Appendix

CONVERSION OF MATRIX ELEMENTS FROM ISOSPIN-FORMALISM TO PN-FORMALISM

The matrix elements of the proton-neutron interaction are written in terms of T=0 and T=1 matrix elements as

$$\langle j_\pi j_\nu \mid V_{\pi\nu} \mid j'_\pi j'_\nu \rangle = \frac{\sqrt{(1+\delta_{j_\pi j_\nu})(1+\delta_{j'_\pi j'_\nu})}}{2} \times$$
$$(\langle j_\pi j_\nu \mid V_{\pi\nu} \mid j'_\pi j'_\nu \rangle J, T = 1 + \langle j_\pi j_\nu \mid V_{\pi\nu} \mid j'_\pi j'_\nu \rangle J, T = 0)$$

where the difference is considered in the normalization of two-particle states between the p-n formalism and iso-spin formalism, and $\delta_{j_\pi j_\nu}$ is unity when the proton and neutron single-particle orbits, j_π and j_ν have the same set of quantum numbers.

Case I:

When $j_\pi \neq j_\nu$ and $j'_\pi \neq j'_\nu$

$$\langle j_\pi j_\nu \mid V_{\pi\nu} \mid j'_\pi j'_\nu \rangle = \frac{1}{2}(\langle j_\pi j_\nu \mid V_{\pi\nu} \mid j'_\pi j'_\nu \rangle J, T = 1 + \langle j_\pi j_\nu \mid V_{\pi\nu} \mid j'_\pi j'_\nu \rangle J, T = 0)$$

Case II:

When $j_\pi \neq j_\nu \neq j'_\pi \neq j'_\nu$

$$\langle j_\pi j_\nu \mid V_{\pi\nu} \mid j'_\pi j'_\nu \rangle = \frac{1}{\sqrt{2}}(\langle j_\pi j_\nu \mid V_{\pi\nu} \mid j'_\pi j'_\nu \rangle J, T = 1 + \langle j_\pi j_\nu \mid V_{\pi\nu} \mid j'_\pi j'_\nu \rangle J, T = 0)$$

Case III:

When $j_\pi = j_\nu = j'_\pi = j'_\nu$

$$\langle j_\pi j_\nu \mid V_{\pi\nu} \mid j'_\pi j'_\nu \rangle = \langle j_\pi j_\nu \mid V_{\pi\nu} \mid j'_\pi j'_\nu \rangle J, T = 0 \ if \ J \ odd$$

$$\langle j_\pi j_\nu \mid V_{\pi\nu} \mid j'_\pi j'_\nu \rangle = \langle j_\pi j_\nu \mid V_{\pi\nu} \mid j'_\pi j'_\nu \rangle J, T = 1 \ if \ J \ even$$