}_{tA}) \qquad \chi^{1/2}_{m_s}(\sigma_p)\psi_B(\xi_B)\chi^{(-)}_{pB}(\mathbf{r}_{pB})$$

$$\left(\phi_d(\mathbf{r}_{p1}, \sigma_1)\phi_d(\mathbf{r}_{p2}, \sigma_2)\chi^{(+)}_{tA}(\mathbf{r}_{tA}) \right)$$

$$\Psi_{A+2}(\xi_A, \mathbf{r}_{A1}, \sigma_1, \mathbf{r}_{A2}, \sigma_2) = \psi_A(\xi_A) \sum_{l_i, j_i} [\phi^{A+2}_{l_i, j_i}(\mathbf{r}_{A1}, \sigma_1, \mathbf{r}_{A2}, \sigma_2)]^0_0$$

$$= \psi_A(\xi_A) \sum_{nm} a_{nm} \left| \varphi^{A+2}_{n, l_i, j_i}(\mathbf{r}_{A1}, \sigma_1)\varphi^{A+2}_{m, l_i, j_i}(\mathbf{r}_{A2}, \sigma_2) \right|^0_0$$

$$T^{(1)} = 2 \sum_{\sigma_1, \sigma_2, \sigma_p} \int d\xi_A d\mathbf{r}_{tA} d\mathbf{r}_{p1} d\mathbf{r}_{A2} \psi_A(\xi_A) \sum_{l_i, j_i} [\phi^{A+2}_{l_i, j_i}(\mathbf{r}_{A1}, \sigma_1, \mathbf{r}_{A2}, \sigma_2)]^{0*}_0$$

$$\times \chi^{(-)*}_{pB}(\mathbf{r}_{pB})\chi^{1/2*}_{m_s}(\sigma_p)v(r_{p1})\phi_t(\mathbf{r}_{p1}, \sigma_1, \mathbf{r}_{p2}, \sigma_2)\chi^{1/2}_{m_s}(\sigma_p)\psi_A(\xi_A)\chi^{(+)}_{tA}(\mathbf{r}_{tA})$$

$$= 2 \sum_{\sigma_1, \sigma_2, \sigma_p} \int d\mathbf{r}_{tA} d\mathbf{r}_{p1} d\mathbf{r}_{A2} \sum_{l_i, j_i} [\phi^{A+2}_{l_i, j_i}(\mathbf{r}_{A1}, \sigma_1, \mathbf{r}_{A2}, \sigma_2)]^{0*}_0$$

$$\times \chi^{(-)*}_{pB}(\mathbf{r}_{pB})\chi^{1/2*}_{m_s}(\sigma_p)v(r_{p1})\phi_t(\mathbf{r}_{p1}, \sigma_1, \mathbf{r}_{p2}, \sigma_2)\chi^{1/2}_{m_s}(\sigma_p)\chi^{(+)}_{tA}(\mathbf{r}_{tA})$$